AN EXPLORATION OF TEACHERS' VOICE PROBLEMS AND THEIR POSSIBLE SOLUTION

by

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A thesis submitted to the University of Birmingham

for the degree DOCTOR OF PHILOSOPHY

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COLLEGE OF ARTS & LAW
September 2015

ACKNOWLEDGEMENTS

There are many people who have encouraged and supported me towards completion of this thesis. Key guidance has come from Dr Rose Whyman at all stages in the study. Thank you to Rose for enabling me to make progress even at the points when I was not able to see a clear way forward. I value all the help and shared insight over this time of working together on voice and the Alexander Technique. I thank Brian Door for allowing me to use the voice procedure developed by him as it forms the basis of exploration undertaken in the laboratory.

A thank you is due to Professor Ian Loram who gave considerable time, effort and expertise so that work in the laboratory at Manchester Metropolitan University could take place. Ian also helped with a large number of analyses that are a major contribution to the results being presented. Also, I thank Dr Victoria Door and those at Keele University who took part or enabled others to participate. Thank you to those at the University of Wolverhampton, students and lecturer colleagues, who contributed to the first stages of the study.

Special thanks to all the classroom teachers and student teachers who contributed by being willing participants. Without you the evidence-gathering could not have taken place. I hope any who see the finished work will consider they are well-represented and that the outcome justifies their efforts as well as mine. Particular thanks to those who participated in the laboratory exploration or those like Sean who agreed to be interviewed.

Members of my family have been supportive throughout; given the timescale of the study it is no small feat that they have maintained such special interest in all that I have done. Including the youngest of the family, who were not born when I began the work, they are all an inspiration. Especial thanks go to Heather who has helped me through the final stages with her proof reading, presentation skills and her meticulous attention to detail. It is much appreciated and has made an enormous difference to my final editing of the thesis. Hopefully there is a worthwhile result for all the discussions on grammar and style that we had.

Finally, this study owes everything to the Alexander Technique as a main inspiration and framework and also in providing a means to all the better things I achieve. For me, Brian is the main person instrumental in all I have learned about the Technique; as are colleagues in PAAT who are part of continuous endeavours to understand and apply what we have been given by Brian.

ABSTRACT

The vocal demands on teachers in UK classrooms are explored in this mixed methods research which notes how little voice support teachers receive. The study draws on information from a range of fields: literature on voice problems, voice science, actor training, and the perspectives of teachers themselves.

First-hand evidence collected through a survey questionnaire and individual interviews gives information of teachers' voice problems. The study provides also an exploration of how voice quality is influenced by psychophysical use as defined in the Alexander Technique. The Technique was discovered by F.M. Alexander (1869-1955) and is well-known in the preparation of actors for performance. There are different understandings of what Alexander taught; what I set out in this study is the particular basis he passed on which influences my own use and voice.

Detailed exploration taking place in a biomechanical laboratory replicated general vocal demand. Considerable quantitative data emerged with results showing that it is feasible to measure voice quality and other changes occurring when the teacher follows a procedure of the Technique to adjust their stance.

The research aims to contribute towards knowledge of the teacher's voice, to inform provision for UK teachers, and to demonstrate further research is warranted.

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CHAPTER 1

INTRODUCTION

1.1   THE AIM OF THE STUDY

The aim of the study is to explore help for teachers to cope with the demands on their voices during a teaching career.

1.1.1   How the idea for the study came about

In the course of almost twenty years as a primary school teacher, and in subsequent work as a deputy head teacher and teacher educator in a university, I noted that working in the classroom makes certain demands when it comes to use of the voice. Teachers are required to use their voices a good deal of the time throughout a teaching day, which in most UK schools entails at least five hours. The demands include making oneself heard in the classroom, in the hall, in the playground and in other locations such as an open-air museum or the swimming baths.

I found during this experience in schools and as a teacher educator that voice problems amongst teachers and student teachers were not uncommon, as though it were difficult for some to meet the vocal demands. On occasion, teachers or student teachers talked informally about their experience of problems, discussing how they experienced discomfort or even 'lost' their voice from time-to-time. This appeared to confirm my observations.

I began to consider the kinds of voice problems experienced by teachers and the consequences of these problems. I observed that some individuals found it hard to be audible, to gain or maintain the attention of all learners, or to have stamina for using the voice over the long period of a school day. Some teachers appeared to have minor but on-going difficulties; others

had persistent difficulties such as recurrent laryngitis, constant hoarseness, voice loss, or more than one of these.

There was some staff absence from work at my school, which teachers would say was because of their voice-related conditions. Because of the need to keep talking when in class, a vocal complaint often meant any teacher became unfit for work for a period or periods of time. Sometimes medical attention was required.

I did not know whether such voice difficulties were connected with a recognised medical condition or other factors, and I began to consider whether any difficulty might be indicative of a wider problem in the teaching profession as a whole. I had a hunch that the problem and the scale of the problem might be considerable if what I saw was typical of teachers in other schools around the country.

My conjecture is supported perhaps by the idea of Mouly (1978: 25-27) that such surmise from experience is a valid starting point for research. Mouly suggests a five-part process where the researcher progresses from the hunch through 'classification', 'quantification', and 'discovery of relationships' to arrive at some research outcome (1978, 25-27). Whilst I thought, to some extent, it might be useful to be able to describe the situation numerically, I was not sure how necessary it might be to quantify strictly (Robson, 2011: 410) for circumstances which, at that point, were my observational view and those of the teachers concerned (Pring, 2004: 33).

In summary, the problems of which I was aware at this point seemed connected to voice quality and also stamina or sustainability, given that teachers have to be able to produce effective voice without undue effort and maintain it over the working day.

1.1.2   Corroborative evidence for my observations of teachers' voice problems

I found corroborative evidence for these personal observations in articles appearing in education publications. The articles might be called journalistic prompts that voice problems are not uncommon amongst classroom teachers. The in-house journal of the Association of Teachers and Lecturers (ATL) published a piece for members entitled: *Value your voice* (Furse, 2008: 24). The article discussed the demands on voice in the course of a teaching day and how a teacher might withstand these. Sore throats, hoarseness, and lost voice appeared to be common problems. Another publication, the *Times Educational Supplement* (TES) said 'it is paramount' that teachers 'maintain a robust and animated voice because without it their career is over' (Frankel, 2007: 22).

A subsequent ATL journal contained a letter from a practising teacher who reported a problem with vocal-fold nodules (swellings on part of the organ of voice, the larynx). She highlighted what she called 'this surprisingly common and serious condition'; also, she suggested that many teachers regard voice problems as 'an acceptable occupational hazard' (Elder, 2009: 17). At that time, I knew personally of two people who had left teaching because of developing nodules which compromise voice quality and can make speaking uncomfortable or even painful.

A former speech and language therapist, who was a lecturer colleague at my university, described her previous clinical practice with adults requiring help. She told me how the clientele included teachers and lecturers who experienced voice problems severe enough for their referral to the speech therapy service where she was working. She found some people had persistent problems even after she had helped them to remedy 'mechanistic' difficulties, by which she meant issues of producing and articulating sounds. What she said also appeared to corroborate my hunch and confirm thoughts on the complexity of people's experiences.

Based on these reports the question arises as to whether voice problems and their consequences are inevitable. It seems that there is a problem in need of resolution from the point of view of teacher welfare, but also due to the possible loss of teaching days and the economic consideration of this for schools.

1.2   FORMULATING RESEARCH QUESTIONS AND OBJECTIVES

All these details made a starting point for my further enquiry. I began to investigate further, thinking that through a study I would like to be able to take steps, however small, towards a way forward for teachers. They need to employ their voices effectively in the classroom without incurring the kind of problems or harm that I have observed over my years in teaching.

Initial research questions stemmed from the aim of this study, investigating how teachers can be helped to cope with the demands on their voices during a teaching career. Therefore, I asked: what are the perceived vocal demands on UK teachers in the classroom currently? An objective associated with this research question was to gather evidence through a first-hand survey with teachers.

In order to talk meaningfully about voice and what the teacher needs to achieve vocally in response to the demands of being in the classroom, it is necessary to consider voice quality, which is a concept 'that is at once widely recognised and very difficult to define in a way that is universally acceptable' (Kent and Ball, 2000: ix). The concept requires literature exploration as an objective in addressing a further research question, namely: is it possible to measure improvements in voice quality meaningfully for classroom teachers?

Before beginning to examine answers to these questions and others which might arise, I wanted to gain a greater understanding of the situation for classroom teachers in this aspect of

professional practice. For instance, as a related research objective, I considered more fully whether voice training might be a solution for classroom teachers. This led to consideration of what training in voice skills is, and has been, available to them.

Also, it is part of my own perspective that the Alexander Technique (AT) has much to contribute to discussion and practical consideration. As well as being a teacher working in schools and with experience in a university post as a teacher educator, I have trained as a teacher of the Technique with the Professional Association of Alexander Teachers (PAAT). When learning the Technique in a short evening class, private lessons and subsequently in training as an AT teacher, I found that, whilst voice had not been particularly problematic in my work in school, my voice improved. For instance, I found audibility in large spaces and sustained use of my voice easier. I observed a similar improvement in voice quality in Alexander teacher colleagues and in pupils as a result of their application of the Technique. Such perception is borne out by my AT colleagues.

The principles of the AT were discovered by F.M. Alexander (1869 – 1955), initially as a means to solving his own voice problem. It is noted that there are differing schools of thought on the Technique. It is named for the person introducing it, rather than having a generic title which describes what it is (Staring, 2005: 1 and 333), and perhaps this leaves much open to interpretation.

The Technique can be considered different to other approaches because it involves a change in 'use'; use is a concept which acknowledges any activity, including vocalisation, as psychophysical. That is, the voice is not purely mechanical or physical (Alexander, 1985: 21) because there is no separation between what we do and the way we think about things; the mind and body are 'so inextricably interwoven' in 'everyday life' (Door, 2003: 38). The AT

has been instrumental in my own vocal development and a mainstay in many other aspects of my more recent lived experience. The concept of use and a related concept of misuse, predicating what can go awry in our activity, are instrumental to an understanding of voice and voice problems. Discussion is taken further later in the chapter. Technical detail of how the voice works is shown in Appendix A.

Personal experience caused me to raise the question: can attention to improving use (as defined in the AT) help classroom teachers with their voice problems? Allied with this is an objective of gaining further evidence of improved psychophysical use and accompanying change in voice quality. I wanted to explore this specifically with teachers or student teachers. It seemed to me this meant finding out: can improvement in voice quality be demonstrated by the adoption of a procedure based on the AT? A final objective of reflecting on outcomes might enable me to propose a way forward in developing support for teachers.

The four research questions and five related objectives have shaped the course of my research, leading to a broad literature review (Chapters 2 and 3) and first-hand investigation (reported in Chapters 5 and 6). These are all within a defined methodology set out in Chapter 4. Informed by all these steps I draw conclusions in Chapter 7 on ways to help teachers.

1.3   VOICE SKILLS FOR CLASSROOM TEACHERS AND STUDENT TEACHERS

When I trained as a classroom teacher at the end of the 1960s, I received little or no help to develop vocal skills or to know what was necessary in terms of quality of voice. One could have the impression that it was assumed teachers would understand implicitly what was needed.

There are now a few initiatives in certain UK training institutions which offer some support for student teachers. For instance, the University of Sussex set up two sessions 'on voice and

self-presentation' to take place during student teacher induction and this was reported in the *Times Educational Supplement* (TES) (Murray, 2004: 62 and Frankel, 2007: 20). The TES also featured an article on student teachers at Keele University receiving help on the AT to 'protect the voice in the classroom' (Revell, 2004: 3), an initiative I knew through my membership of the PAAT. At a later date, this university began to provide some voice training with a professional actor in the form of a two-hour course for postgraduate teacher students. In 2009, I was able to attend one of these sessions to gain experience of such training first-hand. Afterwards the actor, Sean O'Callaghan agreed to take part in an interview which has informed this thesis (Appendix B).

I attended a day-long voice course in January 2008 as part of a programme of continuing professional development (CPD) offered to teachers by ATL. The course tutor had trained in and taught drama before becoming a voice tutor. Such courses are provided for ATL presently through the Voice Care Network (VCN) which was founded in 1993 as a response to problems amongst professionals, including teachers.

The courses mentioned appear, however, to be limited instances of help for teachers. For the majority of classroom teachers in post and for students coming into the profession, the situation appears ad hoc. Any student who trains to teach drama probably has vocal training as part of their course, but this is a special situation which only applies to a small number of individuals among the teaching workforce. Working recently in teacher education with those preparing to teach in primary schools has shown me that voice training provision is available only to a minority of teachers and that, in the main, there is still a lack of help for voice skills and vocal development as there was for me when I entered the profession. This was not always so, as I saw when I traced the earlier development of teacher training from the turn of the twentieth century.

1.3.1 Teacher training and voice skills in the early part of the twentieth century

Teacher training in this country began to be formalised around the turn of the twentieth century. Sandiford, in *The Training of Teachers in England and Wales* (1910: 81), reviews the first years of provision showing teachers were responsible for 'teaching Speech' so that pupils secured 'distinct articulation' in poetry and prose reading. Presumably this indicated teachers being suitably prepared and having the related skills themselves.

Apparently one of the foremost drama schools of that time was able to provide support. The Royal Central School for Speech and Drama in London was founded in 1908. Commonly referred to as 'Central', it trained actors and teachers of speech and drama together over a number of years. There is evidence that voice and speech skills were part of what teachers learned in order that they could promote pupils' skills in English. Susi shows that over the first decades of the School, its students were demonstrating 'good reading skills, and appreciation of literature and the speaking of verse' in their grasp of theory and practice (2006: 58). All students undertook study of voice training and movement as well as verse speaking with the School's founder, Elsie Fogerty (1865 - 1945), (Susi, 2006: 22-23).

Other students at Central focused their studies on voice difficulties. Fogerty and her assistant and successor, Gwynneth Thurburn, were keen to give attention to the study of 'remedial speech', which later became speech therapy. All students in the early years of Central worked together for some elements of their training until the break of therapy from education in the mid-forties when therapists became eligible for registration with a medical body (Susi, 2006: 30-32, 80 and 86).

For teachers, Susi documents how in 1928 when general training colleges 'formally identified' a need for a course to ensure the standards of teachers' speech, Central responded

'by adding a new one-year course for those who already had a qualification in their chosen subject' (2006: 58). Long before that stage, Fogerty offered 'weekly evening classes' in voice for London teachers (Susi, 2006: 25), and an 'important London County Council (LCC) speech conference in 1912' (Oxford Dictionary of National Biography, 2004a). These classes were probably what are called now continuing professional development (CPD).

The teacher training course at Central underwent several changes over the years in response to educational developments, but was still in existence into the mid-years of the century with Bachelor of Education (B.Ed.) qualifications becoming possible (Susi, 2006: 155). The focus on speech was maintained (Susi, 2006: 104 and 108) and, perhaps because of the course origins, was dissimilar to the training offered elsewhere such as at my own teacher college.

During the period under discussion, decisions at a national level about what pupils would learn in English appeared to go alongside provision for teachers so they advanced their own vocal skills to match the teaching situation. For instance, classes which include verse speaking are indicated by *The Newbolt Report (1921) on The Teaching of English in England* (H.M.S.O., 1921). The Report attempted to determine recommendations for training of all teachers in relation to specific elements of English, such as phonetics and speech training. Newbolt says: 'the voice of the teacher is his main instrument, the only model which his pupils will have to follow, and too much attention cannot be paid to it' (H.M.S.O., 1921: 178).

There were similar trends within teacher education elsewhere at the time. For example, Anne McAllister worked in speech training for teachers in Glasgow. McAllister, who had trained as a school teacher herself, had credentials in phonetics and established the Glasgow School of Speech Therapy in 1935. She makes clear that the teacher should train his or her voice 'to be

pleasant and his articulation to be immaculate' (1938: 127); this indicates her aim for identifiable standards in voice quality. In another book she discusses the problem of being audible and vocally clear, saying that the teacher must acquire these skills in order to lead primary school pupils in 'an efficient means of self-expression and inter-communication' (McAllister, 1941: 1).

In the 1920s it appears that teachers in Scotland were receiving at least sixty hours of work on speech during their two year course (see *The Newbolt Report,* H.M.S.O., 1921: 174). This was 'regulated' by the Education Reform Committee in Scotland which was influential in timetabling speech training for primary-age pupils (McAllister, 1941: v). Fogerty and Daniel Jones, a phonetics teacher, suggested in their evidence to Newbolt that this training requirement might become the standard in England too (H.M.S.O., 1921: 177). It may be that the supplementary year's training for teachers at Central was one answer to ensuring support for teachers qualifying in London. The status of the Report was purely advisory and the full extent of provision elsewhere in England at that time is unclear.

1.3.2   Changes to voice training for teachers

By the time I was training in the late 1960s, speech and voice training was absent from courses for the generalist primary school teacher. Perhaps this was connected with the changing curriculum in school from the middle years of the twentieth century, because in the mid-sixties the Plowden Report (*Children and their Primary Schools*) talked about schools emphasising 'the skills of reading and writing at the expense of speech' (H.M.S.O., 1967: 207). The report commented that 'class sets of poetry books are disappearing fast' (1967: 217). It implies the onset of a certain informality of approach that may have been matched by a decline in formal knowledge and pupil skill building which had prevailed previously. By this point, no systematic teaching of speech on a national scale was apparent. Plowden's

section on the English curriculum states that there is less focus on speech and the report itself contains only reference books on teaching reading and writing (1967: 223).

Although it was becoming the case that there was less support for teachers' skills in speech and voice, the requirement for these skills became ever greater after the curriculum changes initiated by the Plowden Report. 'The move away from formal class teaching to group work, projects and learning through play and creativity' (Shaw, 2014: 8), endorsed by the report, made the classroom an even more challenging environment for the teacher in making their voice audible.

As observed (1.3), currently there is very little in teacher training to address voice skills in teachers' own development or allied to their role as teachers of speaking and phonics. This is in spite of the fact that the current curriculum gives considerable emphasis to spoken language and phonics teaching (Department for Education, 2014).

There is an assumption perhaps that, as professional voice users, teachers do not need support to develop their voices, something that was clearly not regarded universally as the case a hundred years ago. If my informal observations are a guide, the lack of provision is seemingly not without serious consequences for the profession. This is difficult to reconcile with emerging occupational health guidance about care for professional voice users.

1.4   REASONS TO FIND A SOLUTION TO TEACHERS' VOICE PROBLEMS

The outlook for individual teachers who experience voice problems and the consequences for pupils and schools mean that there is a need to find a solution to such problems. If teachers are to produce clear and audible voice with sufficient stamina to speak over the course of a school day, they should have opportunities to learn how to do so.

1.4.1   Occupational health concerns

There are evident concerns in some quarters about teachers experiencing voice problems. The independent magazine, *Hazards* shows occupational voice loss has been designated as 'an official work disease' in the UK (*Hazards,* 1996). The UK Trades Union Congress (TUC) says that 'if talking is an essential part of your job, you are likely to put strain on your vocal cords' (meaning the 'vocal folds') (TUC, 2015). It is suggested that some instances of severe voice problems for teachers can be due to background noise making it necessary to speak in a loud voice for prolonged periods. In one teacher's case permanent vocal damage led to premature retirement for which she received compensation (*Hazards*, 2010).

Such reports of occupational health concerns occur because there are problems leading to vocal fatigue or voice loss for many teachers and resulting sometimes in recognised medical conditions. It is not to discount these difficult circumstances for some people, but in my own case I can verify that it is possible to meet many vocal demands without what is called 'strain'. This makes me think that sometimes the problem may lie in something other than the amount of talking required in classroom teaching. However, the problems that are apparent for some make it all the more anomalous that teachers are unsupported by voice training or other form of help.

1.4.2   Voice trainers' concerns

The vocal demands on teachers are evident in what is expressed by voice trainers. Martin and Darnley, writing on *The Teaching Voice*, report evidence from Jackson (1968) that teachers may engage in '1200-1800 exchanges' in speech over the course of a working day (2004: 1). They also refer to a study of four professional groups and give examples of teachers speaking an average of 103 minutes in an eight-hour period compared with office workers having an average of 33 minutes in the same timed interval (Masuda *et al,* 1993 in Martin and Darnley*,*

2004: 1). More than half of the recorded speech time of these teachers was also at a high intensity, or louder than the average speaking voice. Also, Cicely Berry, speaking as Head of Voice with the Royal Shakespeare Company (RSC), acknowledges teachers in schools facing 'very particular pressure'; many she has met complain of vocal fatigue and that 'their voice goes at the end of a day' (2000: 127).

1.4.3   The search for a solution for teachers' voice problems

At the beginning of my study I wondered whether the voice problems and the linked problem of staff absence could be avoided. Several implications are apparent in the situation I have described for teachers with vocal demands yet a lack of training: for the teachers themselves, for those who are responsible for their training, and for teacher employers. Therefore, I pose questions as to what is known about specific voice problems occurring amongst classroom teachers and student teachers; and as to any proposed solutions and how they might help teachers to achieve best quality of voice in the classroom (1.2). In order to progress in understanding more about voice problems and voice quality, I first need to consider what is meant by 'voice'.

1.5   THE NATURE OF VOICE

Voice is a multi-faceted phenomenon which can be described within physiological, anatomical, psychological, psycholinguistic, social, artistic, political, and other dimensions. Voice scientist Alison Behrman shows that although voice and speech as physiological and anatomical phenomena can be distinguished one from another, they are interlinked and interdependent (2013: 4). This makes them difficult to separate when it comes to discussing the activity of speaking, and it has an impact on the way voice is regarded and can be studied.

Voice is a result of sound produced at the larynx, which is an organ situated at the upper end of the trachea or windpipe (Seikel, King and Drumright, 2010: 166). The sound is brought about through vibration of the vocal folds; these are comprised multilayered bands of tissue within the larynx (2010: 173; Behrman, 2013: 125). Further technical detail is shown in Appendix A with numbered sections.

Behrman states that voice and speech production is 'a complex neuromechanical activity', 'regulated by the neurologic system and the physical properties of the structures which govern it' (2013: 4). She describes voice as 'the sound formed in or emitted from the human larynx in speaking, singing or other utterance' (2013: 4). This is differentiated from speech which is 'the utterance of words and sentences' in our expression of thoughts (Behrman, 2013: 4).

Contrary to its definition, voice is not confined to the small organ of the larynx where the sound originates. Interdependence of voice and speech one on another is partly connected with voice production varying according to characteristics of the vocal tract, the airway which contains the larynx and which connects the mouth to the lungs (Appendix A: A2). The length of the tract, and other factors in shaping and altering configuration of the tract and therefore its acoustics (Behrman, 2013: 239-240), mean each voice has identifying features.

1.5.1 The speech process as a whole

The sound emitted at the larynx is only a low tone: what Zemlin calls 'an unintelligible buzz' (1998: 198). Producing this or any sound requires an initial source of energy. Modification to produce recognisable speech sounds takes place in other parts of the tract.

The underlying process is: breathing or respiration accounting for the airflow which provides 'energy' for speech. Phonation or 'voicing' is 'the product of the vibrating vocal folds' of the larynx (Seikel, King and Drumright, 2010: 165); and articulation occurs when shaping of the

upper vocal tract alters the 'acoustical properties' of the initial sound and results in speech sounds (Zemlin, 1998: 198). The production of voice, therefore, requires: initiation, phonation, resonation and articulation (Appendix A: A2.1).

1.5.2   Voice and other systems

Although voice and speech can be categorised in terms of systems defined by their functions (the respiratory, the phonatory and the articulatory), in practice there is interdependence between these voice and speech systems and there is also an overlap with other body systems such as the muscular, skeletal, respiratory, digestive, and nervous systems (Seikel, King and Drumright, 2010: 26, 27). The circulatory or vascular system also has 'functional unity' as a system to be taken into account in voice (Zemlin, 1998: 29). In a schematic model of speech production, Zemlin shows sensory information and motor control in activity as a two-way and interdependent process of brain and muscle (1998: 31) (Appendix A, A2.1).

Evidently, production of voice and speech is not confined to the vocal tract; it is an integrated psychophysical process of the whole person. We can only speak the thoughts that are generated in our brains and the organs of speech such as the larynx can only work when impulses from the nervous system direct the muscles to operate. Integrated mechanisms are a common factor in all behaviour and activity (Alexander, 1985: 52; Door, 2003: 38). Ensuring behaviour is the result of conscious thought is something that is part of Alexander's view within the Technique: when Alexander found a way of improving his voice, he described it as replacing an 'unreasoned' direction of himself with 'a new conscious (reasoned) direction' (1985: 39).

1.6   HOW VOICE CAN BE STUDIED

As indicated in 1.5, voice as a complex phenomenon can be studied within a number of distinctive fields: anatomy and physiology; the science of physics with mechanics, aerodynamics and acoustics; what is sometimes called psycho-acoustics (an interdisciplinary study of psychology and acoustics, Behrman, 2013: 4); and medical or clinical study as voice and speech science. These and other aspects of voice study are related to my field of research and therefore relevant to consideration of voice in the actuality of the classroom.

A further related branch of study is that of phonetics which can be regarded as the scientific study of the system of speech sounds. A meaningful summary of such a complex field is provided in dictionary definitions. For instance, The Free Dictionary (2015) and the Merriam-Webster Dictionary (2015) refer to phonetics as the production, transmission, analysis, classification and transcription of sounds. Phoneticians work both in medical and non-medical contexts.

Therapy is also an important field in voice, recognised in the role of speech and language therapists (SLT), who developed their distinctive profession in the first half of the twentieth century (1.3.1). The work of the SLT encompasses aspects of speech, phonetics and language development. Their training and work has broadened over recent decades from their early designation as speech therapists and they continue to help where there are voice problems at any age or stage in life (The Royal College of Speech and Language Therapists, 2015).

Linguistics is also relevant to consideration of voice; it examines language form, meaning and context. An enduring example of study from the first half of the twentieth century is Lev Vygotsky exploring thought and language in the field of psycholinguistics. He takes as a starting point the idea that 'a clear understanding of interfunctional relations is particularly

important' (1986: 1). At the time of his work in the 1930s, this aspect was taken for granted although never previously studied. In particular, Vygotsky's investigations presented the case that it is possible to formulate thinking independently from speech. This has influenced, and continues to influence, conceptualisation of language development today.

Another example of the breadth of the topic of voice is provided within the writing of Colin Cherry. He gives an overarching introduction to the diverse subject of human communication which he says is 'essentially a social affair' with our response to particular stimuli initiating relationships (1978: 3 and 7). Cherry's discussion covers diverse areas such as the logic of communication (in syntactics, semantics and pragmatics), communication and social pattern, the evolution of communication science, and the analysis of speech signals, for instance in telecommunication.

Maggie Inchley (2015) provides a contemporary example of the wider topic, using the voice to contextualise social expression in a particular political and cultural era, 1997 to 2007. She scrutinises the shifts and influences between voice in theatre and that which is said to portray the democracy of the time. In a range of contexts, voice is important in our everyday interactions with others, both socially and in work and other contexts, but it is also a vehicle for conveying meaning in the arts, enriching our lived experience with increased understanding, leisure interest and enjoyment.

It can be shown that interrelationships between 'production and reception', the listener as well as the speaker, are interesting perspectives (Inchley, 2015: 3-4). This is significant in the role of the classroom teacher who concerns her or himself with pupils' understanding of language (therefore voice) as a vehicle in their learning.

Inchley debates whether voice in the theatre offers 'agency and transformation'; she indicates ways in which drama has come more and more to represent voice as a vehicle for challenge rather than stereotyping (2015: 8-9). Although I am not taking this point further in the context envisioned (Inchley, 2015: 35), it is relevant to acknowledge the idea as part of the role that voice plays for classroom teachers. Similarly, it may be seen as analogous to the role of teachers with their pupils in class when Berry refers to the way an actor's voice needs to 'energize the audience' and 'awaken the desire to talk' (Berry, 2001: 27 and 3; also Inchley, 2015: 35).

Thurburn (1939: 1) and McAllister (1941: 1) as voice teachers refer to voice and speech as a form of 'self-expression'. This focus is a prevalent part of educational practice for both teachers and pupils in school; the idea of engaging in communication is particularly predominant in some educational practice. Communication underpins dialogic teaching, learning through discussion rather than didactic approaches; for example the dialogic is promoted by Wolfe and Alexander (2008) and discussed in James and Pollard (2011).

Whatever the pedagogy embraced by a classroom teacher, there is an onus on her or him to speak 'unscripted', engaging with learners through the medium of voice. As with actors on stage who regularly have learned a script, both the classroom and theatre contexts evidently present substantial challenge.

Most of us, as speakers, have some viewpoint on our voice even if, as Cicely Berry says, the idea may not tally with how our voices actually are (1973: 6). However, the distinctiveness of voice is an 'expression and articulation' of identity (Inchley, 2015: 13; Berry, 2000: 6-7).

My own viewpoint (1.2) is that the AT has much to contribute to discussion and practical support in the case of effective voice. It is apparent that some people, including some teachers

in my survey (1.2), can talk all day and experience no problem. So it can be queried why many teachers have voice problems, for instance necessitating speech therapy, and even leading them to give up teaching (1.1.2). In addition to my own experience via the AT, I aim to draw on my recognition of other teachers' voice problems (for example acquired when a deputy head teacher in school) in order to progress beyond solely a first-hand perspective.

1.6.1   The parameters of my own study of voice

The nature of voice means that information about it is ranged over many fields. To identify the boundaries of this study, it has proved helpful to examine briefly some of the wider options (1.6). The scholarship and practical study exhibited in examples from diverse fields over the twentieth and into the twenty-first century demonstrate that writers have much to say that impinges on my area of study. Yet of necessity, small-scale research such as my own has to have chosen limitations as to its scope.

Although I recognise the importance of different dimensions such as those shown by Inchley and others (1.6), the main field of my research prioritises the collection of data accessible in my situation, such as the viewpoints and experiences of classroom teachers themselves. The study also rests on the AT as a basis for understanding voice and interpreting evidence. It takes account of voice as a physiological and anatomical phenomenon. This research is based on recognition that assessment of voice quality has to pay attention to its perceptual nature. I hope that my contribution may be a valuable adjunct to the way teachers are currently enabled to develop their professional capacity in the area of voice skills.

The intention in this study, following consideration of teachers' voice problems through the collection of survey evidence, is to explore whether the AT can help teachers to improve the quality of their voices (1.2). Therefore, my empirical study of a possible solution gathers data

on voice quality and aspects of psychophysical use such as postural configuration and muscle activity. The survey in itself is unusual, collecting detail from both classroom teachers and student teachers in one area. Also, it is the first time, as far as I am aware, that the exact focus of later exploration has proceeded in the way chosen. This gives the research distinctive and original features.

For reasons of space, the broad forms of evidence gathered leave aside communication in the classroom in favour of examining measurable aspects of voice quality in the microcosm of a laboratory setting, although it is shown that this is by no means a theoretical study. It could be that a further study could address aspects of the wider context of communication in teaching and the Technique.

In addition to the quantitative evidence gathered about teachers, although my study is not social or political in the sense presented by Inchley (2015), I draw on the metaphorical voice of classroom teachers and student teachers in order that I can attempt to summarise their experiences. Therefore, the study is not simply one of anatomy or physiology. Although confined in its scope, it is not 'narrow' because it represents a considerable number of teaching professionals, for instance almost three hundred responses to the survey on voice problems, and it collects different forms of data to evidence findings (1.2).

Because voice serves many purposes for us, in both social and work contexts, it is an important feature of our daily life. For teachers in school, this is particularly so. As shown (1.3.1; 1.6), it is a major tool in their professional role as they communicate with pupils and others (Martin and Darnley, 2004: 12). For a teacher, it is essential that their voice has clarity and audibility and that it is possible to sustain such vocal communication for lengthy periods

in the classroom. In my thesis, the lived experience of various individuals represents aspects of voice to take into account to be researched empirically as part of its assessment.

My specific focus, because of my own experience, is the Alexander Technique. I am aware of other approaches: that of Roy Hart (2015), Estill Voice (2015), Linklater Voice (2015), and other individual methods. Although I consider briefly the terminology and approaches of a few named voice teachers in Chapter 3, I am not claiming to address such a broad remit in any detail, preferring instead that my research is driven by my own interest and linked with the experience of classroom teachers who I see in need of support.

1.7   ASSESSING VOICE

In defining one of my research questions in terms of improvement for teachers and their voices, the importance of measuring voice quality is apparent (1.2). This is now considered further as an aspect of voice assessment.

Within diverse fields related to the study of voice (1.6), it is likely that assessment can take place by various means. It could be said that vocal assessment is either perceptual or instrumental; that is, being either related to what is perceived or heard by speaker or listener, or related to acoustic characteristics discernible and definable by instruments of measurement.

Voice quality has recognised perceptual traits (1.6.1), but also measurable elements. The perceptual characteristics are those such as pitch which can be noted and named by listener and speaker. The quantitatively measurable parameter of pitch is frequency; that is, the frequency of vibration of air particles as they are set in motion by initiation of the voice at the larynx (Behrman, 2013: 21). Our perceptual assessment of loudness will be according to the measurable amplitude or intensity of the vibrations (2013: 25).

Consideration of the study of voice problems reveals a complexity in the use of the two forms of assessment 'tool', the perceptual and the instrumental. Also, it is necessary to refer to the term 'clinical', appertaining to medical diagnosis or treatment. It is not that this is relevant to all voice problems, but many research studies view voice as though this were a major consideration.

Using this terminology, various peer-reviewed studies are reported and their evidence is analysed in Chapter 2. For example, it is demonstrated by the VCN (Martin, 1992) that evidence may chart figures for clinic attendance; also, some studies may draw on the reports of those who experience voice problems (Martin, 1994: 96). Instrumental assessment, if it is necessary, has been possible for some time. For instance, it might include visual inspection of the larynx, such as initiated by the singing teacher, Manuel Garcia (1805-1906). More sophisticated techniques, such as stroboscopy were developed later and they are used currently for clinical examination of the larynx (Behrman, 2013: 192 and 191).

Breathing is a major element in producing voice because movement of air acts as the necessary source of energy (1.5.2). The process of 'powering' the voice through air being expelled from the lungs makes additional measurements relevant for clinicians; for instance, checking for any problem with the air supply. Clinical assessment includes measuring the 'peak rate of air flowing through the vocal tract'; that is, the output 'during sustained sound production' (Behrman, 2013: 12). Notes on the mechanical detail of breathing appear in Appendix A.

To complicate the picture of voice assessment further, diagnosis as referred to medically or in vocal pathology may include perceptual assessment by a clinician as much as reliance on instrumentation; in other words, 'clinical' does not equate always with instrumental measures.

Shewell, for instance, describes the possibility of 'formal perceptual voice assessment schemes' (2009: 63-64).

The discussion of ways in which voice and voice quality can be measured continues in consideration of 'good' voice quality in Chapter 3 and then as background to exploration in the laboratory reported in Chapter 6. It can be stated that my study does not pursue clinical measures beyond the initial literature review. I comment on the usefulness of referring to both clinical and 'lay' forms of assessment as background evidence, whilst noting the importance in my research of paying attention to non-medical voice problems given their perceived impact on a substantial number of people as demonstrated in Chapters 2 and 5. The nature of voice, voice quality and its assessment is also a key aspect to the explanation and justification of my research methodology in Chapter 4.

1.7.1   Meaningful measures of voice quality in relation to classroom teachers

My initial first-hand data collection relates to the perceptions of the classroom professionals themselves. In my survey, many participants appear to describe non-medical circumstances. As reported in Chapter 5, these professionals, both teachers and student teachers, have views on the qualities of voice they require for carrying out their work effectively and they are able to describe the problems which occur when they are not able to meet such requirements. Their experience provides a vital insight into their situation and what might support them; their perceptions are valuable and valid within my research. After conducting the survey, I work with fellow AT teachers in the laboratory exploration, gathering a range of data for a number of student teachers (1.6; 1.7).

1.8   IDEAS ABOUT POSSIBLE SOLUTIONS IN THIS LIGHT

It seems it is the exception rather than the rule for school teachers throughout the UK to be taught voice skills. In interview with the actor Sean O'Callaghan, who was providing voice training for student teachers at Keele University (1.3), he talked about teachers in class speaking for more prolonged spells than actors on stage (Appendix B). He gave an example where the lead character in the play *Hamlet* has performance lines totalling about one hour twenty minutes compared with teachers 'talking all day'. Classroom teachers do this mainly without the benefit of the training that actors might receive in drama school.

Like actors, teachers can be regarded as performers to some extent, in that they have to 'appear' before a class or 'audience', speak for considerable periods and like actors make their voices heard. Also, both teachers and actors have to use the voice to maintain listeners' interest (1.6). However, actors continue to have voice training at drama school, as Sean did at The Royal Academy of Dramatic Art (RADA). One can note also that Sean's vocal training and support did not stop as he completed his course, but continued during seven years as an actor with the RSC (Appendix B). If one considers then the performance aspect and the vocal demands of the two professions, not being suitably trained is an anomaly for teachers.

1.8.1   Voice and the Alexander Technique

From an individual conviction, it is my continuing interest to explore the way in which applying the AT has and does improve my life and support my vocal development. I kept a voice journal or diary over a period at the start of the research, noting things which occurred and considering whether anything could be viewed as change for the better. For instance, there were points when it became apparent that my voice had become more audible yet less effortful in the large assembly hall at school. Also, as a university lecturer it was noticeable that I could speak for considerable parts of two- or three-hour sessions over the course of a

day without suffering problems such as hoarseness or vocal discomfort, although I knew these occurred for some colleagues. Sometimes a fellow lecturer would comment to me about vocal difficulties and, when I presented a short summary of my research (at the point when I had conducted the survey of teachers and student teachers), colleagues were convinced that I was 'on the right track' in considering that a teaching role throws up vocal challenges. In addition to other rationale for the research (1.4), this endorsement is indicative of my engagement in a useful avenue of study.

Voice does not exist or happen just in isolation and the concept of psychophysical use within the whole organism is fundamental to the Technique and to the study of voice and voice quality. The principles of the Technique are explained in Alexander's four books, shown here with their original dates of publication: *Man's Supreme Inheritance* (1910) *Constructive Conscious Control* (1923), *The Use of the Self* (1932), and *The Universal Constant in Living* (1941).

Coincidentally, the AT is part of the curriculum at many actor training establishments (see Chapter 3), although it is noted there are different schools of thought and what is taught might or might not be my understanding of it (1.2). Staring refers to the Technique as 'an instruction method' for bringing 'sensory-motor habits under conscious control' (2005: 1). According to Staring, some training courses for the Technique do not have 'knowledge or proficiency criteria' (2005: 3). The four year teacher training course of PAAT, which I attended, requires qualification through examinable knowledge in Alexander studies, up-to-date anatomy and physiology texts, and practical application of the Technique.

Primarily because of my own experiences and because Alexander demonstrated the AT as a solution to voice problems (1.2), I am interested in exploring the further evidence that can be

gained of its efficacy with a particular group of teachers and student teachers, as proposed in 1.6.1. Secondary to these reasons, the use of the AT in drama training both historically and in the present day indicates a field worthy of exploration, given that I have precluded from my study other voice training approaches current in drama schools because there is insufficient scope to consider them (1.6.1).

1.8.2   Use and misuse

As shown, F.M. Alexander's inquiries leading to the Technique originated in his voice problem (1.2): that when he performed on stage, his voice became hoarse and sometimes he lost his voice during a performance (1985: 24). Finding no medical advice that could help, he began to investigate the problem for himself. In attempting to find a solution, Alexander discovered the principles of the Technique, coming to see that what occurred was in any speaking, not just during recitation. He noticed his tendency to pull his head back and 'suck in breath through the mouth in such a way as to produce a gasping sound' (1985: 26).

The movement of the head which Alexander observed initially did not occur in isolation but was part of what he later identified as a total pattern of misuse in which the pulling back of the head was a key factor (1985: 27-28). His investigation over a long period informed Alexander that what he did in the face and neck was associated with pulling his back in, raising the chest and that there was 'undue' muscular activity in the legs, all of which had an effect on the breathing and vocal mechanisms, including the larynx (1985: 32-33).

Alexander found that he could prevent the pulling back of the head and so 'indirectly' avoid the other effects (1985: 28). Good or improved use occurs where balance is maintained through the optimal amount of muscular effort. Basmajian and De Luca suggest that 'antigravity mechanisms' are very 'economical' in man (1985: 255); that is, it is possible to

remain upright with little muscular effort (Door, 2003: 95). What Basmajian and De Luca call 'idealized normal erect posture' (fitting the idea of an optimal situation) is one with the line of gravity dropping just in front of the head/neck (atlanto-occipital) joint, the shoulder joints, and the hip, knee and ankle joints (1985: 254). Conversely, there may be distortion of the flexible frame through the additional (undue) muscular activity, as noted by Alexander. Such change in configuration ('pulling out of shape') is indicative but not the whole explanation of misuse.

Use and misuse can be described according to a commonly-observed pattern, because we are all built to a common anatomy and physiology, 'out of the same mould' (Door, 2003: 31). In misuse the head is pulled back, the neck is stiffened, the back is pulled in, the chest is raised; and activity in leg muscles leads to stiffening the knees and pulling forward at the ankles (Door, 2003: 27 and 95). Conversely, being in balance occurs with the neck free and the head freely poised (Door, 2003: 96), and the back lengthening and widening (Alexander, 1985: 30). The legs can be free at the knees and in the ankles as well as in the hip joints (Door, 2003: 98).

The pattern is total; if we are stiffening in one area, we will be stiffening throughout the mechanisms of the whole of our frame (Alexander, 1985: 54). Also, as suggested (1.2), the so-called physical and the so-called mental are unified in practice and cannot be separated in discussion of any of our behaviour or activity (1985: 54 and 21). In this sense, human behaviour can only be understood in the context of the working of the organism in general (1985: 22), what we might term the whole person. In any activity including speaking, the self as our 'machinery' can be regarded as a 'tool', use of which has been learned (Door, 2003: 25). As a specific behaviour, speaking might be allied with upright stance for standing, walking, and sitting, and activities accomplished in those configurations or stances. Anyone

can learn to do these fundamental activities differently; they can improve their use, including influencing their voice. Alexander came to state that 'the most valuable knowledge we can possess is that of the use and functioning of the self' (1985: 20).

1.8.3   Alexander's method of investigation

The method by which Alexander came to recognise his misuse in the first place was corroborated by the American psychologist and philosopher John Dewey, who acknowledged that Alexander had followed a systematic method in gaining his original evidence for the Technique (Alexander, 2004: xxviii).

The American biologist, George Ellett Coghill, writing an Appreciation as preface to one book by Alexander (2000: xix), states that 'well-established biological principles' include an emphasis on 'the integration of the whole organism in the performance of particular functions' (2000: xix). This is support for Alexander's idea of a solution to any problem being based on 'the principle of indivisible unity of the human organism' (1985: 22-23). Alexander also referred to 'the manner of use of the mechanisms' and an associated standard of 'functioning' throughout the whole (1985: 55), indicating a change in use is essentially also a change in functioning. Physiologists refer to the 'function of the whole person' with organ systems working, as they say, 'hand in hand' with each other (Boulpaep and Boron, 2012: 3).

Alexander spoke of defects of use or misuse, which would constantly lower the standard of functioning (1985: 87). Misuse is 'a matter of *habit*' (Door, 2003: 15; italics in original), the neural pattern laid down in the brain when an action is performed. It is the particular way we know of doing something which tends to our pulling out of shape (Door, 2003: 15) (1.8.2). The posture of the whole organism impacts on the key mechanisms of the voice (larynx, breathing mechanisms and tract) which all function within our flexible frame (Alexander,

1985: 32-33). In other words, the three interlinked aspects of voice production: breathing, phonation and articulation are affected when someone pulls themselves out of shape.

As is the case for anyone, Alexander needed to recognise the habit in order to change his habitual misuse which was associated with the way he thought about his desire 'to speak the sentence' (1985: 47). Even though much can be gained from considering the mechanical aspect of our nature, we are not simply machines. The way we think and react at any point in time and the way we use ourselves cannot be separated; the only way anyone can change their use is by consciously applying a new way of going about activity. For Alexander, as for anyone, this meant becoming able to prevent his 'wrong habitual use in reciting' through 'conscious, reasoning direction' (1985: 47).

1.8.4   Voice quality and use

The AT has been demonstrated as a solution to voice problems, including through Alexander's own lived experience and his exploration (1.8.2). It has also been shown, in my own experience and that reported by others, to promote improved voice quality. Such first-hand experience demonstrates the Technique may have potential to help classroom teachers with the considerable vocal demands of their role.

The idea of consciously-directed change in use has implications for the context of this study (1.8.3). Firstly, the way a teacher reacts in the classroom will influence his or her perception of the situation. It is acknowledged that this study cannot take further account of the act of 'communication' (1.6) nor of the reactivity in this which is now apparent as psychophysical use. However, in working in the laboratory (1.6.1), the psychophysical nature of use is accounted for in the format of the exploration, which gathers further evidence on voice quality and the efficacy of the AT with a particular group of classroom professionals. The work,

conducted in collaboration with two AT colleagues (both teachers of the Technique), centres on helping the participants apply a procedure of the AT to bring about a change in their use.

1.9   CONCLUSION

This introductory chapter demonstrates why and how I started to consider the demands placed on classroom teachers in respect of their vocal skills, their possible voice problems, and how it might be possible to help them. This all began from the personal perspective of being a teacher and also having experience of the AT which for me has been instrumental in changing my behaviour, including using my voice. From these ideas and some initial corroboration, I formed the intention to find out more through a formal study.

To this end, I formulated four research questions and related objectives (1.2) in order that the questions might be addressed through the collection of varied forms of evidence. This helps set the scope of the research, given that a time-restricted study with limited resources cannot address all aspects of such a broad topic (1.6).

The nature of the questions and the parameters I have in mind, as suited to the phenomenon of voice, require a mixed methods or multi-strategy approach (Robson, 2011: 25) within the overarching methodological framework set out in Chapter 4.

1.9.1   Research questions

As recapitulation of what is shown at 1.2, the questions are:

Research Question 1, can attention to improving use (as defined in the AT) help classroom teachers with their voice problems?

Research Question 2, what are the perceived vocal demands on UK teachers in the classroom currently?

Research Question 3, is it possible to measure improvement in voice quality meaningfully for classroom teachers?

Research Question 4, can improvement in voice quality be demonstrated by the adoption of a procedure based on the Alexander Technique?

1.9.2   Objectives within this research study

On the basis of the defined research questions (1.9.1), the following research objectives are also restated:

Research Objective 1, to carry out a survey, conduct interviews and use other first-hand evidence of the voice problems of teachers and student teachers, helping to address a lack of research in this area, particularly in the UK.

Research Objective 2, to analyse literature (including that denoting criteria for 'good' voice and its measurement) and use a review of other evidence as background to further exploration.

Research Objective 3, to examine possible solutions to teachers' voice problems and draw on a consideration of voice training for actors through the writings of actor trainers in the UK and a survey of main UK drama schools.

Research Objective 4, to gain further evidence, with a number of student teachers, of improved psychophysical use (as defined by F.M. Alexander) and accompanying changes in voice quality by exploring a practical procedure of the Alexander Technique.

Research Objective 5, to reflect on the outcomes of my study and propose a possible way forward in developing support for teachers.

1.9.3   Related questions signposting the literature review

Several questions arise as related to the stated research questions (1.9.1). Following directly from Research Question 2 is a query about what is known of specific voice problems occurring amongst classroom teachers and student teachers. In addressing the first research

question, an allied query is: what solutions are proposed and how might they help teachers to achieve best quality of voice in the classroom? These two related aspects are addressed in my study which draws on and evaluates published research papers on voice problems in Chapter 2 and possible solutions in Chapter 3.

Research Question 3, focusing on voice quality, is addressed by an analysis of what criteria might be used for assessing voice. Therefore, continuation of the literature review in Chapter 3 adds to what has been considered on lived experience of voice (1.6) following Chapter 1 discussion (1.6.1; 1.7), so as to encompass a wider review of voice assessment. This enables me to extract ideas for the criteria necessary to measure improvement in voice quality as part of the framework for a practical exploration reported in Chapter 6.

CHAPTER 2

LITERATURE REVIEW: PART I, VOICE PROBLEMS

2.1   AIMS OF THE LITERATURE REVIEW AND THIS CHAPTER

There are two areas of interest discussed within this literature review relating to Research Questions 1, 2 and 3 (1.9.1). This chapter shows an analysis of existing research into the study of teachers' voice problems, in line with ascertaining the vocal demands on teachers, particularly in UK classrooms. The review continues in Chapter 3 as I examine what qualities best describe teachers' voice so that criteria for meaningful assessment of voice quality for teachers can be identified.

First of all, there is consideration of whether classroom teachers have problems with their voices and what sort of problems these are. In the early part of the twentieth century, not only was it assumed that teachers needed support for their speech work with pupils, but the support possibly helped teachers themselves with the vocal demands of the classroom. The same, if not greater, vocal demands apply in the classroom today (1.3.2)

2.2   CURRENT RESEARCH ON TEACHERS' VOICE PROBLEMS

The anecdotal evidence instigating my study on teachers' voice problems is supplemented by discussions on the importance of teachers' voice as appearing in publications such as the TES (1.1.2). A survey of ATL members by the Voice Care Network (2007) revealed that '68% of teachers in primary schools have experienced voice problems which they feel have been caused by their job'. Similarly, the 2008 survey of the Royal National Institute for the Deaf indicated 'more than 70,000 teaching days a year' being 'lost' because teachers suffer voice strain (Paver, 2014).

The vocal demands of teaching are acknowledged by a VCN voice coach writing for the ATL (Furze, 2008); she gives recommendations also in the *TES* (2010). An internet leaflet produced in partnership between the National Union of Teachers (NUT) and the VCN identifies teachers as being 'at-risk' and suggests signs of voice problems (NUT, 2011). Preventative voice care is advocated in the leaflet, although no detail of provision is mentioned. Also, the issue has gained attention, for instance in one small group of schools in London having a current policy document on voice care for staff (Eaton House Schools, 2014), a policy which mentions VCN recommendations and support.

Academic journals which I have examined also report voice problems amongst teachers and other occupational groups. From these articles it is possible to form a comparison of teaching with other professions.

2.2.1 An apparent increase in research on teachers' voice problems

Studies relating to the voice problems of varied groups of professional voice users have been carried out in different places around the world and published in a number of international journals. Scrutiny indicates an increasing interest in voice problems, particularly within the last forty or so years.

One long-standing specialist journal, *Folia Phoniatrica et Logopaedica* was first published as *Folia Phoniatrica* in 1947. It aims to focus on speech and voice within the areas of education, social work, and the training of singers and actors. In 2010, it contained eight articles relevant to my research area, demonstrating considerable interest in the topic. Further, one landmark study, perhaps one of the earliest on problems specifically amongst teachers in schools, appeared in the *European Journal of Disorders of Communication* in 1993. The article ('Vocal attrition in teachers: survey findings') presented by Sapir, Keidar and Mathers-Schmidt was

based on research in the USA. This study included teachers being asked directly about their voice problems, an approach uncommon until this point. The paper has been referenced by considerable numbers of researchers over the subsequent two decades and is still included in the most recent studies, for instance Szymanowski, Borst and Sataloff (2014). The research approach originating with Sapir, where teachers self-report voice problems, has been adopted by many others as investigation has expanded.

Analysis of journal content demonstrates both an increased interest and a wider geographical spread of research on the topic of professional voice problems. A meta-review of studies by Williams ('Occupational groups at risk of voice disorders: a review of the literature', 2003) indicated active research on the topic, indicating nine studies from the 1980s and twelve from the 1990s, compared with just one paper originating in the 1960s.

Similarly, a specialist publication, *The Journal of Voice*, shows studies considering the voice problems of professionals such as singers, actors, and teachers increasing from one paper in 1987 to three in 2010, and eleven in both 2011 and 2014. Papers over the last two decades originate in a wider range of countries; for instance it has become more common to see work originating in countries such as Brazil, for instance Zambon, Moreti and Behlau (2014) and Garcia Martins *et al* (2014). Garcia Martins presents a global review of teachers' voice problems encompassing the years 1995 to 2013. In summary, it can be said that interest in vocal problems, particularly those of teachers, has continued to increase.

2.2.2   Possible reasons for the increase in interest

It could be that the growing number of studies mirrors a growing awareness of voice as an important professional asset. Alternatively, it could be an increase in concern amongst professionals such as teachers in the classroom finding the demands on their voices are

difficult to meet; or both of these may apply. The increasing number of studies coincides with occupational voice loss being recognised as an official disease of the workplace; in the UK this occurred in 1996 (1.4.1). Also in the UK, enactment of a recent Equality Act requires employers to consider any 'impairment' affecting a person's ability to carry out their normal activities (H.M.S.O., 2010: 16). Perhaps such legislation prompts heightened interest by teacher unions and some school authorities currently (2.2). The spread of research studies may reflect an increased regard for health concerns both here and in other countries.

In the UK at least, there is another possible reason for an increase in either awareness or problems amongst teachers. At the time of the 1921 Newbolt Report on English teaching and until the Plowden Report on primary education in 1967 (1.3.1 and 1.3.2), the verse-speaking which was prevalent as a means for pupils to rehearse clear and audible speech took place in 'quiet' whole-class activities, for instance as choral recitation. Otherwise, the means of learning for schoolchildren in the UK required them mainly to listen, and then to read and write (H.M.S.O., 1921 and 1967). As shown by discussion on the contrast in practices from the time of the Plowden Report to present-day classes (1.3.2), children are encouraged now to 'verbalize ideas and explore language' and 'there are few periods in the day when the teacher is able to vocalize without competing background noise' from frequent pupil-to-pupil exchanges (Martin and Darnley, 2004: 8).

The problem of noise levels and acoustics in classrooms was investigated in the exploratory study of Hétu, Truchon-Gagnon and Bilodeau (1990). They identified that background noise (including that associated with class activities) and conditions of reverberation in the room (as measured by a sound meter) 'do not correspond to the optimal conditions for speech intelligibility' (1990: 32 and 31). This means both modern interactive teaching methods and problems with classroom acoustics bring associated demands on the teacher's voice. Both

factors mean teachers have to work hard to be heard and understood in the surroundings where they carry out their work.

2.3   INTERNATIONAL AND UK EVIDENCE COMPARING TEACHING WITH OTHER PROFESSIONS

Whatever the reasons for the increase in interest (and it may be that all those mentioned in 2.2.2 are influential), an analysis of studies published in journals reveals the fact that there is comparatively little research on the topic in the UK despite an increase world-wide. Therefore, to address the question of the extent of teachers' voice problems in comparison with other professions, evidence from a wider geographical area is considered before anything specific to the UK.

2.3.1   Evidence of teachers' voice problems in studies conducted outside the UK

I have found evidence in a number of published voice studies that many teachers, world-wide, have experienced voice problems. Often problems appear more prevalent than those of other occupational groups. A considerable number of studies demonstrate that, whether the occurrence of voice problems is judged by data for clinic attendance (for example, as shown in the meta-analysis by Williams, 2003), or by professionals self-reporting (such as in Sapir, Keidar and Mathers-Schmidt, 1993), teachers appear more likely than others to be at risk.

Williams' review, covering the period 1966 to 2000, draws on twenty-eight sources of case reports and research studies. He discusses occupational groups such as teachers, singers, cheerleaders and aerobics instructors. Williams gives specific results for two particular surveys that include teachers; that is, Titze, Lemke and Montequin, 1997 in the USA and Fritzell, 1996 in Sweden. Both studies cite clinic caseloads. There is an assumption that greater numbers from a particular occupational group in these caseloads demonstrate a greater

risk of occupational voice disorder in that role. The researchers therefore check clinic attendance and make a comparison with the total number of workers employed in that occupation in the particular country at the time of the study.

One set of figures drawn from Williams might serve to illustrate how teachers stand in such data for clinic attendance in relation to other job roles. Pooled findings from the surveys of Titze and Fritzell show 19.6% of clients at voice clinics were teachers, even though teachers only make up 4.2% of population in the countries surveyed (Williams, 2003: 457). Extrapolated figures show the underlying trend: that there are lower comparative rates of clinic attendance for voice problems amongst occupations other than teaching, even for those required to speak extensively, such as those in telephone sales who are 2.3% of clinic attendees (2003: 457). Singers (11.5% of those attending clinic out of a population percentage of 0.02) are the only other professionals who appear to be at greater risk of voice problems than teachers (2003: 457).

Williams concludes that a particular occupational group might make up a large proportion of those attending a clinic if individuals see major repercussions on their ability 'to do their job' and seek medical diagnosis and treatment (2003: 459). Verdolini and Ramig, 2001 (see Williams, 2003) emphasise that teaching emerges as the occupation where people 'have higher frequencies of voice disorders than the general population' and where impairment can be 'employment threatening' (2003: 457).

Other evidence bears out that a high percentage of teachers report voice problems; for instance, Smith, 1997; 1998a; 1998b; also Preciado, Garcia and Infante, 1998 (see Williams, 2003: 458). Increasingly since the start of the twenty-first century, studies are mainly of teachers as a distinct employment group, perhaps on the basis that their predominant need was established in the earlier research.

2.3.1.1 Studies conducted only with teachers

At first glance, 'teacher-only' studies may not serve as a comparison with other professions. However, a number of studies include a control group and therefore compare teachers and 'non-teachers'.

As well as the meta-review by Williams looking across employment groups, the other summative paper of the time, Mattiske, Oates and Greenwood (1998), examines the voice problems solely of teachers, considering possible causes and treatment (1998: 489-499). They report that it is difficult to produce definitive figures for the occurrence of problems amongst teachers, given that studies do not always establish clear criteria for what is being studied. There may be 'vast discrepancies among the definitions, measurement methods, and results' of different studies; this leads to Mattiske's conclusion that it is difficult to state the case (presumably for or against the incidence of teachers' voice problems) with any certainty (1998: 491).

Alerted to such concerns, I have drawn on more recent studies where methods are perhaps strengthened by the inclusion of a control group. Almost half of the studies I have referenced involve this, so that findings are more open perhaps to generalization. Mattiske, Oates and Greenwood also recommend large sample groups so I include several studies where there are substantial numbers (say, in excess of three hundred participants).

A few research studies have a specific and justified reason for a small sample, made explicit in their rationale. For example, Neto *et al* (2008) compare teachers and non-teachers in a specific group of 100 students graduating from university courses in Brazil. Likewise, the survey of 171 student teachers, reported in the study by Fairfield and Richards (2007), is tied to the size of cohort at a UK university during a given year. Morton and Watson (1998)

undertake another smaller survey within an identified area of Northern Ireland, reporting on 189 serving teachers and 120 non-teachers.

2.3.1.2   The basis of different forms of evidence

Williams (2003) reports on data related to clinic attendance only, whilst Mattiske, Oates and Greenwood (1998) include evidence of voice problems with information gathered directly from those affected. The usual method for gathering such direct data through a questionnaire is referred to as self-reported or 'perceptual' evidence.

Also, Mattiske calls for the use of 'more instrumental measures of voice' (1998: 498). Three studies (Åhlander, Rydell and Löfquist, 2012; Simberg *et al*, 2000; and Sliwinska-Kowalska *et al*, 2006) incorporate such clinical examination and assessment as well as questionnaires. Even without expertise and facilities to do this myself, it seems important in this review to take account of such findings. My analysis of studies therefore draws on a broad range of evidence (1.7).

It is my viewpoint that the non-medical voice problems of teachers, as demonstrated for 68% of teachers in the Voice Care Network's 2007 survey (2.2), are not to be ignored. The only way to gauge such occurrence appears to be self-reports (2.3.1) as in my own main evidence collection with teachers. Firstly, there is consideration of evidence from both 'perceptual' (self-reporting) and 'instrumental' (clinical) measures with analysis of findings from a number of countries, as based on prior discussion of the use of these terms (1.7).

2.3.1.3   Using 'perceptual' and 'instrumental' measures

Chen *et al* (1986) (reported in Mattiske, Oates and Greenwood, 1998) investigated over five thousand teachers in China. Questionnaire information was gathered and clinical (laryngeal) examinations took place to ascertain whether these teachers had developed vocal nodules.

Eight percent of the sample had nodules, but no comparison group took part and there is no report on how many teachers experienced voice problems 'in the absence of vocal fold pathology' (1998: 491). Yiu and Ho (1991) studied 115 voice clinic patients in Hong Kong and reported 'that teachers were the second most common profession to experience voice problems' (see Mattiske, Oates and Greenwood, 1998: 492). Focusing on a review of teacher problems world-wide, Mattiske concludes that the 'true prevalence of vocal problems in teachers is unclear'; the predominant view given in the paper concerns clinician work and 'treatment' (1998: 498).

Some researchers begin with self-reporting of voice problems, proceeding to clinical examination if greater problems are apparent. For example, Preciado-López *et al* (2008) reported findings in Spain for 579 teachers and 326 participants in other employment. They began with an initial survey followed by further investigation of 413 individuals. The prevalence of voice disorders among teaching staff was 57%, including 14% with vocal nodules (2008: 489).

Other studies draw only on self-reported evidence. For example, Sala *et al* (2001) in Finland compared teachers in day care centres (perhaps akin to UK nursery provision) with a control group of hospital nurses. Through questionnaire responses they find some similarities on reported 'symptoms', but note that prevalence over the course of a year is greater for the teaching staff than for the nurses: 38% of teachers identify problems compared with 8% of nurses (2001: 421). The study, involving 262 teachers, indicates that if results were replicated across the Finnish day care system, 7,400 people would be affected. Sala *et al* say this is an 'overlooked/underestimated problem' (2001: 422). Smith *et al* (1998b), from research in the USA with a random sample of 554 teachers and 220 other professionals, conclude that teachers have 'a higher rate of self-reported voice problems than those who work in other occupations' (1998b: 486).

Other studies consider student teachers. For instance, Neto *et al* (2008) in Brazil investigate a small sample (2.3.1.1), where more than 83% of those who are student teachers report some voice problem (2008: 251). The majority of these have not sought help. A survey conducted in Sweden found 208 teacher students (17% of a sample group of 1250) had voice problems 'defined as at least two symptoms weekly' (Ohlsson *et al,* 2012: 629). Another study with 226 student teachers takes place in Finland using a questionnaire for self-reporting (Simberg *et al,* 2000). Thirty-four percent of participants report two or more symptoms over the previous month; 20% speak of symptoms in the past year; and 16% cite problems in the previous two years (2000: 232). Simberg went on to further investigation, for instance comparing student teachers with those studying in other fields; she concludes: 'vocal symptoms are more prevalent among the teacher students than among students studying other subjects at the same university' (Simberg, 2004). Simberg (2004) concludes across several of her investigations that voice symptoms among teachers as a professional group have increased during the period 1988 to 2001.

2.3.1.4   Factors affecting interpretation of evidence

Results from published studies vary but all show that considerable numbers of both teachers and student teachers experience some voice problems. If there is no way to compare findings between studies which produce different kinds of information, this may not be a difficulty for individual researchers. However, it seems to me it matters very much for teachers themselves and affects decisions about remediation that research appears to represent different aspects of the problem. If teachers experience problems, even from time to time, it is pertinent to know that this is occurring and also to distinguish problems from medical circumstances. Whichever view is examined it appears that many teachers experience voice problems, some of which apparently have no medical explanation or cure.

The use of the term 'disorder' bears further scrutiny. Aronson and Bless say that, because there is no designated criterion for 'normal voice', it is difficult to define 'abnormal voice'. They suggest referring to 'voice disorder' when a voice is different from 'others of similar age, sex, and cultural groups' (2009: 5). It is evident in some of the cited studies (for example the review of Garcia Martins e*t al,* 2014) that research into 'voice disorders' may presuppose clinical circumstances. It might be wondered why researchers choose the term 'disorder' rather than 'problem'. It is likely there is no single reason across the many groups who have studied voice, but Jónsdottir *et al* for instance, give five alternative descriptions for 'symptoms' according to whether the prevalence can be described as 'nearly always', 'often', or whether, at the other end of the scale, they occur 'rarely' or 'never' (2002: 100).

In addition to Jónsdottir *et al* (2002) giving rating categories, Thibealt *et al* (2004) investigate similarly, perhaps as an attempt to progress beyond the general definition of voice disorder of Aronson and Bless. Thibeault's study sets out a definition of disorder as 'any time your voice does not work, perform or sound as you feel it usually does, so that it interferes with communication'; in addition, the researchers designate as 'chronic' any disorder persisting more than four weeks and they note as 'acute' any problem lasting less than four weeks (2004: 787). In other words, they have turned from perceptual features suggested by Aronson and Bless to functional criteria. In many ways this helps to contextualize the information being gathered which appears important in the light of earlier criticisms that, as suggested by Mattiske, Oates and Greenwood (1998) (2.3.1.2), terms are unclear.

Garcia Martins' (2014) meta-review of studies considers clinical assessments as well as questionnaire responses. The review draws on many of the papers I have analysed independently (for instance, Smith e*t al,* 1997; Simberg *et al,* 2000; Roy *et al,* 2004a; de Jong *et al,* 2006; Van Houtte *et al,* 2011).

Many researchers, including Garcia Martins, use the term dysphonia as though it is a way of showing broadly that a problem is present. For instance, Neto *et al* refer to dysphonia as difficulty in vocalization (2008: 247). Zemlin suggests dysphonia can be 'any voice impairment' (1998: 568); Shewell refers to it as 'disordered phonation' (2009: 415). According to Aronson and Bless, it is possible to be specific about a so-called 'dysphonic' voice in relation to variability in pitch, loudness, or 'aberrant quality' associated with hoarseness or breathiness (2009: 2).

The term dysphonia is used by Carding (2000) in his review of voice therapy where he indicates that it may be linked with organic or structural problems or that there may be non-organic dysphonia 'in the absence of organic pathology'. It is apparent in his investigation that dysphonia varies from writer to writer (2000: 29), creating some confusion in the way it is used. This is not a contemporary problem given that Fawcus (1986) outlines different 'conditions' seeming to infer that there may a pathological condition or that dysphonia may occur in the 'absence of any physical cause' (1986: 2). Both Fawcus and Carding (2000) designate the term 'functional dysphonia' to the non-organic, suggesting this is common terminology in clinical circles even though its meaning is not obvious to any lay person.

As a blanket term 'dysphonia' appears to make discussion of problems and solutions difficult for the non-specialist. Although Kumar and Clarke link dysphonia with hoarseness and give clinical detail (2009: 1082), it is worth taking into account that at least one current specialist text on voice science (Seikel, King and Drumright, 2010) does not use the term at all, casting some doubt on its usefulness if it masks what is needed for solutions

There is use of the word 'symptom' instead of 'problem' commonplace in many studies and this carries a medical connotation. It is hard to know whether such a predominantly clinical

focus is justified. For example, Preciado-López *et al*, although they report 'prevalence of voice disorders' in 57% of their study sample of teachers, only find 'organic lesions' (nodules) in 20.2%; considerable numbers in the survey have 'temporary' problems (2008: 501-502).

The question for my study is whether it is helpful to label as a disorder those vocal problems which may not be accessible to medical treatment; that is, where there is no structural or pathological problem within the vocal apparatus. In general, it is difficult to compare different kinds of information conveyed by results in different studies and gained in different ways. For example, figures for medical or clinic attendance, such as those presented by Williams (2003), are probably not comparable to figures arrived at when teachers outside a clinic situation are asked to report their so-called symptoms. Emerging in the context of this study, there is an issue in the conceptualisation of some voice problems which hinders teachers receiving appropriate support. This was apparent for F.M. Alexander given that his problem was not describable or solved in medical terms.

One key factor related to interpreting results is the rate of response in any survey, whether perceptual or instrumental. If there is a low response rate, any findings could be called into question, because those who reply, for example to a questionnaire, may not be representative of the study group or sample as a whole. Some large-scale studies are shown to have low response rates. In contrast, there is greater weight of evidence where response rate is high. This indicates possible strengths in a smaller specific survey such as that of Fairfield and Richards (2007). Its rate of return for questionnaires is 89.5%: sufficient that the researchers may claim it is a valid 'picture' of the particular restricted group of student teachers.

2.3.1.5 Summary

I have confined this analysis to the period from the 1960s to the present day. Evidence over

this time shows teachers in various countries requiring medical or clinical help. In addition, substantial numbers of teachers self-assess that they have some problem with their voice at work even if it cannot be regarded as medical. As well as more-experienced teachers, it has emerged that those early in career as students may experience difficulty

To summarise what appears to appertain for teaching professionals worldwide: Åhlander, Rydell and Löfquist (2012) state that 'teachers are at high risk of voice disorders compared with other occupations'; they cite twelve studies to support this view (2012: 149). Morton and Watson, writing at the end of the 1990s, considered 'the true scale and dimensions of voice problems in teachers' had not been 'revealed'; they pointed to the 'appearance of related pieces in the general press' as evidence confirming the 'extent' of the problem; that is, it is in the public gaze because it is prevalent (1998: 133). ATL, the VCN and other organisations continue to demonstrate in their publications that voice problems are a concern amongst classroom teachers in the UK (2.2).

Not all studies I have analysed regarding the extent of teachers' voice problems are drawn into this section, because some are incorporated in 2.4 in consideration of specific problems. Prior to that, I examine in more detail what is known about the situation for UK teachers.

2.3.2   Evidence of voice problems of teachers in the UK

The proliferation of academic studies during the last decades of the 1900s and into this century is not matched in the UK. It should be noted that, although Williams' 2003 paper was compiled for the journal of the UK Health and Safety Executive, *Occupational Medicine*, it includes no UK evidence because figures for absence from work relating to voice problems are not available here: there is no reporting category akin to other countries such as the USA.

Without such means of monitoring it is difficult to provide comparative data or to gauge the situation in the UK.

A small amount of evidence has been collected in other ways in the UK; for instance, clinic attendance figures are reported in a survey of the VCN (Comins, 1995). In addition, Martin (1994) conducts a survey of voice therapy in the UK and finds teachers are more than six percent of those attending. Neither Comins' nor Martin's findings are current but they provide some indication that UK classroom teachers experience voice problems.

A small number of more recent studies relate to UK teachers or, in the case of Fairfield and Richards (2007), student teachers. The 2007 survey conducted by the VCN for ATL (which represents approximately 160,000 UK teachers and educational professionals in its membership) shows a substantial proportion (68%) of the 490 participants experience problems (2.2). The figure coincides almost exactly with Martin's figure of 66%, although the background, rationale and time frame of the two studies differ considerably and there is no substantive detail available for either sample.

Morton and Watson (1998), gathering information on teachers' problems through UK speech and language therapists, also question teachers who are not attending clinic. Overall, their findings show that 'teachers run a considerable risk of presenting with a voice problem' (1998: 133); to what extent is unclear (Morton and Watson, 1998) (2.3.1.5). In addition Fairfield and Richards (2007) provide useful data on those in UK training who are currently within the first ten years of their professional employment. If representative of others, the evidence reveals a relatively large-scale problem with a third entering teaching having already experienced vocal difficulty.

2.3.3   Support for UK teachers

Morton and Watson conclude that findings support 'the implementation of specific voice conservation and care for those in the teaching profession' (1998: 133). The vocal concern expressed by a teacher is said to be 'constant with age' (1998: 137), indicating that support for voice skills appears to be necessary no matter what the teacher's age and perhaps regardless of experience. Results in Smith's US investigation show that 'the number of symptoms and physical discomfort symptoms appear to increase with age in the teacher group' compared with those in other occupations (1997: 85). Similarly, Roy (2004a) noted that prevalence of voice problems amongst teachers reached a peak in the age range 40-59 years. In other words, the situation does not improve with more experience in the job. This makes it apparent that some form of help is necessary.

In spite of such evidence, there are fewer systems in the UK than in other countries for supporting teachers in terms of their demanding role or in relation to voice problems. In contrast, teachers in Poland have for some time been entitled to an appointment with an ENT (ear, nose and throat) specialist every five years (Sliwinska-Kowalska *et al*, 2006: 87). Also, it was observed (2.3.1) that data such as that collected by Williams is not available for teachers in the UK where no reporting system for work absence due to voice-related problems is in place. It seems there might be less awareness of the existence or impact of voice problems in the UK over the period 1966 to 2000, and possibly beyond.

The World Health Organisation (WHO, 2001) through its International Classification of Functioning, Disability and Health has shifted the focus 'from cause to impact', ensuring that, regardless of the origin of the problem, those who need help might qualify to receive it. De Jong says this approach means that health should be regarded as 'a condition of total physical, mental and social well-being and not only the absence of disease' (2010: 5).

Morton and Watson suggest that UK provision for vocal well-being appears inadequate; for instance, support during teacher training is too often seen as 'an optional extra' (1998: 137-8). There is also the question of what the best support and solutions for teachers would be. In order to address this question, it is necessary to clarify what qualities are needed for voice to be effective in the teaching situation. These points are addressed in Chapter 3 (3.2 and 3.3, in particular). Prior to that, this chapter concludes with consideration of the specific problems occurring for teachers.

2.4 TERMINOLOGY FOR THE KINDS OF VOICE PROBLEMS EXPERIENCED BY TEACHERS

An analysis of studies indicates some commonalities in the voice problems arising. As discussed briefly (2.3.1.4), terminology can be problematic to knowing what appertains and how to help. For instance, there is widespread use of the term 'symptom', implying a clinical or medical categorisation regardless of whether sample groups originate in medical settings or as part of a general population group. I am interested in whether this ignores general or non-medical evidence which might emerge where teachers are able to express it.

2.4.1 Problems which are commonly described in studies

Setting the background to defining problems (2.3.1.4 and 2.4) gives a context for exploring specific voice problems as identified in voice research. The problems can be summarised as: losing one's voice, finding it hard to be audible, suffering from hoarseness or discomfort (which might be apparent in 'scratchy' voice), experiencing tiredness or fatigue, or having a strained voice. Therefore, in the main, studies are focused on 'poor' quality of voice and lack of stamina. I have categorised problems which emerge in studies of classroom teachers and their voice experiences so as to summarise the research findings within four such headings

(2.4.1.1 to 2.4.1.4). That is not to imply that there may not be connections or overlap between different problems.

2.4.1.1 Loss of voice

Loss of voice is sometimes called 'aphonia'. Seikel, King and Drumright define this as 'loss of ability to produce voicing for speech' (2010: 234); Shewell associates aphonia with a 'whispered voice' where the vocal folds do not close for full phonation (2009: 415). Sliwinska-Kowalska *et al* list 'aphonia' within a questionnaire about 'lifetime vocal symptoms' and also ask participants about being 'voiceless' (2006: 99 and 88). Whatever the terms encompassed within the latter study, percentages for occurrence of aphonia and being voiceless are each more than ten percent higher amongst teachers than those in a control group (2006: 88). Morton and Watson state that a significantly high proportion of teachers in their survey report 'voice loss with cold/allergy' (1998: 135).

If loss of voice occurs, whatever its initial cause, a teacher is vulnerable to longer term consequences in continuing any prolonged or demanding voice use when the vocal folds are affected by viral infections, particularly laryngitis or any infections causing inflammation of the sensitive tissues of the upper respiratory tract (NHS Direct, 2015). Excessive vocal use ('abuse') is said to be a 'precipitating factor' in possible 'vocal fold trauma' (Aronson and Bless, 2009: 233); that is, possibly permanent damage to the folds such as formation of nodules. What is not initially a medical problem may become one later.

Weak voice and problems with audibility may occur even when there is no actual loss of voice. Several studies show teachers' views of how audible their voices are in class. Problems with audibility may be termed: 'difficulty being heard' (Simberg *et al,* 2000 and Simberg, 2004), 'difficulty in projecting the voice' (Roy *et al,* 2004b), or 'inaudibility' (Ilomäki, Mäki

and Laukkenen, 2005). The findings of these studies vary and so it cannot be assumed that the information gathered relates to the same phenomenon. However, the statistics suggest that problems with being heard occur frequently amongst teachers in the classroom. In addition, in a survey of a large number of student teachers, 39% of those with voice problems reported 'difficulty being heard' (Ohlsson *et al*, 2012: 631).

More than 20% of teachers taking part in the survey carried out by Roy reported difficulty 'projecting the voice'; it is not possible to know what they meant by this term other than its use within the context of 'symptoms/signs typically associated with voice disorders', but teachers are six times more likely than non-teachers to report this difficulty (2004b: 544 and 546). A comparison with this finding comes from Morton and Watson's study where a non-teaching group 'report non-clinical features such as problems making themselves heard' (1998: 135). This does not mean teachers were finding it easy to be audible in the classroom, because raising the voice was also identified by Morton and Watson (1998) as a factor in voice problems for teachers in their study. Further discussion of teachers' use of the term 'projection' is necessary in Chapter 3 for a wider understanding of what may be involved.

Studies by Smith *et al* (1997, 1998a and 1998b) demonstrate that more teachers than non-teachers think they have a 'weak voice'. This is perceived as a more prevalent problem by female teachers in the survey populations. What is meant by 'weak voice' may not be well defined. However, Smith notes that many teachers use loud voice over considerable periods of each day (1998a: 332; 1998b: 483); they seem to consider it necessary to speak louder in the classroom than 'during normal conversation' (1998b: 483). If a teacher finds this loudness difficult to maintain, perhaps they consider this means they are vocally 'weak'.

These insights into teachers' perceptions of their voices being sufficiently audible may be relevant to considerations of quality and stamina (2.4.1) and to voice training (3.3.3).

2.4.1.2 Hoarseness

Hoarseness is reported in studies as occurring more frequently than any other voice problem for teachers. It features in four of the papers reviewed by Williams (2003). For example, Williams cites Smith *et al* (1997) who say hoarseness is a frequently occurring problem for almost half of the teacher group surveyed compared to about one-fifth of non-teachers in the study. This indicates it is a feature of problematic voice, but more so for teachers than other occupational groups.

Also, hoarseness is one of the problems cited in more recent studies. To give several examples of this: Bermúdez de Alvear *et al* cite 54.9% of teachers reporting hoarseness (2010: 26); da Costa *et al* show 23% of teachers missing work because of hoarseness (2012: 59); and Neto *et al* find hoarseness in 21.33% of students in their survey (2008: 248). In some cases, the researchers elicit responses by listing possible voice problems including hoarseness, so it is unknown whether participants would have used the term if they had been asked simply to describe their problem.

The other term employed by da Costa *et al* in their discussion of survey findings is 'dysphonia' (2012: 71). As commented (2.3.1.4), the term occurs in a number of other studies and may be used to identify a generic medical condition or voice disorder. It is also of note, given an interest in providing help through the Alexander Technique, that the term dysphonia was employed at the time of F.M. Alexander and in diagnosis of his problem. In a newspaper article published in his native Australia in 1894, Alexander refers to the condition as 'Clergyman's Sore Throat', taking as a source the joint writings of a physician, Lennox

Brown (1840-1902) and a teacher of elocution, Emile Behnke (Alexander, 1995: 4 and 260-261). The complaint, known as 'dysphonia clericorum', was the subject of a UK medical text of 1848 written by Doctor James Mackness. Two emphases emerged when the writing was reviewed in the *British Medical Journal* at the time: one, that the voice should be rested and, secondly, that the way the voice is employed may be the root cause of the 'disease' (see BMJ, 2015).

In Alexander's own experience there was no lasting solution when doctors repetitively prescribed only rest for his hoarseness and loss of voice. He determined, therefore, to search for a root cause, and it was only by improving his psychophysical use (1.8.2) that he found a satisfactory way forward (1985: 24-26). If medical aetiology underlies the situation for only a minority of classroom teachers (2.3.1.4), there may be similarities with Alexander.

2.4.1.3 Problems of discomfort

Some voice problems are described as 'discomfort'. Roy *et al* find teachers more likely than others to say they experience discomfort when speaking, with 27% of teachers compared to less than five percent of non-teachers (2004b: 546). Similar findings of high numbers of teachers reporting discomfort emerge in several studies including those of Smith *et al* (1997, 1998a, 1998b). Also, Smith's studies separate figures for 'physical discomfort' from voice reported as: 'tiring', 'effortful', 'scratchy', 'uncomfortable', or 'rough'. As with hoarseness, these labels may be open to individual interpretation.

In their study, Roy *et al* rate 'effort to talk' and find a statistically significant difference between teachers and the control group: 23% of teachers compared with 2.4% of others (2004b: 546). Evidence in Roy's study comes solely from questionnaires, whilst Sliwinska-Kowalska *et al* (2006) use follow-on clinical examination to verify any 'subjective' vocal

symptoms and to link them to what they call 'strained phonation'. Again the terms used by different researchers may, or may not, be synonymous one with another.

Several research projects incorporate use of the Voice Handicap Index (VHI). Originating with Jacobson *et al* (1997), this is a questionnaire validated from work with voice clinic patients. The VHI has thirty-two statements and requires participants to show what they think accords with their own experience. Some of the points relate to a 'Physical' subscale which the authors classify as 'self-perceptions of laryngeal discomfort and voice output characteristics' (1997: 67). It is noted that this physical scale is said to equate with discomfort and that other studies associate discomfort with the throat, as in Sapir, Keidar and Mathers-Schmidt (1993: 180). The VHI has a three-way classification with two further subscales entitled 'Functional' and 'Emotional' problems.

Studies using the VHI, such as Fairfield and Richards (2007), appear to focus attention often on numerical evidence of problems, taking the overall total score of a participant as indicative of the severity of problems. This is also the case in the study by Ohlsson *et al* (2012) who compare total VHI scores against their participants' results on other screening tests.

Some studies comment on subscale scores of the VHI in a way which maintains the classification set up by Jacobson without discussing people's specific experiences. For instance, where Fairchild and Richards report specifically on the physical scale, they say it 'gives rise to the highest scores' or the most frequently-occurring problems in their student teacher group (2007: 417). Also, Åhlander, Rydell and Löfquist identify that the emotional subscale discriminates most clearly between participants with and without voice problems and they draw on studies 'linking psychological factors' with so-called functional voice problems (2012: 158-159). They identify the reactions of teachers in class as though it was possible to

regard these as separate, an approach which contrasts with the psychophysical view of voice I have put forward (1.8.3; 1.8.4).

Results appear to show that the participants suffer frequent instances designated as 'physical' voice discomfort. However, it is not clear whether there are difficulties of definition which affect what is identified as a problem and therefore what can be done to help. It could be helpful, in my view, to pay attention to the lived experience of individuals in any review of solutions to specific problems. The other question may be how to avoid the dichotomy in terminology which does not recognise the psychophysical nature of voice (1.8.3).

2.4.1.4 Vocal tiredness or fatigue

What is termed 'tiredness of voice' or 'vocal fatigue' is a predominant problem according to several studies. Fatigue or tiredness is particularly reported by teachers compared with other groups. Many research groups refer to Gotaas and Starr (1993) on vocal fatigue, even where they are not reporting on this voice problem in detail. For example, listed chronologically, the studies where Gotaas and Starr are referenced without discussion include: Russell, Oates and Greenwood (1998), Smith *et al* (1997; 1998a; 1998b), Mattiske, Oates and Greenwood (1998), Williams (2003), de Jong *et al* (2006), and Åhlander, Rydell and Löfquist (2012). Others such as Sliwinska-Kowalska consider fatigue and show that 40.5% of classroom teachers report voice tiredness compared with 38.6% of other occupations (2006: 88). Although the differential between employment groups is not statistically significant, both figures are notably high.

There has been considerable research into so-called 'vocal fatigue' within the last thirty to forty years and the outcomes of studies suggest that the problem of fatigue is worthy of attention for teachers as a specific group. The study by Gotaas and Starr (1993) draws on a

sample of 39 teachers, reporting their perceptions of vocal fatigue at the beginning and end of workdays. The definition given for fatigue is: 'a problem that begins to occur as the speaking day progresses, is most evident at the end of the day and usually disappears by the following morning' (1993: 121). Individual teachers self-evaluate their own 'vocal characteristics' via sound recordings. Accompanying information is collected on: the amount of talking during an average working day and during evening social activities; and the estimated proportion of time speaking loudly or under 'different degrees of tension' (1993: 122-123). The word 'tension' is not defined but reference is made to circumstances regarded as 'anxiety producing' (Gotaas and Starr, 1997: 120). This possibly corresponds with Åhlander, Rydell and Löfquist (2012) discussing people's reactions to vocal situations (2.4.1.3). It may be this takes into account the concept of use and reactivity (1.8.3), but awareness of this is not evident in the study report.

Investigations such as that of Gotaas and Starr have established 'the prevalence of vocal fatigue in certain professions' (2008: 324). Boucher and Ayad consider that 'an objective measure' is essential 'for the development of standards in the prevention of acquired voice disorders', but they point to the lack of progress in this (2008: 324). I assume in using the term 'objective' they are perhaps pointing to quantification. In seeking ways forward, they suggest re-assessment of the belief that has become common: that 'muscles of the larynx are for the most part nonfatiguable' (2008: 324). Wu *et al* (2000) and Hoh (2005) show that fast-acting muscles fibres of the larynx are 'fatiguable' in a way not understood prior to their work. This is an important distinction and finding.

By taking electromyographic (EMG) recordings of some of the muscles in action, Boucher and Ayad seek to relate these recordings to any acoustic signs of muscle fatigue. Electromyographic imaging is 'the study of muscle function through the inquiry of the

electrical signal the muscles emanate' (Basmajian and de Luca, 1985: 1). It enables us to know about the activity of different muscles or groups of muscles because when a motor neuron (a nerve cell, in the nervous system) fires 'it sends an electrical signal called an action potential' to the muscle fibres (Behrman, 2013: 97). The least invasive method of monitoring is through surface electrodes which can distinguish signals varying according to the activity of underlying muscles. Although wider findings in Boucher and Adad's research using the technology of EMG are tentative, they indicate some confirmation that vocal fatigue is 'not exclusively a perceptual condition but a distinct physiological condition of the voice apparatus' (2008: 333-334). They also confirm that 'observable physiological effects' of vocal fatigue can be 'objectively' assessed (2008: 333).

Further to this, Boucher and Ayad note in their investigation a link between measured vocal fatigue and voice 'tremor', and they demonstrate that such fatigue can be differentiated from general fatigue which is 'associated with waking hours' (2008: 334). They state that their research does not address 'the question of speech behaviors that create fatigue', but suggest that fatigue may not only be influenced by loudness or duration of voice use, but also by other variables (2008: 334-335). Their paper raises awareness, therefore, of the complexities that may underlie assessment of fatigue in different individuals, and that may impact on vocal stamina in a role such as teaching.

2.4.2 Summary and next steps

The problems identified as common amongst classroom teachers can be summarised as related to audibility and clarity. A teacher may experience difficulty being heard if their voice is hoarse, 'scratchy', strained or tired, or lacking clarity; therefore, voice quality and sustainability are compromised.

From discussion (2.4.1.1 to 2.4.1.4) it is apparent that there is some disparity in the research regarding the terms used for different voice problems. This makes it difficult, not only to compare figures quoted by different research groups one with another, but it also means there is uncertainty about what these problems actually entail. Also, such lack of clarity over terminology may be problematic when it comes to finding or appraising solutions.

Clearer definition of what is being studied is required for the collection of evidence, so that there can be meaningful reporting of results and implications for individuals can be considered. Consistency in the terminology of voice problems in any survey might ensure its outcomes can be evaluated more clearly.

In addition to the teachers' vocal skills providing a model for pupils (1.3.1), problems associated with the quality of a teacher's voice may lead to difficulties for pupils in understanding what is said. A study by Rogerson and Dodd found evidence to support the hypothesis that (for example, where a teacher has a hoarse voice), 'poorer voice quality hinders children's speech perception' and their consequent comprehension (2005: 53 and 54). Van Houtte *et al* also suggest that the voice problems they report as prevalent amongst teachers have repercussions for 'the quality of teaching' and the pupil's 'learning experience' (2011: 573).

In addition, negative voice qualities, such as hoarseness or strain, imply that a teacher may find it hard to sustain their voice. Martin and Darnley emphasise that teaching effectively includes 'the demands of prolonged voice use', often loudly, every day (2004: 7). While the loudness required may vary, the length of time a teacher engages in talking is likely to be a major demand and this will be affected by the stamina of voice of that individual.

Da Costa *et al* make a point about teachers' expectations: that 30% of participants in their study regard hoarseness as 'normal for teachers' (2012: 72). It may be hard to know what underlies the high frequency of problems for teachers in widely differing work circumstances, even allowing for demographics such as gender, age, or length of time in teaching. Nevertheless, the question arises as to whether those who experience problems should accept that their situation is inevitable.

In order to support teachers to attain improved outcomes to their situation, it is necessary, in addition to considering solutions, to determine how any solution might be assessed and evaluated. Therefore, in Chapter 3, I proceed to other literature examining these points.

CHAPTER 3

LITERATURE REVIEW: PART II, VOICE QUALITY

3.1   INTRODUCTION

Any investigation of voice problems presupposes an idea of non-problematic or 'good voice'. Therefore, this review goes on to investigate what has been written about the qualities of voice a teacher needs in order to carry out their job. Voice quality for teachers is examined in a number of different disciplines and fields: voice science, speech support and therapy, and actor training.

It is important to be able to measure improvement in voice quality for classroom teachers (Research Question 3) so as to have a means of evaluating meaningfully any proposed support (1.2). In this way the chapter lays the ground for the exploration set out in Chapter 6 and carried out in fulfilment of the fourth research question which looks at whether improvement in voice quality can be demonstrated by the adoption of a procedure based on the Alexander Technique (1.2). This follows an analysis of possible solutions to the voice problems of classroom teachers as proposed in published studies.

3.2   WHAT QUALITIES OF VOICE ARE NEEDED IN TEACHING?

It can be inferred from the identification of problematic voice qualities (lack of audibility or a voice which is strained, tired or hoarse) (2.4.1), that conversely, clarity and audibility are key voice qualities. These attributes also appertain to the statements of the Newbolt Report (H.M.S.O., 1921) and of McAllister (1938) that the teacher needs to sustain a clear and audible voice (1.3.1). As another essential voice quality, there is also the teacher's capacity to sustain daily use of the voice in the classroom without problems (2.4.2) as described by Martin and Darnley (2004: 2-4).

It appears, therefore, that the necessary voice qualities in teaching are clarity, audibility, and 'sustainability' or the stamina required for prolonged use. Questions emerge; firstly, that of whether these ideas equate with literature on voice quality from other disciplines as drawn into this study. It is apparent that some qualities required in teaching are not dissimilar to those expected in acting which means literature provided by actor voice trainers is a useful source to accompany the discussion of voice scientists and 'good' voice quality (3.2.1; 3.2.2). Expressiveness is one aspect of such public speaking which is important. Martin and Darnley refer to 'expressivity'. Other voice trainers suggest variety of voice, without necessarily calling it expressiveness; for instance, Berry suggests that variation in pace and other characteristics are necessities in acting (2000: 111-112). Even if expressive voice is regarded as desirable for classroom teachers also, it is beyond the parameters of my study to look at the wider implications of this (1.6.1), although the question of 'appeal' is raised briefly (3.2.1 and recurring in Chapter 6).

Secondly, there is the question of defining measures of relevant voice qualities so the evaluation of any solution to voice problems can take place. Therefore, I seek to show how any change is to be assessed, including what might constitute a positive change (3.2.3).

3.2.1   The voice scientist's view of 'good' voice quality

Hazlett, Duffy and Moorhead define a professional voice user as 'an individual who depends on a consistent and appealing voice quality' in their employment role (2011: 181). In the question of criteria for what is 'appealing' or 'good' in a voice and to determine whether it is of consistent quality, I turn to the phonetician, Hollien and the voice scientist, Zemlin who express distinctly similar ideas.

Zemlin refers to 'the semantic merry-go-round' of the term voice quality, highlighting the general problem of identifying and studying it (1998: 171). In common with Kent and Ball (2000) (1.2), Zemlin considers quality is difficult to define. To circumvent such difficulty he recommends using measurable parameters such as pitch and aspects of intensity in association with pitch (1998: 172). Hollien concurs on 'good voice quality' including particular characteristics of pitch and loudness (2000: 17 and 22). In addition, Zemlin includes resonance as a 'specifiable parameter' in voice production. Therefore, the three criteria (pitch, loudness and resonance) are discussed further in my examination of the voice qualities a teacher needs to carry out their role (3.2.2).

Detail can be understood within graphical representation of the different frequencies present in a sound (3.2.1) known as a sound spectrum; it shows the amount of vibration at each individual frequency, the acoustical energy in the sound (UNSW, 1997; Zemlin, 1998: 173). Any element of 'random distribution of acoustical energy' in the signal is defined as noise which is regarded as detrimental to sound quality (Zemlin, 1998: 173); conversely, 'a well-organised 'spectrum' means a voice does not 'exhibit noise' which might be noticeable as breathiness or harshness (Hollien, 2000: 22). Zemlin speaks of roughness (1998: 173). One of Zemlin's other parameters is jitter, where irregularity of vocal fold vibration may also be perceived as roughness of voice (1998: 172-173). It is noted that roughness or breathiness of voice may impinge on required clarity, audibility and sustainability (3.2). The phenomena of jitter and noise will be examined further when it comes to reporting data in Chapter 6.

3.2.2   Investigating the voice qualities required for a teacher to carry out their work

To consider the practicable ideas offered by Zemlin and Hollien, each parameter of pitch, intensity and resonance is discussed. In 3.2.3, I focus on whether the terms correspond or can be reconciled with the clarity, audibility and sustainability proposed for the voice of a teacher.

The analogy between the roles and vocal demands of school teachers and actors has been noted (1.8). Therefore, in the following examination of voice quality and vocal skills, I refer also to the writings of voice teachers who work mainly with actors. These include Cicely Berry, Barbara Houseman, Kristin Linklater, and Patsy Rodenburg. Also, Stephanie Martin and Lyn Darnley are included because of their work on teachers' voice in addition to Darnley's work with actors in her current role as head of Text, Voice and Artist Development at the RSC. Additionally, I refer to Christina Shewell, a qualified speech and language therapist and voice coach; she has undertaken a study of voice at the Royal Central School for Speech and Drama in London. All have published manuals on voice work which are in current usage, and most are connected with major UK drama schools.

Linklater acknowledges her debt to the Alexander Technique in her teaching. A further text considering voice training and the Technique is *The Voice Book* by Michael McCallion (1998). McCallion taught at RADA for a number of years and his text is used within a number of actor training establishments.

In addition to the voice teachers listed for inclusion in my own work, it may be noted (1.8.1) that I have drawn on F.M. Alexander's own writings as the origins of the Technique and have looked at the development of Alexander's work, for example as encompassed by my own training (Door, 2003), the movement studies drawn together in critical analysis by Basmajian and DeLuca (1987), and the research approach of Jones (1997).

3.2.2.1 Voice quality and sound waves

Work on voice quality is predicated on an understanding of sound waves, the graphic representation of air vibrating back and forth as energy is transported from one point to another (Behrman 2013: 14-15). The simplest waveform is that of a pure tone as when a

tuning fork is struck. Complex sounds are those which need several connected waves to represent them; the voice is this kind of complex tone (Behrman, 2013: 35-38). The number of times the particles of air vibrate backwards and forwards in producing a sound is the frequency of the wave; frequency is perceived by the listener as pitch (1.7).

The amplitude (the amount of energy in a sound wave) is equivalent to its perceived loudness (1.7). In the sound waves shown in Fig. 3-1, the *frequency* is demonstrated by the number of waves passing a point each second, so the horizontal 'spread' of the wave represents 'time'. Higher pitch is represented by greater frequency of recurrence of that wave; lower pitch is shown in the lesser frequency over time (Behrman, 2013: 23-24). The *amplitude* in the sound wave is shown in the peak of the wave; the louder the tone, the greater the disturbance of air particles and therefore the more 'extreme' the peaks of the wave, although the intensity of the wave (its power) diminishes with increasing distance from the source of the sound (2013: 25 and 27-28). This is relevant to any sound, including voice (also, Fig. 3-2).

3.2.2.2 The pitch or frequency of a voice

As shown within recognised traits of voice (1.7), pitch describes the perception of a speaker or listener; its measurable counterpart is frequency which relates to the vibration of air particles when they are set in motion (in this instance, by the moving parts of the larynx, see Appendix A) (Behrman, 2013: 21). Increasing or decreasing levels of frequency are associated with corresponding changes in pitch (Seikel, King and Drumright, 2010: 243). Both forms for assessing voice are important to my study (1.7). As frequency relates to the vibrations or oscillations created by the sound (3.2.2.1) it is expressed as the number of 'complete vibrations or cycles per unit time' (Zemlin, 1998: 415).

Fig. 3-1 Forms of sound waves
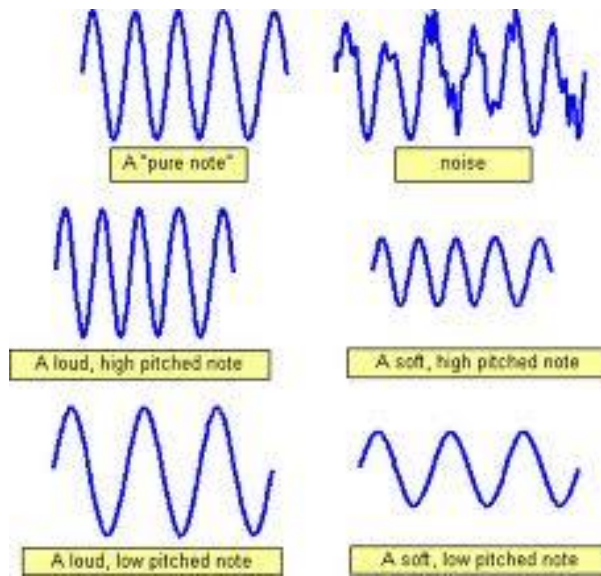
(Gibbs, 2007)

Fig. 3-2 Sound wave of the human voice
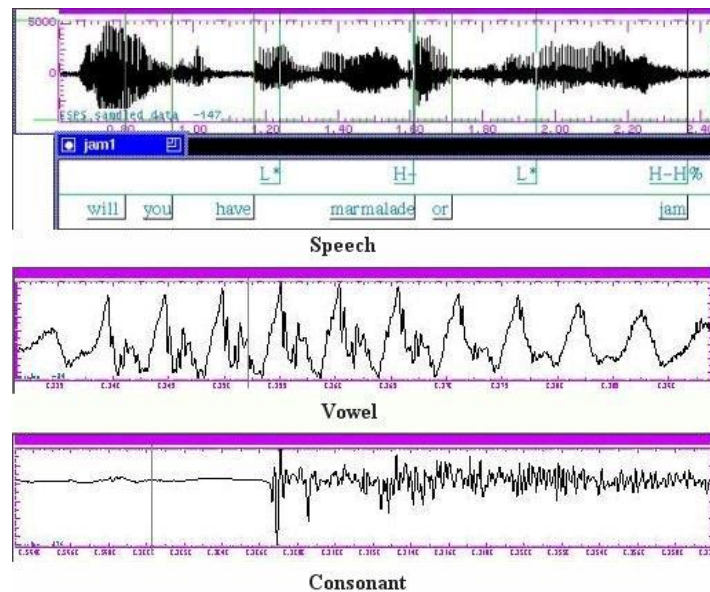
(Non-copyright source of illustration: Review of the Universe, 2002)

Voice teachers generally use the everyday word 'pitch'. Voice quality is described, not just in terms of the actual pitch of an individual voice in any utterance, but also in relation to the average rate of vocal fold vibration known as fundamental frequency. It is shown sometimes

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as F0 or F_0 and referred to simply as the fundamental (1998: 152). For females, F_0 is around middle C on the piano scale and for males commonly an octave lower, termed C_3.

It is usual for the pitch or frequency levels of individuals to vary over a range; the part of the scale possible for any individual is partly gender dependent because it relates to the size of the larynx and vocal tract (Zemlin, 1998: 152). Where Zemlin suggests voices can encompass two octaves, Linklater refers to a capacity for expressive movement over two to four octaves (2006: 7). Rodenburg advocates a wider range as 'fuller use of the voice' beyond 'the three or four notes' which usually predominate (1997: 98). She says the 'healthy spoken voice can easily stretch over three octaves if not four' and she suggests exercises to extend the range in use by an individual (1997: 98 and 99). Similarly, Berry appears to support broadening the range of pitch, because people are generally 'very dull in the amount of range they use' (1973: 78). There appear to be different views on what constitutes variety of pitch. However, a point raised by Berry is that someone tending to use 'the lower part' of their range for rich tone can learn to incorporate a wider range of notes which 'become equally rich' (1973: 32). This might be interpreted within Hollien's suggestion that 'good' voice has a 'lower-than-average' fundamental frequency (2000: 22).

When the function of the larynx in sound production is examined, it becomes evident that it is not just the area around the larynx which is associated with the pitch of voice and other qualities but the crucial workings of the whole organism (1.5.1; Appendix A, A2.1). The overall postural configuration that an individual assumes (and its association with the best total use of the organism, 1.8.2) has to be considered significant to breathing, phonation and articulation which make up speech and voice.

3.2.2.3 The intensity or loudness of a voice

The lay term 'loudness' is a perceptual recognition of the measurable sound characteristic known as amplitude (1.7) referring to the 'range of movement of a vibrating object' (Zemlin, 1998: 563). In the case of voice, tissues within the vocal tract are set in motion after the air passes the larynx (Appendix A; A3.2.1). Loudness can also be quantified as intensity (Behrman, 2013: 25) which is a 'measure of energy flow per unit of area per unit of time', said to represent the 'power' of that sound (Zemlin, 1998: 572 and 415). Hollien's finding is that 'good' voice displays 'average to softer than average vocal intensity' (2000: 22). Both forms of assessment for this are important (1.7). All four quality terms (loudness, amplitude, intensity and power) are used in this study.

The voice teacher, Linklater refers to 'feeling of vibrations in the body' and their 'freeing' or exploration (2006: 65 and 87). This may have a link with the intensity of sound being produced. Later discussion (3.2.2.4) will consider the term 'vibration' in connection with resonance of voice. Other voice teachers refer mainly to loudness. Occasionally the term 'volume' is employed (for example, Berry, 1973: 38-9; Rodenburg, 1992: 223-227; Martin and Darnley, 2004: 2), although Behrman suggests intensity or loudness are better descriptions (2013: 32).

There is an adage amongst teachers that the louder the teacher, the louder the class; this may be recognised in the practicalities that we come to learn as teachers: gaining attention and then lowering the intensity of the voice rather than continuing in the initial loud tone when it is unnecessary. Where teachers 'compete' with other sound in the room, it is perhaps indicative of the general phenomenon called the Lombard effect where without conscious thought someone increases the loudness of their voice above surrounding sounds (Behrman, 2013: 160-161).

In the classroom, a teacher's voice has to be sufficiently loud to be heard even above background sound, so the question is how this can occur without problems for that individual. Hollien indicates that the intensity of a voice can be 'softer' in many circumstances, so perhaps producing 'good' voice is concerned partly with discerning what is appropriate in any given situation. Also, there has to be sufficient energy within the voice, given this may not be solely a function of how much is generated at the larynx but includes its transmission within the tract and then into surrounding space such as the classroom.

It is useful in terms of effective loudness of voice, for instance that it is heard in large spaces, to consider the term 'projection'. This often refers to the 'carrying' power of the voice and does not appear to be a new term, as indicated by Levbarg (1919: 421). Voice projection has been terminology in some drama training and is used also amongst classroom teachers when they talk about voice training. This emerges in my survey responses in Chapter 5.

Martin and Darnley discuss voice work to increase the 'forward projection of the voice' through suggested exercises as the means (2004: 165). Berry describes focusing on different distances and also giving time to allow for the sound to reach that place (2000: 110 and 111). In a similar sense, it is indicated that projection is about appreciating the acoustics of the space in which one speaks (Rodenburg, 1992: 293). This indicates projection may require more than just the setting of exercises. Levbarg describes it being helpful 'to fasten the gaze upon the person or place at which we intend to speak'; in other words, he says, projection has to be considered not just 'from the mechanical viewpoint', it is about what one is thinking (1919: 421). I would want to add that it should be seen as a psychophysical process, not as two separate aspects (1.8.2).

Although projecting the voice is taken into account in voice training now and historically, it does not seem to be recognised in voice science texts. However, if projection is connected with the tone being produced, there may be some link with resonance which is the other voice quality now discussed.

3.2.2.4 'Resonance' as a description of voice quality

Resonance is a further characteristic of voice quality in Zemlin's specifiable parameters. He describes resonance as a characteristic of matter being 'energized' so that the matter vibrates 'at its own natural frequency' (1998: 294). Resonance equates with the frequency or 'set of frequencies, at which the object vibrates most easily' (Behrman, 2013: 45). In terms of vocal sounds, vibration involves tissues within the tract and beyond into the environment and these are important factors in human voice (Appendix A, A4). Once the vocal folds of the larynx are set in vibration by the stream of air exiting the lungs, further movement or resonance of the produced tone may occur within the vocal tract and may influence voice quality. The short puffs of air originating in the vocal folds are combined in multiple bursts which then radiate energy or create resonance within the upper tract.

Resonance as overall quality of a tone is an important feature of voice alongside pitch or frequency and it has some link with the frequency at which the air column resonates according to other factors such as the internal dimensions of the tract (1.5; Appendix A, A4.1). This is partly influenced by structure and, for instance, gender differences (3.2.2.2), but it depends also on the configuration of the tract, the positioning and flexibility of the larynx within the tract, and the configuration and functioning of the whole organism (1.8.2).

It is common for voice teachers to mention resonance. For example, Martin and Darnley suggest that resonance might give body and 'carrying power' to the voice (2004: 158), a view

that appears broadly in line with what is discussed by voice scientists. Some voice teachers refer to 'vibrations' rather than 'resonance'; for instance, Linklater (2006) (3.2.2.3). Berry emphasises registering vibrations in the back, chest and head and getting a sense of 'throwing the vowels out' (2000: 110). This means thinking of different distances for the voice to carry, which also seems to relate to projection (3.2.2.3). Houseman talks of '*sympathetic vibration*' taking place in the throat and mouth, 'filling out' the sound, giving it strength and enriching it (2002: 162, italics in the original).

Shewell discusses whether the idea of resonating 'spaces' of the head and chest are necessarily about actual resonance in those places or about 'images' for creating a particular quality in the voice (2009: 176-177). As accords with anatomy and physiology texts, Shewell describes sound waves being 'shaped and changed' in the pharynx, mouth and nose, and that, even if vibrations are felt in parts of the chest, there is obviously no sound there. She also points to some disagreement about the role of the hollow sinus spaces of the skull (2009: 177). Zemlin attributes 'minimal contributions to the resonant characteristics' of these (1998: 224). *Gray's Anatomy* suggests the sinuses 'have been thought to add some resonance to the voice' but no definitive claim can be made either way (1995: 1637).

To summarise, resonance is a useful term which is not always well defined. Sometimes it may be described in ways that are at variance with what is agreed by voice scientists. The idea of a tone being produced, but changed within the vocal tract, appears important in discussion of a teacher's quality of voice, but any accuracy of description might have implications for how people say resonant voice can be achieved. The resonant quality of voice and clarity of articulation depends on the whole vocal tract within the overall configuration of the individual (1.8.2; Appendix A, A4.1).

3.2.3   Measuring 'good' voice quality for a teacher carrying out their job in school

The voice qualities necessary in teaching (clarity, audibility, and sustainability) would not appear to be in one-to-one correspondence with the parameters suggested by Hollien and Zemlin. However, in this section I show links between the two sets of terms and ideas.

Notably, it is evident that audibility will be dependent upon the loudness or intensity of the voice (3.2.2.3). In addition, Hollien gives reminders about context; that is, how loudness is perceived and whether it is adequate and appropriate to the situation. His example is that what is suitable for an opera singer on stage would 'knock your socks off' if used in an 'elevator' (2000: 13). For the purposes of this study, that might translate into an example that a loud voice suitable for a teacher on the games field would be 'over the top' at a dinner party or possibly even in the classroom. However, normal speaking intensity may not be enough for some moments in the classroom or in any large teaching space.

In agreement with Hollien, some voice teachers suggest vocal intensity or loudness being appropriate to the situation. For instance, Shewell writes about the kind of problems where someone has a 'habitual loudness level', either inappropriately loud voice or conversely too quiet (2009: 199). She also refers to the importance of variety in loudness to maintain the listener's interest and without 'declamatory style' (2009: 200). Specifically actors are mentioned, but the point appears no less relevant to teachers who want to convey meaningful messages to classes, groups and individuals (1.6.1). There is also the consideration that the individual (teacher or actor) has to produce a loud voice without incurring damage to the vocal mechanisms. My own experience shows this is possible in applying the AT (1.8.1).

Also, resonance is seen to be important to the so-called carrying power of the voice (Martin and Darnley, 2004: 158). Shewell discusses 'oral resonance' and its connection with ensuring

the clarity of both vowels and consonants (2009: 180); this may be influential, although we should note that some writers of voice manuals often teach articulation of vowels and consonants in separate exercises. For example, Berry discusses work on vowels (1973: 59-61), having first suggested consonant exercises (1973: 54-59); in contrast, Rodenburg looks firstly at 'working on the vowels' and later 'exploring the consonants' (1992: 196 and 201). Martin and Darnley suggest that consonants help with 'audibility over distance'; they outline exercises used in their workshops for classroom teachers (2004: 172).

In the same way that audible voice seems to encompass both intensity and resonance, the clarity of voice required in the classroom may be ascribed to more than one measurable parameter. Pitch will be influential to the intelligibility that may be part of the clarity of a voice, perhaps also to its appeal as suggested by Hazlett, Duffy and Moorhead (2011) (3.2.1). As highlighted, resonance and appropriate loudness may play a part in how clear a voice is for the listener. Clarity could be to do with articulation and resonance which is dependent on the overall configuration of the individual at the particular moment (1.8.1).

In Chapter 6, my exploration with teaching professionals in a specialist laboratory (1.7.1) reports measurable aspects of voice quality: amplitude or pitch, intensity or power, resonance and other measures. The qualities are demonstrated as relevant to an affirmative answer to Research Question 3: that it is possible to measure improvement in voices meaningfully for classroom teachers, given that voice recordings (particularly the precision of digital recording apparatus) provide an appropriate means for this. As the listed voice qualities are now shown to interlink with the clarity and audibility needed in teaching, they may be used to ascertain whether the procedure being explored in the laboratory helps to achieve suggested voice quality. Perceptual evidence is also meaningful, although the main aim of the laboratory exploration is collection of evidence which is quantitatively measurable.

Possible noise or jitter in a voice is also part of the analysis of quality discussed by Hollien and Zemlin (3.2.1) with accompanying descriptions of harshness and breathiness in such circumstances. It is surmised that these may impinge negatively on the clarity and audibility of the voice. Particularly, breathiness or noise is associated with inefficiency in phonation which is said to result in 'a very limited intensity range' (Zemlin, 1998: 174-175). This can be interpreted as affecting the ability of the voice user (such as a teacher in the classroom) to make themselves heard.

At this point it is difficult to say a great deal about sustainability, the stamina required by an actor or school teacher. However, the notion of breathiness or noise means that '*air cost is extremely high*' (Zemlin, 1998: 174, italics in the original); this means that speaking is likely to be more effortful or that the speaker runs out of air for voicing. This would almost certainly have implications for vocal stamina. Also, Zemlin states that resonant movement set in train in an unforced way causes vibrations which will continue for some time, whereas a forced vibration comes to a stop abruptly when the influencing force ceases (1998: 294). This may give a clue to the further influence of resonance in maintaining audibility and enabling long periods of speech without incurring harm. Possibly related to this, McGlashen and Howard (investigating the use of amplification equipment as a means of help for teachers) suggest that it is generally desirable, where voice is unamplified, to create 'a louder voice with more acoustic energy for less muscular effort' (2001: 179). What appears necessary is a means of producing voice in this way.

3.3   SOLUTIONS TO THE VOICE PROBLEMS OF CLASSROOM TEACHERS

What solutions to voice problems are there which might enable teachers to achieve best quality voice? This question follows from my third research objective (1.9.2). Literature sources show three categories of solution: technological support (such as sound systems with

microphones to augment the voice), voice care, and voice training. Researchers have gauged the efficacy of these differing solutions; I analyse what is reported in the case of each proposal.

3.3.1 Technological support of teachers' voices

It is suggested that one way of minimising strain on the voice of a teacher is to adopt technology in the form of a sound system so that the voice is augmented electronically. Any sound signal, including the human voice, can be converted from acoustic to electrical energy so that amplification can take place by electronic means. Since the invention of the microphone in the 1800s and its growing sophistication in the 1930s, public address (PA) systems have become an aid to many professions. For instance, by the 1990s PA was widely available to assist clergy in churches and in the last two decades it has become more widespread, for instance in judicial courts and also in theatres.

3.3.1.1 Sound systems in the classroom

McGlashen and Howard say that 'amplification devices are underused' in schools and have a part to play in 'preventing teachers from getting voice problems' (2001: 178). Apart from benefit to teachers, it is desirable that some children (such as those with hearing difficulties) work within adapted environments, either with a loop microphone system that amplifies one voice through the child's hearing aid or with specialised sound-field equipment where the voice of the teacher (or the microphone wearer) can be amplified for everyone through sound speakers in the corners of the room. The latter ensures a teacher is heard throughout a room without raising the voice. Both forms of amplification can work through modern-day wireless radio microphones which have the advantage of not restricting the movement of the teacher.

Music teachers have been said to be in particular need of amplification assistance; Morrow and Connor suggest that with voice as their 'tool in trade' they may engage in prolonged voice use (e.g. in demonstrating techniques), often in circumstances of poor acoustics or high background sound levels with possibly no time 'to rest and recover' vocally (2011: 441). Morrow and Connor's small-scale study on how to address this through amplification in the classroom reports 'robust treatment effects' for music teachers and suggests that amplification 'may be an effective intervention' (2011: 446 and 441).

However, as an additional point, Morrow and Connor conclude that 'vocal breaks' (presumably time away from teaching interaction) are also important (2011: 446). This demonstrates that there are additional factors to consider in addition to the teacher being made audible. The point about vocal breaks indicates that any problems in sustained use of the voice are not addressed by amplification systems alone. Also, although music teachers are the focus of their analysis, prolonged or loud use of the voice has to be accounted for in the case of other teachers such as those teaching other subjects and any generalist teacher who works in a primary school.

3.3.1.2 Other factors in consideration of sound systems

However persuasive the evidence for technological support, it is beside the point to have amplification systems if classroom acoustics are not also considered (McGlashen and Howard, 2001: 183; Morrow and Connor, 2011: 446). Where acoustic conditions are poor, a voice may not be heard with clarity even where its 'loudness' is not a problem. Problems of acoustics in any space are associated with the loss of high frequency energy in consonant sounds that are 'critical for speech recognition' (Rosenberg and Blake-Rahter, 1995 in Jönsdöttir *et al*, 2002: 38).

It seems also that provision of amplification on a large scale is an expense that many schools are unlikely to prioritise, except in cases where there is proven need; that is, the pupil needs help to hear or the teacher has medically-recognised vocal risks. McGlashen and Howard agree financial cost is a 'main disincentive' to widespread adoption of sound-field systems (2001: 184). Also, this and general sound systems are not a viable overall solution because teachers work in so many different locations, including the outdoors.

Nor would widespread installation of sound systems address the underlying problem that teachers appear to experience. As Morrow and Connor acknowledge, there are a multiplicity of other factors including the amount and constancy of vocal use (2011: 446). Also, McGlashen and Howard refer to research (such as that of Martin, 1994 and Vilkman, 1998), and to information from speech and language therapists working with teachers: that 'without training there is a tendency for both males and females to use excessive intra- and extralaryngeal tension' (2001: 179). This reverts to McGlashen and Howard's recommendation of creating voice with more acoustic energy but less muscular effort (3.2.3).

3.3.1.3 Summary of the viability of providing sound systems

Although teachers may benefit from the adoption of technological sound systems, it is clear that such provision is no cure-all for voice problems. McGlashen and Howard acknowledge that several approaches should be adopted as 'preventive or remedial measures'; they appear to indicate voice training to help teachers in the way they produce voice (2001: 181). Morrow and Connor concur with the importance of 'educating future teachers' on voice matters (2011: 445-446).

In the theatre, present-day actors sometimes perform with amplification, perhaps dependent on the size of the theatre. Even in a small studio theatre I have seen a recent production where

actors utilised a sound system and I noted the space was less than that in a school hall. Yet, with or without these aids, drama schools continue to offer training to actors so they can sustain spoken communication and make their voices heard. It is true that not all actors might have formal training, but it is apparent that the large number of establishments which include voice in the curriculum is an indication that actors, in the main, are more prepared for vocal challenges than are teachers (1.8).

3.3.2   Vocal care approaches

On vocal care approaches, not only are there differing ideas in the research literature, there is also variation in terminology, some of which associate vocal care with training, some which separates the two. Researchers suggest calling these 'indirect' and 'direct' approaches, after nomenclature introduced by Carding, Horsley and Docherty (1999: 74). One commonly found term for an indirect vocal care approach is 'vocal hygiene' which is discussed in 3.3.2.1. Findings across studies are analysed before conclusions are drawn about voice care approaches (3.3.2.4).

3.3.2.1 'Indirect' and 'direct' approaches to vocal care and 'vocal hygiene'

A body of studies adopts the terms 'indirect' and 'direct' for different forms of voice care but the reported situation is far from straightforward, partly because of inconsistencies in the use of this and other terminology. Carding, Horsley and Docherty say that indirect approaches assume speakers make excessive demands on their voices through lack of awareness about 'healthy voice production' or because of other issues such as 'tension' and 'personal anxiety' (1999: 74). One presumes that use of the word 'tension' in this regard is related to 'anxiety' or stress. A direct approach may involve changing 'aspects of faulty voice production', although it may also include some indirect treatment. In this respect, Carding, Horsley and Docherty point out direct and indirect approaches should not be regarded as 'mutually exclusive' (1999: 74).

Reviews of voice care solutions have been conducted, for example by Ruotsalainen *et al* (2008) and by Hazlett, Duffy and Moorhead (2011). Where researchers label approaches as 'direct' or 'indirect', it bears examination whether they are using the terms as defined by Carding, Horsley and Docherty (1999). Ruotsalainen refers to the indirect approach as concerned, not with the 'voice production apparatus' but rather with 'intervention that is applied to other mental or bodily structures or functions' (2008: 558). Hazlett, Duffy and Moorhead (2011) make a distinction between direct and indirect approaches without defining the terms. They are relying perhaps on previous papers such as Duffy and Hazlett, 2004 and Ilomäki *et al,* 2008 to set the scene. However, whilst Duffy and Hazlett (2004: 64) reference Carding (2000), Ilomäki relates the term, 'indirect' only to 'voice hygiene' approaches (2008: 83). This demonstrates the use of terms is not consistent across different writers.

Further, some voice care approaches, particularly the indirect, may be designated as 'prevention'. Examples of studies where this occurs are Chan (1994), Timmermans (2004), and Bovo *et al* (2007). Again, there is some lack of consistency in the use of terms and approaches. The discussion is further complicated by the decision in Hazlett, Duffy and Moorhead to refer to 'training' as 'prevention' (2011: 182), whereas Carding, Horsley and Docherty (1999) refer to it as 'direct care'.

According to Ruotsalainen *et al* so-called indirect techniques incorporate: 'patient education, auditory training, and vocal hygiene programs'; this introduces other terminology and ideas (2008: 558). For instance, auditory training is referenced to Boone (1983) and Fawcus (1986). Fawcus suggests becoming a 'critical and discriminating listener' is 'probably the single most important therapeutic goal' (1986: 162).

It can be seen in the examples given that lack of consistency of terms is counterproductive to reporting findings from studies and giving a clear picture of provision. There is often a medical or therapeutic bias both to approaches and in the language used to discuss what is provided, for instance, referring to 'patient education' or to 'treatment'. Ruotsalainen *et al* refer to treatment when discussing work by Stemple, Stanley and Lee (1995) even though the research has been about 'normal' subjects, not patients (see 2008: 557). It appears uncertain what may be helpful to anyone who considers they have a non-medical voice problem.

Kovacic investigates knowledge of vocal care amongst student teachers in the Netherlands and concludes that a preventive education programme would be useful. The research does not recommend a specific programme, but indicates increasing 'teachers' vocal endurance' (2005: 96). Kovacic says that voice programmes are important and that 'the relevant authorities' should consider providing them (2005: 96). This will be analysed further in 3.3.3.

3.3.2.2 Findings on 'vocal hygiene' approaches

Roy *et al* (2001), Pasa, Oates and Dacakis (2007), Leppänen, Ilomäki and Laukkenen (2010), and Ferreira *et al* (2010) look specifically at 'vocal hygiene', and I examine these papers and also include previous work by Chan (1994) as part of this comparison. The term 'vocal hygiene', probably first used by Froeschels in a paper entitled *Hygiene of the Voice* (1943), was adopted by Chan to refer to a 'correct use of the voice to avoid hyper-function or too much muscular contraction of the laryngeal mechanism' (1994: 279). It might be that the meaning of the term has been changed from Froeschels' original work where he refers to the hyper-function as involving 'muscles in some of the upper resonating cavities' rather than just within the larynx (1943: 122). His study is based on cries of new born babies, yet the term he introduced there remains in wide general usage.

From Chan's study with teachers, it appears a vocal hygiene approach brings about some improvement in voice amongst the group being studied. The group receive information on vocal mechanisms and on vocal pathology (in other words, 'what can go wrong') (1994: 288-289). Teachers in the study also consider vocal 'abuses and their consequences' and the 'does' (including drinking more water) as well as the 'don'ts' of voice care (1994: 289). According to Chan, teachers in the study discuss useful ways to solve other problems of their teaching situation, such as how to get attention in class and how to maintain order. In this respect the programme indicates vocal hygiene can be a broad approach and this is borne out in practice by strategies reported by teachers in my survey (Chapter 5) and their suggestions for newcomers to teaching (Appendix H).

Ferreira *et al* consider the influence of 'abusive vocal habits', finding that most of the classroom teachers in their questionnaire survey report speaking 'excessively' (2010: 87). The researchers consider other vocal use factors such as loud voice and outdoor speaking, and they signal as particular problems: 'inappropriate vocal use', the amount of fluid intake (presumably too little), and smoking; they recommended that information about these 'risks' should form part of teachers' 'health promotion and prevention programs' (2010: 86, 90 and 91).

Strategies classed as vocal hygiene are included in the investigation of Roy *et al* (2001). The research considers measures such as: avoiding shouting or speaking over background noise; reducing 'total amount of voice use'; avoiding certain food and drink (2001: 294-5). The study compares different solutions, with contrasted provision for three groups: one provided with the vocal hygiene approach; one given 'vocal function exercise[s]'; and a third non-treatment group (2001: 286). The researchers report inconclusive evidence on vocal hygiene.

Vocal hygiene measures in other studies sometimes include advice on what to avoid eating and drinking, for example Chan recommends caution with 'excessive consumption of irritating foods' (such as those which are spicy) (1994: 289); and several studies suggest avoiding caffeinated drinks, and reducing those which are alcoholic. Roy *et al* conclude there should be more evaluation, particularly as the life-style changes in such an approach may require longer study for effects to become apparent (2001: 292). This appears to indicate a complex picture emerging both in what is suggested and in any researched provision.

As part of a vocal hygiene approach, hydration (drinking water) appears to be regarded as a prime strategy by many teachers themselves (Yiu, 2002). Roy *et al* also comment on maintaining fluids, especially water (2001: 295). However it would be misleading to regard this as a cure-all or prevention for voice problems. Drinking adequate amounts of water to maintain all body systems may have general health benefits but may not specifically intervene in vocal effectiveness. For example, Aronson and Bless refer to the more specific situation of professional singers and their hydration requirements (2009: 276). Hartley and Thibeault investigate 'systematic hydration' in respect of performers in many fields including where voice use is necessary; they review a range of studies, concluding that there is some support for 'a relationship between hydration and voice production', but that further investigation is warranted (2014: 652.e18). Aronson and Bless also cite research by Yiu and Chan (2003) where karaoke singers appear to be helped with vocal fatigue by a combination of regular vocal breaks and hydration, although 'whether similar results would be found in other singers' or 'with vocal rest without hydration' could not be determined by the study (2009: 246). Yiu suggests that 'clients need to be informed of the rationales' in any vocal hygiene strategy so they understand about following specific routines (2002: 223).

Pasa, Oates and Dacakis (2007) conduct a comparison of three groups: one receiving vocal hygiene training, a second given vocal function exercises (which originate in Stemple *et al,* 1994) and a third group designated as non-treatment. Both Pasa (2007) and Roy (2001) think the approaches might serve to prevent voice problems. The outcomes of Pasa, Oates and Dacakis, however, are slightly different to Roy's study in that voice hygiene appears to be relatively 'more effective overall' than the exercises (2007: 137). I discuss 'vocal function exercises' further when considering voice training (3.3.3.1).

Leppänen, Ilomäki and Laukkenen consider voice hygiene, voice training and voice massage treatment, described as a 'Finnish special massage involving respiratory, laryngeal, and articulatory muscles' (2010: 14). The voice hygiene is provided for all participants as a one-off three hour lecture; other provision is limited to two of the three groups, one of which receives voice training and another group given massage treatment. Results are gauged by self-evaluations from the student teachers taking part. Positive effects are reported by all groups, although less by those who experience only the voice hygiene approach (2010: 15).

Aronson and Bless, as clinicians, regard vocal hygiene as reduction of behaviours that might 'contribute to the cause or maintenance of voice problems', and that it might include voice rest (2009: 241). Such prescriptive rest is either 'complete/absolute', 'modified', or related to 'voice conservation' (2009: 240). They discuss that voice rest is controversial. Although rest may seem logical in medical (e.g. post-operative) circumstances 'based on what we know about healing characteristics' (2009: 241), this may not necessarily be effective intervention in non-medical instances, as shown in Alexander's case (2.4.1.2).

3.3.2.3 Studies which mention posture as a factor in voice

The study by Duffy and Hazlett (2004) shows work with student teachers in the UK, comparing two approaches. A designated 'indirect' group receives information and advice on vocal behaviours, lifestyle, diet and hydration, not dissimilar to the vocal hygiene ideas in other studies (3.3.2.2). Their 'direct' training incorporates some voice care education but also 'retraining on habitually negative vocal behaviour' (2004: 64). Apart from 'respiration, release of tension in the vocal apparatus, resonance, and voice projection', the focus also includes posture (2004: 65). There is a control group receiving no help; for other participants, help is over a period of eight weeks with initial checks and re-assessment at the end of the study (Hazlett, Duffy and Moorhead, 2011: 183). Findings of this study are complex. Although the indirect or vocal hygiene approach results in greater voice awareness amongst the group, there is no positive change in voice quality akin to that shown in the training group. The results for this latter group do not reach statistical levels of significance and it is not defined whether any particular aspect of the 'training' is most beneficial, so the effect of learning about postural considerations is unknown.

Timmermans *et al* (2011) conduct a review of research incorporating that by Duffy and Hazlett (2004) and including Simberg (2004), and Schneider and Bigenzahn (2005). Timmerman's own series of studies provides training for student teachers as a combination of indirect and direct approaches. One early study incorporates training which proposes 'basic skills' in 'relaxation, natural posture and healthy breathing' (Timmermans, 2004: 122); it is unspecified how this posture is achieved. A 2011 study by Timmermans indicates postural problems being identified and pointed out to participants. The training appears to lead to results of expanded voice range and to altered 'vocal behavior'; clear explanation of how the voice should be used (e.g. with techniques for pitching the voice) is said to have an impact (2011: 195).

Kooijman *et al* (2005) report a study of posture and voice quality, looking at underlying features with twenty-five Dutch teachers who have persistent voice problems. Judgements of posture are made by therapists and an index is created to link 'tension' and posture. The study uses teacher self-assessment of voice through the VHI (2.4.1.3) and also a clinical measure called the Dysphonia Severity Index (Wuyts *et al,* 2000). Dysphonia has been linked to hoarseness as a measure of negative voice quality (2.4.1.2). Scores on the 'tension/postural' index are said to correlate with both the VHI and DSI results across the study group (2005: 134).

Kooijman references a study by Schneider, Dennehy and Saxon, who report a way thought to improve postural alignment so it might assist 'vocal performance' (1997: 332). It is held that 'proper alignment is acquired through training postural muscle groups' (1997: 332). The researchers refer to posture as involving 'the mechanics of maintaining balance when forces are acting on the total body in various directions'; they reference Basmajian, 1978 (1997: 332). Although aspects of the explanation relating to the articulated structure are familiar, there is a problem if posture is not seen in the context of psychophysical use throughout the organism (1.8.1).

Also, the predominant force to be accounted for is that of gravity which is why Basmajian and De Luca define upright posture according to location of the line of gravity within the aligned musculoskeletal frame (1985: 254). In terms of the AT, this connotes optimal use in the upright (1.8.2), although allowing for different configuration in different activities.

The downward direction of the force of gravity does not vary, although posture is dynamic in the sense of weight shifting so that 'the pressure fluctuates incessantly' around a point in maintaining upright stance (Basmajian and DeLuca, 1985: 254). They demonstrate there is no

idea of posture as static, which is how sometimes it appears to be regarded. As further to this point, Coghill (1.8.3) (in Alexander, 2000: xx) suggests that 'in posture the individual is mobilized (integrated) for movement according to a definite pattern'.

Alexander describes improved use 'making for a satisfactory condition of co-ordination and adjustment' (Alexander, 2004: 153). Learning the AT is about learning to be the best shape that you can 'for the job', 'maintaining that posture during the activity' and then 'assuming the best posture for the next activity' (Door, 2003: 14); posture is therefore transitional throughout everyday activity, including vocalisation.

3.3.2.4 Conclusion

Research on solutions to voice problems ranges across differing contexts. Some investigate medical patients; for example, the review of Ruotsalainen *et al* (2008) includes four studies all featuring patients receiving medical care. In contrast, studies such as Pasa, Oates and Dacakis (2007) draw on teachers within the general population rather than in a medical context. Simberg *et al* (2001) and Duffy and Hazlett (2004) consider 'preventive education' for student teachers.

From the evidence presented, discrete vocal care approaches (sometimes termed indirect) have either unknown or limited effect. Whilst information on voice and voice care is likely to be helpful in raising teacher awareness (for instance, Chan, 1994), there is inconclusive evidence of benefit from vocal hygiene education with variable results emerging across different studies.

Where participants are encouraged to think about how to 'modify their vocal behavior' in the way reported by Duffy and Hazlett (3.3.2.3) they may be receiving a more direct training approach. What counts is whether an approach provides a practical answer to helping those

with vocal problems; no study included in the analysis so far has definitive outcomes for any approach.

Some researchers place emphasis on a relationship between posture and voice. This link is suggested as a basis for training (3.3.2.3), although the definition of posture may vary. What is meant will not coincide with psychophysical use as conceptualised in the AT (1.8.3), if it is focused only on so-called 'physical' phenomena.

3.3.3   Vocal training

There are a limited number of studies evaluating voice training for teachers, which may be simply because there is a limited amount of training available to evaluate, particularly in the UK. Any teacher with a voice problem seems to be provided with few options beyond specialist therapy which is likely to be in short supply and possibly inappropriate.

In the case of medical treatment of a voice disorder, therapy in a clinic can form part of what is offered; it is likely to be individually specified. This study takes into account the prevalence of therapeutic approaches but the main focus of my work is the general (non-clinical) situation affecting a majority of teachers experiencing problems, as discussed in later chapters.

3.3.3.1   Studies of voice training for classroom teachers

Some of my analysis (3.3.2.2), specifically Roy *et al* (2001) and Pasa, Oates and Dacakis (2007), refers to a voice training approach known as vocal function exercises from work by Stemple *et al* (1994). This training indicates a strengthening and rebalancing of 'the subsystems' of voice production (that is: respiration, phonation, and resonance, 1.5.1) and that this can be achieved through 'a program of systematic exercise' (see Roy *et al*, 2001: 287). Roy's study compares exercise for one group with another offered vocal hygiene instruction.

The exercise group report 'more overall voice improvement, as well as greater ease and clarity' in their voices (2001: 291). It is suggested that an exercise programme requiring only 'two short practical sessions a day' might be more accessible than the 'basic lifestyle changes' expected in vocal hygiene approaches (2001: 292). Roy queries whether any improvements can be maintained following a short exercise programme; something which at the time of the study was unknown (2001: 292).

In contrast to the 'voice-disordered teachers' included by Roy (2001: 286), Pasa, Oates and Dacakis have volunteers who are teachers drawn from a convenience sample of schools (2007: 130). Outcomes vary notably for the two different study populations. Pasa, Oates and Dacakis find the vocal hygiene approach is perceived by teachers to be more effective than the vocal function exercises. Teachers in the exercise group of their study report only a slight reduction in vocal symptoms and this is less than in the vocal hygiene group (2007: 137). Because no conclusive outcomes appear when studies like those of Roy and Pasa are compared (3.3.2.2), the work also raises the question of whether an approach for anyone with non-medical problems (likely for most of the participants in Pasa, Oates and Dacakis's study) can be effective for those with medical difficulties, and vice versa.

Specifically within the UK, the British Voice Association (BVA) offered practising teachers 'the opportunity to attend voice care and development courses' (Martin, 1994: 93). Those attending the course learned about: anatomy and physiology of voice; strategies for dealing with problems; and practical work on 'relaxation, breathing, resonance, pitch and projection' (1994: 93). Provision was country-wide and appeared to vary; and not all participants could be contacted for the follow-up questionnaire so that less than 50% responded, indicating the report and its results might be viewed with caution.

Roy *et al* (2003) linked provision of training with a research study of its effectiveness. Three approaches were compared: voice amplification; resonance therapy; and breathing exercises termed 'respiratory muscle training' (2003: 670 and 684). In the resonance approach, a therapist helped the teacher with exercises such as appropriate pitching of voice. Results suggested some improvement in voice when measured acoustically before and after help was given. However, as implied in 3.3.3, therapeutic help is in short supply which means this approach may not be feasible for teachers in general. The respiratory muscle training brought no significant changes in voice as measured through the Voice Handicap Index, but the efficacy of voice amplification was confirmed (2003: 670), a result to set alongside findings on sound systems in 3.3.1.

Hazlett, Duffy and Moorhead (2011) conducted a summative review of previous studies to report any impact of voice training. The major focus of the review was how to improve vocal quality, although the review also considers prevention of 'vocal deterioration' (2011: 189). Because there is contradictory evidence across the evaluated studies, no overall view emerges on vocal hygiene as a so-called indirect approach compared with the direct support of vocal training (2011: 189). Hazlett, Duffy and Moorhead question whether any evidence should be collected over longer periods.

3.3.3.2 Discussion

The approaches adopted in different studies vary. Hazlett, Duffy and Moorhead (2011) identify that it is important to have consistency of definitions and methodology if there are to be meaningful and valid comparisons. However, they do not call into question the basis of the training, either that which research groups study or that provided and evaluated.

3.4 COMPARISONS BETWEEN VOICE TRAINING IN TEACHING AND ACTING

Hollien (2000) identifies 'good' voice quality (3.2.1), which was discussed in relation to teachers (3.2.2). Similarly, Hazlett, Duffy and Moorhead (2011) propose that classroom teachers, as a group of 'professional' voice users, depend on achieving 'appealing' voice quality. Further consideration of voice training for the classroom therefore takes account of how 'good' voice quality might be achieved drawing on what is known of provision for actors. The analysis of drama training in the UK includes a brief historical perspective (3.4.1; 3.4.4) in order to throw light on present approaches and, overall, to inform ideas about what provision might be useful for classroom teachers.

3.4.1 Courses in drama schools within the UK

A certain amount can be ascertained about voice work in main UK drama schools from investigation of their web material on courses and programmes. Because this analysis has been conducted primarily as a review of such sources, it is included in this chapter.

Principal schools considered in this internet search include several established since the early decades of the twentieth century: the Royal Central College of Speech and Drama (referred to as Central), the Guildhall School of Music and Drama (Guildhall), the London Academy of Music and Dramatic Art (LAMDA) and the Royal Academy of Dramatic Art (RADA). In alphabetical order, others included in my analysis are as follows: Birmingham Conservatoire, including singing (now part of Birmingham City University, BCU, along with the Birmingham School of Acting); the Bristol Old Vic Theatre School; East 15 Acting School (which is part of the University of Essex); the Guildford School of Acting (incorporated in the University of Surrey); Mountview Academy of Theatre Arts in London (governed by the University of East Anglia); the Royal Scottish Academy of Music and Drama in Glasgow

(now known as the Royal Conservatoire of Scotland); and the Royal Welsh College of Music and Drama in Cardiff.

This survey therefore covers geographical locations across the country. All these schools/conservatoires offer university-accredited qualifications where voice is part of actor training provision. Many have Masters-level degrees in addition to undergraduate qualifications, for instance the Birmingham School of Acting where it is possible to gain an MA in Professional Voice Practice (2015).

The search revealed that the Alexander Technique is often part of drama school provision. This prompted me to circulate the schools by post or email resulting in some teaching staff answering questions about the AT within their course. I have used all sources to inform detail given in 3.4.2 and 3.4.2.1. I am aware that some universities offer degrees in drama and theatre arts; for example, the course offered by the University of Birmingham's (UoB) Department of Drama and Theatre Arts incorporates the AT. However, my survey has focussed on conservatoire training.

3.4.2 Examining the aims of acting courses at UK drama schools

Aims expressed by drama schools appear to incorporate a combination of skills work and application of these skills. Several schools use the term 'technical', such as Central having reference in postgraduate provision to 'the individual technical craft of the actor' (2015). The websites of different schools show that the underlying structure within such technical studies is the focus on 'movement' and 'voice' often taught as separate topics at least in the early stages of training, particularly in undergraduate acting courses. For instance, Year 1 modules in Acting, Vocal and Movement Skills are part of an undergraduate BA Honours degree at the Royal Welsh College of Music and Drama (2015).

3.4.2.1   Is there any common basis to the approaches in drama schools?

It appears, therefore, that many courses are structured with an initial separation of 'movement' and 'voice' work; it may be this is considered a necessary feature of fulfilling the aims in any individual school. The AT is evident in the work of all listed schools, with the exception of Central.

From the internet research carried out, there is apparent variation in the way the AT is linked to other parts of the course. Available information appears to show the AT is more likely to be associated with movement than voice studies. LAMDA (2015) includes the Technique within movement classes, in that AT staff are listed as part of the Movement department. This seems common to a number of schools; for instance it occurs at the Royal Welsh College of Music and Drama (2015), although the course there refers also to 'vocal quality' in the teaching of AT sessions and scrutiny of the course overview shows that voice and movement are combined in some assessment tasks.

Variations across schools are perhaps unsurprising given that there are different interpretations of the AT with no clue in its name as to how it might be applied (Staring, 2005: 333) (1.8.1). At Mountview (2015), it is less clear cut that the Technique is limited to movement studies, as occurs elsewhere. For instance, the AT is listed as a generic aspect of the undergraduate course across movement, acting, and voice work. In postgraduate work, for example the one-year course at Mountview, the AT is associated with voice skills.

In 2012 – 2013, at the time of writing to staff in particular establishments, RADA provision in AT classes was said to help students gain a basis 'for interpretative work' and to develop 'the resonance and range of each student's voice'. At the Birmingham Conservatoire, individual

and group teaching by Alexander specialists was and continues to be offered for musicians and singers, although this does not seem to extend to BCU's School of Acting (2015).

Summarising what I have found out from internet sources and direct correspondence with staff, it is apparent that the AT is offered in the drama schools in question, yet its perceived focus varies considerably. It is often not related specifically to voice work and it is difficult to form a complete picture or one that is totally up-to-data because there are constant shifts probably brought about by a range of factors. For example, Carey refers to Central and RADA having 'a very long but inconsistent link' with the AT (2010: 6). There was a report in *The Stage* that the AT provision at RADA was to be reduced in 2010. This appears controversial given that previously 'RADA has made an extraordinary commitment over the years', with the AT as 'the foundation of their training' (Hemley, 2010). Checking detail of current provision may be worthwhile to future exploration, although the important thing is how teaching remains true to the psychophysical nature of the AT and its approach (1.8.1) rather than the perception of 'bodywork' (Carey, 2010: 6) or 'body' learning (Shewell, 2009: 262).

3.4.3   Consideration of approaches adopted by key voice teachers in the UK

Approaches which I have analysed, as advocated by present-day actor trainers, appear predominantly based on exercises; for instance: breathing exercises, relaxation (sometimes linked with breathing exercises), and exercises to improve clarity. This means components of voice (breathing, phonation, and articulation) are developed separately.

There is a question to be raised about an exercise-based approach. Firstly, if aspects of voice are dealt with as discrete elements, it may not be apparent how there is to be the necessary integrated activity (1.5; 1.8.4), for example when speaking in class. Some of the voice manuals being evaluated show 'recombining' in later activities. For instance, Rodenburg

suggests 'putting it all together' after working on 'lots of different aspects' (1992: 213); and Berry gives a section on 'the whole voice' (1973: 76) and work on 'your voice in action' (2000: 123).

However, it is apparent in the view of psychophysical use conceptualised within the AT that a learner will approach any work with their habitual use (1.8.2; 1.8.3). Exercises, which are not problematic in themselves, cannot be beneficial if carried out with habitual misuse. Alexander's view was that such an approach will not change 'the present condition' of the individual 'since all exercises will be conducted under a primary misconception with regard to the use of the muscles involved' (1996: 126). His teaching, borne out by the learning experiences of myself and AT colleagues, is that 'the first effort must be directed to the exercise of the conscious mind' (1.8.3): establishing principles for the way activity is approached which Alexander called a process of re-education (1996: 124-126). Otherwise, unless the learner knows how to prevent it, his or her way of going about activity will be misuse (1.8.2).

It is useful to bear in mind these points about an exercise approach to voice training in consideration of a study by Walzak *et al* (2008) who evaluates work with student actors. In the programme, elements of the voice (for instance, breathing) are trained separately and the researchers found that many acoustic measures were not changed after training, and some measures that did change were 'negative changes' (2008: 301 and 306). The research took place in Australia but the training was based on approaches advocated by UK voice teachers, Berry and Rodenburg.

Walzak's findings add some weight to the point I put forward about re-education. In the research report, she discusses how the training incorporates feedback to the students based on

'outcome' rather than 'feedback on technique' (2008: 301). From this, it seems that exercise-based training may focus on particular results rather than equipping individuals with the means to achieve improvements. The study includes several detailed acoustic measures and shows how these contribute to the conclusions drawn. Walzak *et al* suggest further investigation into specific techniques, noting the need for 'more evidence-based training methods' 2008: 300). I concur with these ideas, particularly as related to my exploration based on the AT (Chapter 6).

Inconclusive and varying study results were reported by Roy *et al* (2001), Pasa, Oates and Dacakis (2007), and others (3.3.3.2) and may indicate outcomes in training depend on the individuals who take part. There is the influence of use to take into account also, in a way that few studies appear to do. One improvement in gauging the efficacy of any training would be to utilise the measures of voice quality discussed in 3.2.1 so that assessment is independent of individual perceptions. It is noted that Walzak *et al* (2008) use measures of fundamental frequency, pitch, and other acoustic criteria in a promising manner in their research.

3.4.4   Drawing on what is known of previous approaches in voice training

Considering what is known of current approaches in voice training, and particularly the predominance of exercises, it would be useful to know whether this has always been the case. In looking into the origins of drama schools at the turn of the twentieth century, it can be shown that Elsie Fogerty, as first principal of Central (1.3.1), began to move her teaching away from a formalised delivery of speech common at the time that the school became established. Darnley talks of the way the 'mechanical' gestures predominant in nineteenth century elocution methods have given way 'to a more realistic colloquial approach' (1994: 2).

Fogerty's ambition was 'to develop a simpler and more effective speech in the theatre' (Darnley, 1994: 33). According to Inchley in her discussion of 'cultural privileging', it may have been many decades later that actors really came to 'sound natural' because of the predominance of Received Pronunciation, (2015: 52). It is helpful to my study to consider the idea of 'natural' in terms of avoiding false theatricality (Berry, 2000: 111). Avoiding theatricality in the sense of genuine messages reaching the listener, appears relevant to the communication of a teacher. As Shewell suggests a 'declamatory style' may not be as effective as quiet 'subtle' variation (2009: 200).

It seems that there is evidence of changing approaches in actor voice training in the time of Fogerty and since. To an extent, Fogerty's approach seems to promote voice as an integrated activity, as can be shown for her work at Central over a long period (Susi, 2006). For instance, Fogerty (1923) came to define prose as ' "setting forth our meaning as simply and clearly as possible" ' (Susi, 2006: 46). Considering this quality of vocal communication, which coincides with the requirement of any classroom teacher, there appears an intention in Fogerty's approach to ascribe 'means' in her teaching rather than focusing only on the desired end. It might be that this contrasts with exercise-based approaches which otherwise make outcomes their predominant focus (3.4.3).

3.4.4.1 Thurburn's work alongside Fogerty at Central

Gwyneth Thurburn (1899-1993), who trained with Fogerty and became her successor as principal at Central, remembered that movement 'was integrated with Voice' in their teaching (Darnley, 1994: 40). Fogerty also worked with Dr H Hulbert, who was responsible for anatomy and physiology as background teaching in the early days of Central; this helped Fogerty and Thurburn 'to find new methods of movement and voice training for actors' (Susi, 2006: 23). Such historical detail suggests that integration of activities during the learning

promoted in the early 1900s was seen as an advantage and this implies that greater separation of movement and voice in any drama school may have evolved later.

There is also evidence of the proposal at one point to introduce the Alexander Technique as part of provision at Central. Thurburn, when she took over from Fogerty, was said to be in favour of its inclusion. Susi records that on financial grounds this did not go beyond a small trial in the 1950s (2006: 107). This trial, however, may have influenced other drama schools taking up the AT. In Chapter 6, I consider other AT studies as background to my further exploration.

The perceived benefit of the Technique was also apparent from the links which F.M. Alexander had with well-known actors of his day. At the turn of the twentieth century, Henry Irving and Herbert Beerbohm Tree, his actor son who established RADA, as well as Viola Tree and Lily Brayton are thought to have had links with (and perhaps teaching from) Alexander (Staring, 2005: 75). Detail of others who worked directly with Alexander are unconfirmed in some instances, but Staring refers to 'nine letters of tribute written by famous London actresses and actors'; these were printed in a flyer published by Alexander around 1910 (2005: 119). The Technique continues to be provided in drama schools throughout the UK, but is little used in training for classroom teachers.

3.4.5   Applying conclusions on actor training to helping classroom teachers

The integrated nature of the training once offered at drama schools such as Central fits the integrated nature of voice as put forward in this thesis (1.8.1). It may be that specialisation in technical movement skills in the more physical forms of theatre which involve dance, acrobatics, clowning, and aerial work has diverted attention from an integrated approach, perhaps leading to even further separation of movement and voice teaching in recent decades.

Whilst this may be necessary to some extent, the key consideration in this study is what impact there may be in compartmentalising voice training when, at the time of teachers such as Fogerty and Thurburn, movement and voice were not unduly separated. If this integrated teaching approach would still be appropriate to actors, presumably this might hold also for classroom teachers (3.4).

The AT has been part of drama school provision for an extended period therefore I propose further exploration based on the school of thought on the Technique with which I am most familiar from first-hand experience. My understanding includes the view that voice is integral to all other activity of the human organism and that an account of how the voice works is founded on the anatomy and physiology of the integrated psychophysical mechanisms (1.8.2). For these reasons, I raise a question about introducing voice training for classroom teachers with the AT as its basis, given the teachers are no less in need of an integrated approach than actors. It is also relevant to suggest it would be valuable for educationalists in general to gain an understanding of psychophysical use.

3.5   CONCLUSION TO CHAPTERS 2 AND 3

This chapter and the previous one demonstrate from analysed research that classroom teachers have voice problems, often more than those experienced by other professions. There is evidence of the nature of these problems affecting voice quality and sustainability. Also, this chapter bears out the idea that voice training may offer a solution to teachers' voice problems, but demonstrates that the situation is complex and that there are a number of factors to be taken into account.

There are indications from review of varied sources within this chapter that training based on AT procedures could be a viable way forward. The basis of this approach in the concept of use

is detailed in 1.8.2. The voice training under consideration in Chapter 6 offers a practical procedure that may be a means of addressing the voice qualities that a teacher needs in their role. The qualities defined in 3.2.1 are used to assess the intervention when it is explored in the laboratory.

Preceding that exploration, in the light of existing research, I ascertain what further evidence would be informative. On this basis, I present my own first-hand survey of classroom teachers and student teachers and give an account of that in Chapter 5. Chapter 4, as a description of the overall methodology of the thesis, confirms how this review has led to my original research study and how that was conceptualised and carried out.

CHAPTER 4

METHODOLOGY

4.1   INTRODUCTION

The aim of the study, being to consider how classroom teachers can be helped to cope with the demands on their voices in a teaching career, requires the gathering of evidence on a current understanding of teachers' voice problems and on ways forward towards a solution.

The research questions previously identified (1.9.1) provide a framework for the study within my overall design. The questions are:

Research Question 1 Can attention to improving use (as defined in the Alexander Technique) help classroom teachers with their voice problems?

Research Question 2 What are the perceived vocal demands on UK teachers in the classroom currently?

Research Question 3 Is it possible to measure improvement in voice quality meaningfully for classroom teachers?

Research Question 4 Can improvement in voice quality be demonstrated by the adoption of a procedure based on the Alexander Technique?

There needed to be further evidence to support the hunch from my own experience of teaching that the scale of voice problems might be wider than generally recognised (1.1.1). Following initial consideration of what is said in education periodicals about the voice of classroom teachers, I corroborate in the wider literature that teachers appear more likely than other professions to experience voice problems in the course of their jobs and I examine what

those problems seem to be. Analysing research into the extent and type of teacher's voice problems (2.3; 2.4) led to consideration of studies into possible solutions (3.3).

This chapter explains and justifies my methodology: what I did to find out more about the topic in the light of what was already known and why I did so in a particular way. The chapter makes explicit the research paradigm; that is, my rationale and its influence on the choices I made in deciding what kinds of data to collect. It also shows why I chose, within my rationale, particular methods for gathering and analysing this data; for instance conducting a teacher survey through a questionnaire and interviews shown in Chapter 5, and also exploration of voice and postural configuration shown in Chapter 6.

The multi-strategy or mixed methods approach which I introduced as pertinent to the study (1.9) provides an overarching paradigm which unites my view of the problem, the questions raised, the methods for data collection, and my discussion of outcomes. As Punch identifies, questions in any research come before methods (2014: 7); having formulated questions, it is possible to identify as objectives what actions or methods might address those questions (1.9.1; 1.9.2). All of this enables pursuit of the research aim, formulated or 'driven by some specific problem to be solved' (Robson, 2011: 62 – 63): in my case that many teachers seem to be vocally challenged within their classroom role.

Cohen, Manion and Morrison indicate that single-method approaches may provide limited evidence for studying human behaviour where mixed methods have advantages (2011: 195). The significance of a mixed methods approach is apparent also in the term 'multi-strategy', used by Robson to indicate collection of evidence, as in this instance, through different means because differing forms of data are required (2011: 25 and 164). Also, the key concept of use defined by the AT is influential in this study (1.8.2). It is therefore fundamental that the

paradigm and choice of associated methods accommodate the fact that human voice is a psychophysical phenomenon, not just assessed in a singular frame of mechanical or psychological. An appropriate research design was required for collection of appropriate broad forms of data (1.6.1; 1.7; 1.8.4).

4.2 DETERMINING RESEARCH METHODS MATCHED TO EXAMINING THE PHENOMENON OF VOICE

In Chapter 1, I consider the phenomenon under scrutiny (the nature of voice, 1.5) and discuss how it can be studied and assessed (1.6; 1.7.1). As suggested (4.1) such considerations were influential in deciding the data I wanted to collect. The research questions, mainly the first, second and fourth, encompass the collection of original data. Different kinds of data were collected by a variety of research methods in relation to all the objectives (1.9.2). I confirm detailed reasons for conducting each part of the research in a particular manner which accords with the parameters of my study and takes account of the individual's experience of their voice (1.6.1)

4.2.1 The background influential in shaping this research

In practice, voice can hardly be differentiated from speech even though they can be separately defined (1.5). It comprises the three interconnected elements of breathing, phonation, and articulation, which should be understood as a function of the whole psychophysical organism (1.8.3). Therefore, this research is based on an account of voice as a physiological and anatomical phenomenon and on its psychophysical nature.

It is also important to acknowledge the perceptual nature of voice quality which is implicit in our experiences of voice, both our own and that of others given that vocal skills fulfil a social

purpose. This aspect has been stated as one I am unable to pursue to any extent in this thesis (1.6.1), even though it is of note.

4.2.2. How voice can be studied and assessed

As indicated, voice as a complex phenomenon can be studied within a range of fields, each distinctive in its own right (1.6). I draw on several of these areas of study, notably voice science, voice teaching and therapy, to form ideas of criteria that can be useful to assessing voice. As well as its recognised perceptual traits, it is also possible to identify measurable elements of voice quality (1.7). Examples are the perceptual labels of pitch and loudness for which there are corresponding objective measures of frequency and amplitude (3.2.2.2; 3.2.2.3).

4.2.3 The kinds of data that help define voice

Two kinds of data are possible: the voice can be defined by its qualitative characteristics of pitch, loudness, et cetera; alternatively these and other attributes can be defined acoustically and measured quantitatively; that is, independently of the listener. The latter kind of measures may be quantified, using recognised forms and units of measurement such as frequency measured in hertz and loudness, known as amplitude. The decibel scale is a measure of loudness relative to sound pressure levels (dB SPL, abbreviated to dB) (Behrman, 2013: 28). Both the decibel and hertz are named after scientists who were influential in the field of acoustic science in the nineteenth and early twentieth century (2013: 28 and 21).

Qualitative assessment of the voice (1.7) has been formalised by clinicians. This signifies that the data they gather is of a perceptual origin, that is, they gain it by listening, but seek to objectify by using agreed clinical descriptions of voice quality, in order that they can

systematise their judgements in diagnosis and treatment (Kreiman and Gerratt, 2000: 73 and 77; Tveterås, 1992: 145).

Listeners in general have a view on the voice they hear, as to whether it is pleasant to listen to. Pleasantness is acknowledged as 'attractiveness' of voice in one study, even though the researchers recognise that this 'does not cover all aspects of voice quality' (Zuckerman and Miyake, 1993: 119). Most of us as speakers also form a view on our voices (1.6) and no study of voice of the kind I am conducting can be complete without taking account of this aspect in relation to our experience of using the voice as a teacher.

It has been shown that it is essential for the teacher's voice in the classroom to have clarity and audibility and that she or he is able to sustain its use throughout a teaching day (3.2.2). I have drawn on different views to demonstrate how this has been recognised from the earliest days of formalising the role of the 'schoolteacher' (H.M.S.O, 1921); also, that it is expressed by those concerned in their training around that time (McAllister, 1938 and 1941). Audibility and 'definition' or clarity are acknowledged still by voice teachers today (Martin and Darnley, 2004: 160). Whereas classroom teachers themselves and voice trainers express their ideas on perceptual voice qualities as qualitative views, voice scientists propose quantifiable criteria referred to as acoustic measures and I have taken account of what is written by Hollien (2000) and by Zemlin (1998) (3.2.1).

4.3 RESEARCH QUESTIONS AND OBJECTIVES WITHIN THE METHODOLOGY OF THE STUDY

Moving forward in this research on teachers' voice has required furthering my understanding of the phenomenon that is voice and creating a connected pathway of investigation through the study. From the broad area of research identified at the start, I focused on a specific topic

and framed research questions so as to proceed to data collection with related field questions (after Punch, 2014: 59).

My research questions define the area of research more specifically (1.9.1): they help set the boundaries or scope of the research; they give direction to the gathering of evidence via identified objectives (1.9.2); and the questions can be applied after evidence collection to help show whether the project has reached 'credible answers' (Robson, 2011: 58-59).

In order to set out background to the investigative work of the survey and the exploratory work on voice quality with a procedure based on the AT, Research Questions 3 and 4 are of prime concern. In considering all questions in turn (4.3.1 to 4.3.4), I ascertain the different kinds of information that could be gathered to answer them, the kind of information I actually chose to collect for each, and the rationale of these choices. Further detail is then given to justify how I proceeded to collect specific data, how and why that was valid, and how the data analyses also match the presented rationale. I consider Research Questions 2, 3 and 4, showing how they prompted the analysis of other studies on voice problems, as well as instigating original data-gathering. Finally, the rationale is considered apropos my first (main) research question.

4.3.1 Research Question 2: What are the perceived vocal demands on UK teachers in the classroom, currently?

It is not possible to answer this question fully from the literature because of the shortage of evidence in the UK. Studies conducted elsewhere give a picture of what may apply for classroom teachers in the USA, Sweden, the Netherlands, Spain, Brazil, and elsewhere, as noted in Chapter 2. Some research contributes to knowing what may apply for teachers in the UK, but only partially.

A comparative lack of research amongst teachers in the UK means it was useful to begin a first-hand investigation into the topic with my own survey of classroom professionals in the UK Midlands. Asking them about vocal demands, any problems and any available support meant I was able to gather qualitative views on UK teachers' voices. This was possible using a questionnaire with both classroom teachers and student teachers. Evidence was also collected in the form of short case studies and some interviews. I was able to draw informally on a personal voice diary to inform my collection and interpretation of data. The survey therefore provides further clarity of the vocal demands on UK teachers in the classroom currently (Research Question 2) taking the perspective of teachers and student teachers themselves.

4.3.1.1 The information gathered to address this second research question

Asking teachers in school and student teachers in university directly about any possible voice problems provided an accessible form of data gathering within my study. Such a survey had the advantage that it provided both numerical information about the scale of the problem and also qualitative information about what this meant for the teachers and student teachers themselves as their lived experience. This approach and the collection of data in more than one form appear useful because they help take account of voice being a complex phenomenon.

It is important that this study combines different forms of data (descriptive through both numbers and words) because research, as well as investigating an area of interest or an issue, can play a role in promoting change and this requires consideration from all perspectives. It is an intention in this research to widen what is known about teachers and their voice problems as a three-fold influence on the situation. Firstly, I want to broaden my own knowledge. I wish

to clarify whether the hunch I formed when working as a deputy head teacher is borne out by further exploration.

Secondly, I want to share feedback with teachers, acknowledging their problems as part of what is found in the research, so that they can see potential for the situation to change. For instance, it seems that a teacher may think they are 'on their own' in this situation. I have come across teachers who find that their only course of action for a voice problem is to ask for medical help. This may seem unsatisfactory for two reasons: one is that they may not regard their problem as medical; for instance, it goes away in school holidays. In other words, they seem to contain any problem by reducing demand, even if the problem is not fully resolved (5.5.2.1). The case study of Jane which I present is one illustration of this occurring (5.5.1).

The other reason that the situation perhaps seems unresolvable to some teachers in that she or he may find the medical profession unhelpful; for instance, in the case of someone who receives no help when mentioning vocal fatigue, as I will discuss in Chapter 5. In such circumstances it is not surprising that there is an idea amongst some members of the teaching profession that voice problems are inevitable (da Costa *et al*, 2012) (2.4.2).

Therefore, thirdly, I would like to help teachers find resolution of their voice problems. There is a question of what other help is available if what teachers experience are not medical problems and the medical profession is necessarily only concerned with organic (structural) or pathological problems. Where it emerges in the early stages of my study that there is little other help for a teacher to turn to (for example, in the case of Jane, 5.5.1), it is an issue for the profession, but also in the wider role of employers (1.1.2), that this is the case for the many classroom teachers who appear to be in need.

4.3.1.2 Describing and defining voice problems

Studies have often been carried out by voice scientists, phoneticians or clinicians (2.3.1.1 to 2.3.1.4). This has affected the format of questionnaires used to elicit information about what problems teachers experience; the framing of terms has inevitably been influenced by these professional contexts.

For instance, a term such as hoarseness is classified by clinicians within the pathology of 'acute or chronic laryngeal infection or irritation' (Kreiman and Gerratt, 2000: 77). Yet taken as a lay term or general description, hoarseness probably does not have medical connotations in many instances (2.3.1.4; 2.4.1.2). Where people do experience laryngitis, they may describe the discomfort of a sore throat as a prevalent symptom (NHS Direct, 2015); one first-hand description of suffering tonsillitis emerges in a teacher interview (Appendix D).

However, discomfort can be used as a description outside the medical context, for example, when the throat is dry. What I am indicating is that it could create difficulty to use some clinically-orientated descriptions when addressing a questionnaire to a general sample of teachers who may only know lay terms and misunderstand what is meant by the questioner. Without knowing the basis of the answer to a closed question, teachers' answers may be misinterpreted when the questionnaire is analysed. It will be evident in the format of my own questionnaire that I continue using similar prompts but interpret the responses with caution; in my subsequent evaluation (Chapter 7), I make suggestions for further use of open questions to obviate this.

It is relevant to my exploration in the laboratory, that one interpretation of hoarseness suggests it may be judged quantitatively in extracting data from analysis of a voice recording. The measure is known as the harmonics-to-noise (H/N) ratio (Yumoto, Sasaki and Okamura,

1984) (6.5.6.4). However, studies presented in Chapter 2 show such a form of measurement may not be widely utilised within voice studies, clinical or otherwise.

For some problems, such as vocal fatigue, it is possible to collect information about people's perceptions of their fatigue, but it has been defined also as a physiological condition. Scientific work on muscle fatigue suggests the possibility of an assessment through its 'observable physiological effects' (Boucher and Ayad, 2008: 333) (2.4.1.4).

One questionnaire instrument used in a number of studies is the Voice Handicap Index (VHI) which asks questions in three main categories: the physical, the functional and the emotional (2.4.1.3). The results of using this measure with groups such as teachers or student teachers are usually dealt with in quantitative form, even though the prompts themselves are qualitative statements of participants' views on what applies to them. The use of numbers to present data from the VHI does not ascribe the individual meaning of those who have responded (2.4.1.3).

The categorisation system of the VHI, from my perspective, raises a question as to whether the three categories are separable and if so, what this might achieve in helping someone with a voice problem. Where a teacher describes their problem, they are likely to be talking about its impact on their lives and work. As such, teachers may link together what the VHI separates as 'physical symptoms' and the so-called 'functional' which describes how the problem affects them. Also, anyone's response to what they experience is termed 'emotional' in the VHI, making it appear separate to the problem itself (Jacobson e*t al*, 1997: 70). This runs counter to any explanation of problems and the integrated means of addressing them offered by the AT (1.8.2).

4.3.1.3   Limitations on the different kinds of analyses and descriptions

One of the main limitations of descriptions for voice problems (such as hoarseness) is that there may not be a clear definition and this may impact on situations where someone without medical knowledge is being questioned. In general, because many terms are used by clinicians, it may not be recognised that many teachers appear to have problems of non-medical origin and that specification of these may require different terms.

As shown above, a purely qualitative or perceptual description of vocal fatigue or hoarseness may miss the measurable physiological evidence which is now understood by scientists. The qualitative descriptions, such as those employed in the VHI, could be taken to serve a useful purpose in evaluation of perceived problems, but deal with it on a numerical basis.

4.3.1.4   The information I choose to gather directly from teachers

I gathered information on voice problems directly from teachers in both a questionnaire survey and some interviews. I chose to collect data in these ways because it meant that I did not have to restrict the type of evidence to only that which is numerical or only that which describes in a qualitative way. I could collect and compare information of both kinds to help gain a wider view of teachers and their voice problems, possibly of a non-medical nature.

4.3.2   Research Question 3: Is it possible to measure improvement in voice quality meaningfully for classroom teachers?

There are various implications in the classroom teacher's need to have a clear and audible voice that she or he is able to sustain over considerable periods of a school day in a variety of demanding situations. In practical terms, for instance, a teacher is likely to want to avoid problems such as hoarseness, suffering discomfort or vocal fatigue, as these may affect clarity and sustainability of voice and be a disadvantage to fulfilling the role.

Drawing on evidence of identified voice qualities demonstrates that there are at least two ways of delineating them. They can be described in perceptual terms and this can be according to sensation ('my voice feels weak' or the 'feeling of lump in throat') or impact (described by: 'I am unable to sing' or 'I cannot project any more'). These are actual responses from individuals in my survey (5.5.2.1). Such analysis may not consider the wider aspects of a teacher's role in engaging pupils and sustaining their interest. It could be said that this study does not take account of those, but the teacher's success in them is founded on the clarity and audibility of voice that has been described. Those responding in the survey made suggestions for newcomers to teaching such as: 'use quiet voice', 'use good intonation' and 'use your voice within a comfortable range'; participants also commented on ways of communicating in class without the voice (Appendix H). Although, I recognise the latter from a teaching perspective, it is not within the scope of this research to look at areas of study such as paralinguistics.

Voice clinicians define two factors in their work: pathological problems relating to any 'organic' or structural factor; and any phonetic factor relating to formation of speech sounds. In conducting specialist assessment, phoneticians rely on perceptual aspects; for example, they may consider perceptual quality of phonation at the larynx or they may want to account for perceptual quality, both in relation to the larynx and arising in the tract above the larynx (Laver, 2000: 37-38). Such detail, important in clinical contexts, appears relevant to only a few of the professionals responding within my survey.

Alternatively, voice problems may be considered within the descriptions and therefore the range of quantitative measures. In addition to frequency and amplitude, examples of this are the measurable harmonics-to-noise ratio in a voice and that vocal fatigue can be objectively assessed (2.4.1.4).

4.3.2.1 Voice quality defined and described in different ways

As well as the clinical information described, finding out about the qualities of voice needed by the classroom teacher requires a comparison of information from a range of sources: voice science, voice training and asking teachers themselves.

As shown in Chapter 3, voice teachers talk about the quality of a voice in terms of pitch and loudness, and they may use a variety of other terms, such as tone and resonance. For example, Berry relates improved, 'richer' tone to frequency or pitch (1973: 32, 18) (3.2.2.1). On resonance, Houseman describes the sound being enriched and strengthened by vibrations in the throat and mouth (2010: 162) (3.2.2.4). There is no suggestion by voice teachers that quantitative measures will be collected in their work, other than as described by therapist and voice trainer, Shewell (2009).

Voice teachers may refer to projection of voice or its carrying power, including taking account of the space in which one has to speak (Rodenburg, 1992: 223-224; Berry, 2000: 110 and 111), Martin and Darnley, 2004: 17) (3.2.2.4). Classroom teachers too appear to 'measure' their voices by descriptions such as projection, when they are asked about any voice problems or their wish to improve their voice (5.5.6.1). Projection has been discussed in relation to the power of the voice (3.2.2.3), but also as linked possibly to resonant characteristics (3.2.2.4).

Voice scientists turn to measurable aspects of voice such as frequency and amplitude; and they look to define the characteristics of resonance in the pressure or sound wave (Behrman, 2013: 44-46). Zemlin describes resonance as a characteristic of matter being 'energized' so that the matter vibrates 'at its own natural frequency' (1998: 294) (3.2.2.4).

Scientists and clinicians may refer to the harmonics-to-noise (H/N) ratio in a voice which can be calculated from data in a voice recording, and two aspects, jitter and shimmer. Jitter relates

to irregularities of pitch; shimmer defines the variability in amplitude (Behrman, 2013: 181). Whilst these are complex phenomena, when measured they give indications of voice quality or any improved voice quality and assessment is straightforward to achieve with computer software. The H/N ratio in a voice has been shown to correspond to hoarseness; calculating its value statistically is preferable to perceptual ratings of hoarseness (Yumoto and Gould, 1982). In summary, the quality of a voice may be defined by the listener or by the speaker, or it may be noted through measurable criteria.

Sometimes voice teachers and classroom teachers themselves, refer to the pace or rate of speaking. For instance, in her interview Claire speaks of adjusting the pace to suit pupil needs (Appendix C). Hollien talks about the prosodic elements of voice and suggests that 'good' quality demonstrates a 'slower than average' rate of speaking' (2000: 20). Simplistically, pace might be considered quantitatively by taking the timing of specific sentences, but quality in this measure for someone like a teacher may have greater complexity than this. For instance, it could be necessary to have regard for intelligibility of what is said and how it can be understood in the context of communication, and for these reasons it is not a measure of quality pursued in this study (1.6.1).

4.3.2.2 Measurable aspects of voice quality and other aspects of voice production

Frequency or pitch and amplitude or loudness can be measured quantitatively. With the appropriate computer software (e.g. an online facility called Praat; see (see listing for Boersma and Weenink, 2011), the H/N ratio, jitter and shimmer can be extracted from the data in a spectrogram, so allowing for quantitative analysis.

Perceptual attributes of voice are 'measured' by listening and there are complicated rating scales used by clinicians; for example, a formulated measure of voice disorder is the DSI

(Wuyts *et al,* 2000) (2.4.1.2) which considers hoarseness in relation to other aspects of voice judged by a therapist or clinician (3.3.2.3).

Review of literature reveals that posture is sometimes considered in connection with voice approaches, for example in the studies by Duffy and Hazlett (2004: 65) and Kooijman *et al* (2005); the latter incorporate perceptual judgement of posture to create 'a tension/posture index' (2005: 134) (3.3.2.3). We know that F.M. Alexander conducted detailed observations of voice and posture reporting qualitative 'measures' of voice and use in his book, *Use of the Self,* 1985 (1.8.2).

In the USA, a teacher of the AT, Frank Pierce Jones engaged in laboratory studies with quantitative analysis of voice known as 'voiceprints', said to relate to the visual representation of sound called a spectrogram ('Spectogram', 2015); Jones also gave subjective reports on the voice recordings and reported qualitative (perceptual) assessment of posture by the teacher and student (1972: 214).

4.3.2.3 Possible evidence for improvements in quality

With objective measures one might gauge improvement in voice quality by applying the known criteria, as detailed from the work of phonetician, Hollien (2000) and voice scientist, Zemlin (1998) (3.2.1).

Alternatively, improvements might be judged by perceptual means; that is, by listening. For instance, it is possible to tell when someone is able to improve the resonant characteristics of their voice, because it has an enriched tone and more carrying power. Shewell describes the resonance quality associated with 'clear and ringing tone' which can 'cut through the background noise' (2009: 178). Berry refers to the way changes in posture due to muscle tension can limit the voice and 'deprive it of its richness and reverberations' (1973: 20): a

richness which the speaker can judge for themselves through perceptual awareness of voice and context. As well as listening to their own voice, the speaker, such as a teacher, will be looking for responsiveness (in their pupils) which indicates to them that their voice has enabled them to communicate clearly.

4.3.3 Research Question 4: Can improvement in voice quality be demonstrated by the adoption of a procedure based on the Alexander Technique?

Voice training is one of three kinds of solutions to voice problems as analysed in Chapter 3 (3.3.3). In analysing studies some difficulties are noted in their design and terminology when it comes to delineating vocal care, vocal hygiene and vocal training and their effects (3.3.2.1; 3.3.2.2; 3.3.3.1). Rather than this, the AT takes account of factors within a description of the use and the functioning of the psychophysical organism, the entire person (1.8.3).

The link with acting since the early days of F.M. Alexander taking up residence in London is one reason drama teaching has become a consideration in this study. The early connection between RADA and Alexander is perhaps attributable to Herbert Beerbohm Tree as founder of RADA in 1904 (3.4.4.1). Also, the playwright, George Bernard Shaw was a student of the Technique (Staring, 2005: 1) and possibly Shaw contributed funding for provision at RADA through royalties from *Pygmalion* and *My Fair Lady* (RADA, 2015; McEvenue, 2001: xx). As stated (3.4.2.1), many UK drama schools incorporate the AT in their current courses, although in different ways. Knowledge of Alexander's experience and teaching and my own experience of the AT suggests to me that further detailed exploration of the Technique, as taught within PAAT, is appropriate (1.8.3; 1.2).

4.3.3.1 Information that could be gathered on proposed solutions and their efficacy

Information can be gathered from published surveys on voice care and voice training, many conducted by clinicians. Sometimes information emerges from self-reporting in surveys. Less is known of the situation in the UK than elsewhere (2.3.2). Evidence is mainly presented in quantitative form. Some studies seek to compare different solutions, perhaps by providing training in voice which is then evaluated (3.3.3.1).

In my study, presence of the Technique in actor training has been reviewed. I have considered general changes in actor training in a historical comparison between current provision and that which used to appertain, for instance at Central and RADA in the 1900s (3.4.4). The details are a prelude to my exploration with a group of student teachers. However, I do not claim the analysis is intended as a comprehensive view of actor training in general.

4.3.4 Research Question 1: Can attention to improving use (as defined in the Alexander Technique) help classroom teachers with their voice problems?

The means to answering the first research question, posed as a main aspect of this study, is rooted in the exploratory work conducted and reported in Chapter 6. The exploration, introducing a procedure based on the principles of the AT, provides opportunity to work with student teachers to collect information about the improvement that can be gained.

4.3.4.1 How use can be measured

Exploration of the efficacy of the AT can be gathered empirically. This is how it was discovered and verified by Alexander (1.8.3). Similarly, in learning the Technique, everyone can develop understanding by progressing through individual empirical investigation of what the Technique means for them, including its influence on vocalisation (1.8.3).

As shown within the definition of use and misuse (1.8.2), being upright is a balancing act and optimal erect posture can be defined (Basmajian and De Luca, 1985: 255 and 254). Any additional muscular effort applied in upright stance or during related activities pulls the flexible musculo-skeletal frame ' "out of shape" ' (Alexander, 2004: 94). This occurs as a matter of habit; how we think and therefore act and react is integrated and improvement in use requires a change in habitual reactivity (Door, 2003: 13, 35 and 37; Alexander, 1985: 38-39) (1.8.3).

Misuse is verifiable to an extent by perceptual evidence: that of an observer through visual means, and that of any individual learner taking account of what is seen in others and observed in oneself, or registered in the self through the feedback mechanisms of proprioception. Proprioception provides the detailed information needed about the body for an individual 'to know where each of its parts is in space, whether it is moving, and if so in what direction and how fast' (Connors, 2012: 405). When such information is conveyed in words, it is classified as qualitative information (Punch, 2014: 3).

However, the 'pulling out of shape' in misuse (1.8.3), is also quantitatively measurable, for example by means of monitoring within a specially-equipped laboratory such as that undertaken at MMU. Quantitative measures, for instance for muscle activity, enable collection of data expressed in numbers (Punch, 2014: 3). In the case of muscle activity, a technical measurement system can be used, both in the means of detection and in finely graded units of measurement (Basmajian and De Luca, 1985: 8-10). This is known as electromyography (EMG). Recording operates through small, harmless electrodes (in this case, attached superficially to the hand). Also, images can be captured through Vicon cameras fitted in the laboratory. Images are stored and analysed mathematically through the motion analysis software programme, Matlab (see sources of the software listed at the end of the references).

Such data is available for quantitative comparison between individuals and on different occasions.

4.3.4.2 Gathering information on the efficacy of the Alexander Technique as a means to improving voice quality

It is possible to gather first-hand quantitative data through laboratory systems and this was the case for my exploration at MMU. I worked with two AT colleagues to carry out this work with participants, who were either student teachers or already qualified. Equipment enabled detail on postural configuration and other measures of psychophysical use to be taken into account. We also made voice recordings for the same individuals, comparing information on voice quality when they were in two differing stances: their habitual stance, the way they usually stood (1.8.3) and an adjusted stance, based on a procedure of the AT. The idea of adjustments (described in Chapter 6) is to give opportunity to achieve an improved configuration in balanced standing (1.8.2).

In the laboratory, information on all measures (psychophysical use and voice) was quantitative. We were looking for any results which were statistically significant; that is, whether measures on different variables, when analysed, demonstrated any differences that were more than might have occurred by chance. The variables for comparison were voice qualities, such as pitch and loudness (measured as frequency and power respectively).

The kind of information gathered was useful because the measures did not rely on differing accuracy between observers, as might occur in qualitative data. This meant measures of physical and psychological state provided a valid means of making comparisons with voice recordings which were also analysed quantitatively and according to criteria ascertained from voice science texts (3.2.1).

It was important to gain such information for comparison of stance so as to reveal any verifiable patterns accessible through such data gathering and analysis. This is regarded as enabling generalisation of findings (Pring, 2004: 93) which, in this case, relate to psychophysical use and voice quality within the first research question.

4.3.4.3 My reasons for addressing the first research question in a particular way

There was a question of accessibility to the chosen form of data gathering; it was made possible by the AT teacher colleague, Professor Ian Loram, the scientist leading work in the particular laboratory. The main reason for collecting information in this way, given the opportunity to take part in such specialist measures, was that it enabled me to progress from the work demonstrated by Jones (1972) in collecting and comparing voice spectrograms. It was known that carrying out this process with modern technology would make it possible for more data to be collected than in the 1970s.

It would have been possible to carry out subjective (perceptual) assessment of both posture and voice without looking to quantitative data, but the chosen form of laboratory investigation is more replicable and provides detailed quantifiable measures. The exploration in the laboratory gave data collected directly from teaching professionals. Results enabled me to evaluate possibilities or recommendations which might be taken forward on the basis of evidence in the study as a whole.

My first research question considers attention to improving use which does not appear to be much regarded in other research on voice problems or in the provision of training for teachers. Where other studies refer to postural considerations, it is not known if the term is the same as that employed within the AT when discussing upright stance and psychophysical use. This is discussed further in Chapter 6.

4.3.5 Summary

The data from the survey, interviews and case studies are substantially qualitative with some numerical description of teachers' situations. The combination, with quantitative data from the voice exploration, provides a basis for findings overall. The procedures followed and the status of data, as part of my overarching rationale, are explained further within my discussion of the methodological paradigm (4.5; 4.5.1; 4.5.2).

4.4 THE RESEARCH OBJECTIVES ALIGNED WITH MY AIM

The research objectives (1.9.2) originate in the aim of the study and are closely allied with the research questions. Objectives stem from consideration of what forms of evidence were required; they help translate the rationale, the design, and the questions into action. In describing and discussing methods of data collection, I give reminders for each objective and show their relationships to particular research questions.

4.4.1 Research Objective 1

To carry out a survey, conduct interviews and use other first-hand evidence of the voice problems of teachers and student teachers, helping to address a lack of research in this area, particularly in the UK.

This objective could be said to relate particularly to Research Question 2. However, as detail of each method is described, it can be seen that the objective is enmeshed with other research questions. My voice diary (4.4.1.4) relates to all questions, but has particular relevance to my understanding in relation to the third, fourth and the first questions on voice quality and on practical application of the AT. As indicated, following a review of literature evidence (Chapters 2 and 3), my initial first-hand data collection employed various methods intended to draw directly on teacher and student teacher views. For example, the interviews (4.4.1.3)

range across ideas being investigated via all the questions, although predominantly with the second.

4.4.1.1 The teacher and student teacher surveys

In further pursuit of an answer to my second research question and in line with the first objective, I collected data through a questionnaire survey in the UK Midlands between 2008 and 2009. Almost three hundred responses were received from a combined sample of classroom teachers and student teachers. It could be conjectured that the particular sample of teachers in the survey was what is called a 'convenience' or 'opportunity' sample (Cohen, Manion and Morrison, 2011: 155-156), that is, I collected evidence in a number of schools to which I could gain ready access. However, it can be argued that there was a 'purposive' approach to both this and the student survey enabling me to gain information from a range of people working or training in relevant establishments, what Robson calls their 'typicality' (2011: 275).

There is evidence that teachers taking part in the survey were diverse in background and teaching experience (5.4) and with presentation of differing problems (5.5.2.1). The way in which teacher responses in the survey represent this variation and variety is part of the discussion of their evidence. The sample of student teachers was the cohort in a given year at a Midlands university: both undergraduate and postgraduate primary education students were included (5.2.2). There was also a small survey of postgraduate students studying secondary education at another university (5.7.1). In summary, all survey groups represent a range of people across the profession.

The survey asked questions in the field as a means to making my research questions specific or 'operationalizing' them (Cohen, Manion and Morrison, 2011: 126-127). Such

'operationalism' is said sometimes to apply to quantitative data collection (Punch, 2014: 74). In line with this, I asked a range of questions by which responses could be numerically described, for instance, about experience of particular voice problems and about any voice training undertaken. In the latter there was so much diversity across answers that, although there is some classification and enumeration of responses, it was useful to report also individual comments which were received. This was part of the presentation of qualitative evidence from participants. For instance, I found even during their first years in the profession, a number of student teachers experience problems similar to those teaching for a number of years (5.5.2). Descriptions for both teachers and students (for example, on vocal fatigue) are both shown numerically and through qualitative comment (5.5.1; 5.5.2.1).

I sought information in relation to several open questions, similar to the one on voice training. Responses to these meant I received qualitative views which are often quoted verbatim to add substantive detail to my findings. For example, based on the comments of participants, there is discussion of how teachers dealt with their voice problems (5.5.5).

Where appropriate to the form of data, results were entered into the software programme, SPSS (Statistical Package for the Social Sciences); this enables analysis of numerical data and supports the presentation of results in tabular or graphical format (Chapter 5).

4.4.1.2 The case studies

Two brief case studies showing these individuals' experience of voice problems emerged from the questionnaire responses; one was that of a teacher, the other of a student teacher (5.5.1). The case studies added brief qualitative information on voice problems and training.

4.4.1.3 The individual interviews

Three interviews took place. The first was with an actor, Sean, who was leading voice training for student teachers at Keele University. Some of the evidence from this first interview is incorporated in my introduction to the field of research (1.3 and 1.5), but also it weaves throughout the evaluation of other evidence (such as that emerging from the questionnaire) and it is relevant to the drawing of conclusions in Chapter 7.

Of the other interviews, one was a newly-qualified teacher (NQT) who wanted to improve her voice because she had come to recognise that voice skill in teaching is not just about being loud enough to be heard in the classroom. Secondly, I spoke with a student teacher who had trained to be a professional actor before beginning her teaching course. It was of particular interest to talk about how she might be using her prior experience in voice training to inform her role in class.

My rationale was for interviews to be semi-structured (Robson, 2011: 286-287); that is, I had devised some questions in advance, but left scope to take account of any wider views being expressed by the interviewee. Rather than just pursuing my own agenda, I could accommodate comments they wanted to share that I could not have anticipated in advance. In other words, I planned questions which drew on the individual's knowledge and experience, but remained open to additional points that arose. For instance, the NQT informed me that she thought her voice was too loud and unvaried. When she took that as her focus in talking about change, I responded appropriately to gain relevant detail other than that I had expected.

Whilst leaving open the exact course an interview would take, I had to ensure the interviews had 'fitness of purpose' (Cohen, Manion and Morrison, 2011: 412). I did not want to quantify

this evidence, but I did systematise its collection. For instance, I related interview questions to the overarching research questions I wanted to address.

The intention to collect qualitative data from interviews meant I chose to draw on the flexibility of interviewing as 'a data collection tool', which 'can be adapted to suit a wider variety of research situations' (Punch, 2014: 145). This enabled me to find evidence that would otherwise have been inaccessible.

All three interviews were recorded digitally at locations convenient to the individual. Transcriptions are shown in Appendices B, C and D. The 'analysis' of an interview, as I have approached it, is not systematic other than in drawing on their evidence at relevant points in the reporting of teachers' and student teacher views and, in the case of the actor, interposing a perspective that would otherwise have been absent from the study (for instance at 1.8). Once the conversations were transcribed, I could draw on them for unstructured, but thoughtful, analysis; that is, I looked for individual comments relevant to particular aspects of the topic: voice skills, voice problems, voice training. This matched the rationale for the questionnaire, because in some respects, interview evidence was similar to that gained by open questions in the survey.

I was able to incorporate detail from the interviews in my study in a variety of ways. For example, they provided individual perspectives on what constitutes the demand on a teacher's voice (time in the classroom, the loudness and intonation required, etc.). This additional variety of evidence informs discussion in different parts of the thesis. I have already indicated a broad use of the detail provided by Sean, but the other interviews form part of later exploration of results reported in Chapter 5. All the interviews helped me to formulate overall conclusions in Chapter 7.

4.4.1.4 My voice diary

The voice diary was an informal journal of my own experience of using voice in teaching situations, such as being in the classroom or lecture room with children or teacher students, or teaching classes in the Alexander Technique.

I noted particularly my impressions of what presented more vocal challenge and any notable changes in my responses (1.8.1). I did this for three reasons: firstly, to further my own knowledge and awareness of voice; secondly, to see how I might develop my voice as a teacher and as part of my advancement in understanding how the Technique enables vocal improvement; and thirdly, as part of this research project to help me better understand the experiences that other teachers report.

The diary is not shown in detail but it supported my initial shaping of the research (1.8.1) and helped me to raise the research questions (1.9.1). Also, it informed the construction of research instruments such as the questionnaire, enabling me to consider what would gain information from others about a situation I knew personally (for instance, at 5.3). In addition, ideas gained from keeping the diary aided my interpretation of findings in Chapters 4, 5 and 6, where I applied my background knowledge to help with insight into what others were saying and doing.

4.4.2 Research Objective 2

To analyse literature (including that denoting criteria for 'good' voice and its measurement) and use a review of other evidence as background to further investigation.

This objective links with Research Question 3. As shown (3.2.1), voice science is instrumental in determining acoustical measures of voice quality which can be of use in later

exploration. It is possible to match the descriptions of voice quality to what appertains for teachers (3.2.3).

Primary evidence towards this objective is to be found in the survey, the case studies, my voice diary, but particularly in the interviews. Notably, the actor and voice trainer Sean O'Callaghan related experience which contributes to my knowledge of the qualities promoted by voice training. I attended Sean's short course for student teachers at Keele University in 2010 and a day-long CPD course in January 2008 offered by my professional teacher association. The student workshop was an hour-long practical session led by Sean. The teacher workshop was a day-long combination of presentation and practical activity led by a VCN teacher, also previously trained as an actor.

My approach to activities on these courses could not be from a neutral perspective because my participation was surely influenced by being a long-practising teacher rather than a student and also by my experience in the AT. Even so, attending the courses was informative of general ideas for the research.

4.4.3   Research Objective 3

To examine possible solutions to teachers' voice problems and draw on a consideration of voice training for actors through the writings of actor trainers in the UK and a survey of main UK drama schools.

The objective relates to finding answers to Research Question 3, with background provided in Chapter 3 (3.4.2; 3.4.3). Studying text and web sources to gain practical information about voice teaching for actors in the UK meant I was able to form a viewpoint on contemporary provision. I amalgamated the writings of well-recognised voice teachers and also information about well-known drama schools, considering the aims, structure and teaching content of their

courses from their online prospectuses. Also, I approached drama schools and received responses from some members of teaching staff willing to answer brief questions by mail or email (3.4.2.1). There is no claim that this first-hand contact covered a representative sample, but nevertheless it provided further primary data and useful insights.

Attendance at the two practical workshops was a useful adjunct to my understanding of voice training. I have not reported directly on these workshops but they are part of the 'picture' of provision informing my analysis (for example, 2.3.2; 5.7.1) and my conclusions (Chapter 7).

An analysis of previous experiments involving the AT demonstrates that relatively little research has taken place on the speaking voice since F.M. Alexander's own investigation (1.8.3), apart from that of Jones, 1972 (4.3.2.2). In Chapter 6, I give further detail of this and other research which gathers qualitative information on the AT. Both types of evidence, qualitative and quantitative, were useful to gaining a broader view of the AT as a solution.

4.4.4   Research Objective 4

To gain further evidence, with a number of student teachers, of improved psychophysical use (as defined by F.M. Alexander) and accompanying changes in voice quality by exploring a practical procedure of the Alexander Technique.

This objective contributes to addressing Research Question 4, framing my exploration of a procedure of the Technique as I consider relevant support for teachers. As shown (4.3.4.1), the work with two other AT teachers drew on the specialist facilities at MMU for the collection of quantifiable data.

The week dedicated to evidence gathering in the laboratory took place in 2010, with preparatory work and discussion in advance and interrogation of data afterwards. Data was recorded for postural configuration through the Vicon recording system fitted in the

laboratory (with cameras and digital apparatus) and subsequent motion analysis using Matlab computer software. Also voice sound recordings were analysed using Matlab and the Praat online voice software (6.5.3.1).

The research sample was ten volunteers; most were student teachers from the two universities where questionnaire information had been gathered. One participant was the NQT who had been interviewed, and one participant was a PhD student who agreed to take part when another student was unable to come because of illness (6.6).

Analyses were made for voice quality and for postural configuration, muscle activity (through electromyography or EMG), and a skin conductance measure known as EDA which stands for electrodermal activity. The laboratory setting also enabled us to consider readings from a force plate (a simple, but calibrated platform where the participant stands during the intervention). This gave information about the centre of pressure, in other words where a person's weight is falling. What has been said on use and upright stance, referenced to Basmajian and De Luca (4.3.4.2) is relevant to this, but it is explained in further detail in Chapter 6 preparatory to the laboratory exploration.

All data collected in the laboratory contributed to conducting comparisons in voice and two different stances of upright posture for all participants; one of the stances we termed 'mechanical advantage' being based on the procedure of the AT (6.2); the other was the individual's usual habitual stance. Statistical analysis examined relationships between measures. Some analyses were conducted in Matlab; others drew on the analytic software, SPSS, for instance for analyses of the voice quality variables in relation to each stance.

4.4.5   Research Objective 5

To reflect on the outcomes of my study and propose a possible way forward in developing support for teachers.

In Chapter 7, results are drawn together into final conclusions as a summative answer to Research Question 1. As well as drawing together overall conclusions on all that was found out, I consider what I might have done differently. This points the way to proposals for supporting teachers, but also suggestions for further research so that understanding on the topic of voice may continue to move forward.

4.5   SETTING OUT THE RESEARCH PARADIGM UNDERLYING THE METHODOLOGY OF MY STUDY

An explanation of the rationale for my research sets out the means by which I have sought to answer my research questions. Punch proposes that a study such as mine should draw together knowledge which is logically connected and with a process moving from abstract generality to concrete and specific data collection (2014: 58-59). This can be seen in the way I have devised the research questions to set a framework, defined the area of research and moved forward with specified methods and field questions to gain specific information. Punch advocates questions coming before methods in this way (2014: 7). The research questions are also important markers against which I can know whether my project has reached 'credible answers' (Robson, 2011: 58-59).

Assurance of logical connectivity throughout the process comes from the paradigm which underpins the methodology of my study. My explanatory discussion starts with consideration of two main paradigms which have dominated research in many fields. It has been the case in recent centuries and until the last few decades of the twentieth century that much research

followed either the positivist paradigm (said to be the 'standard philosophical view of natural science', Robson: 2011: 20) or an approach known as the interpretivist (appertaining to 'persons' and therefore helping us 'interpret, or attach meaning' to ourselves and others, Pring, 2004: 98).

The sharp division between 'different forms of enquiry' (Pring, 2004: 44), such as imposed sometimes via restricted positivist and interpretivist viewpoints, seems unhelpful in what I am investigating. Sometimes, the positivist is said to espouse that which is regarded as factual and predominantly quantitative; and interpretivism is said to focus on 'the meanings people bring to situations and behaviour' (O'Donoghue, 2007 in Punch, 2014: 17). The world view I take as a classroom and AT teacher makes it hard to recognise any sharp division between the forms of evidence espoused by some schools of positivist and interpretive perspectives; as indicated, there is 'a middle way' (Pring, 2004: 116 and 140). More recently, research in the social sciences using empirical information has done so by recourse to broad and diverse forms of data (Punch, 2014: 2-4) rather than by following a narrowness of framework. I conceptualise my research drawing on such diversity in order that questions can be answered by the breadth as well as the extent of data.

Different kinds of data, as indicated by my five research objectives (1.9.2; 4.4) were collected and examined towards the forming of conclusions in my research. I was not just looking at the scale of the problem but considering different kinds of information which could be gathered; for instance, 4.4.1.1 regarding the survey. This process enabled consideration of the problem to be addressed from a number of different aspects, all falling within the parameters of the study (1.6.1).

In order to answer my five research questions (1.9.1), it was appropriate to follow a mixed methods approach, collecting both qualitative and quantitative data. Punch shows that a research paradigm can combine, integrate and link different data under the umbrella of 'mixed' methods (Tashakkori and Teddlie, 2003 in Punch: 2014: 302-303). In this, each question indicates a 'mix' of strategies to provide answers (Cohen, Manion and Morrison, 2011: 111) rather than having the limitations of dealing only in numbers or only in words (Onwuegbuzie and Leech, 2005: 384). Robson prefers the term 'multi-strategy' in recognition of the research design, 'not only combining methods', but in some way also using more than one 'research strategy' (2011: 161). This is an apt description of my search for evidence through the survey and interviews, and in the laboratory.

An exclusively positivist approach could not address my research questions; yet, the appropriateness of the interpretivist paradigm does not restrict my data-gathering to only this means. For instance, it seems important to me that the viewpoints of participants be represented through interpretative means: that the profession and its students have a say (1.6.1). This is not recognised in the purely positivist paradigm, which tends to take a 'factual' account although, according to Pring, what counts as factual is 'by no means unambiguous' (2004: 91).

In addition to personal viewpoints, my gathering of evidence includes that which is quantifiable and which therefore has some traits associated with positivism. At the same time, study which is interpretivist can take account of 'the *subjective meanings*' of participants, even though these are unique to the individual (Pring, 2004: 98 and 100, italics in original). Therefore, qualitative evidence is justified as well as the quantitative and only an appropriate combining of the two, each valued for its own strength, fits the situation being explored.

Drawing together a mixed methods approach, I can turn the focus to the means by which evidence is gathered: the form of data is dictated by methods of collection. As a rationale this provides a reasoned epistemological basis for study and indicates strengths not afforded by exclusivity in data gathering, precluding one form or another; there can be reconciliation in practice of the different forms of data which need not be separated when any piece of research is actioned (Pring, 2004; Punch, 2014: Robson, 2011). In respect of my study, both qualitative reports of participants and the quantitative voice quality measures could be chosen as appropriate to exploring different evidence relevant to my topic. The research design and underlying paradigm gave strength in this way.

4.5.1   Summarising my rationale for using a mixed methods approach

Being willing 'to embrace multiple paradigms' so that 'we can learn more about our research topic' provides 'a fundamental rationale' for the combined approach as opposed to a singular one (Punch, 2009: 290) (4.5). In other words, my project was not best served by a 'fixed design', but warranted flexibility as in Robson's interpretation of a multi-strategy approach. The approach takes advantage of different perspectives and is able to deal with 'the complex nature of phenomena' from the real world (Robson, 2011: 167).

There were two reasons for requiring this flexibility: first, that the research questions could be answered fully and effectively with a mix of data; secondly, that the course of the research was, to an extent, progressive but with interdependence of one part on another. These links are apparent in the research questions. They demonstrate that later stages of searching for solutions, and being able to answer the main question (designated as Research Question 1), needed to draw evidence from several earlier steps in the research process (1.2; 1.9.1). For example, I verified the extent and nature of voice problems amongst UK teachers to ascertain the demands faced in the classroom.

Having established that problems are considerably widespread, not just as shown in the literature, but amongst the populations responding to my own survey, it became a reasonable linked proposition to investigate further. That further search led me to clarify ideas on voice quality and its measurement in order then to see what might be appropriate assessment of voice amongst such professionals. Dewey discusses the process of taking one's current knowledge and engaging with it in a reflective manner to determine suggestions for further interrogation (1933: 102-104). It might be said this is what occurred in the initial stages of my study and as it progressed.

The methodology should encompass a means of investigating the behaviour of teachers from different aspects, i.e. voice, perceptions and use. Voice is a physiological phenomenon which is quantitatively measurable, as well as being perceptually assessed in everyday situations (1.7.1). The AT allows one to see the person as a whole psychophysical organism and it is possible to study the individual in the microcosm of the laboratory, taking one act or behaviour: speaking a sentence when adopting a particular stance. This demonstrates that using an intervention such as the procedure based on the Technique is feasible and useful in a process of exploration. Using quantitative measures offers meaningful evaluation of what occurs, in the sense that it provides data in a particular format on the acoustics of voice and on stance within varied measures relating to use.

Quantitative data, as aligned with the positivist paradigm and dealing with matters of statistical significance, is not the way intended for my survey of classroom teachers. Giving teachers and student teachers a say in the research meant collecting information in a qualitative manner. This and also what is said about the exploratory work in the laboratory indicate a mixed methods approach is most appropriate for gathering information about the topic in the way I have approached it.

Collecting both quantitative and qualitative data is now a well-recognised rationale (Cohen, Manion and Morrison, 2011: 21 and Robson, 2011: 29). Johnson and Onwuegbuzie go so far as to call it 'a third paradigm' (2004:14 and 23). Although it is not vital to my study to debate such a claim, what is important is to be able to contextualise what is being studied through different methods or strategies providing different forms of data (Punch, 2014: 4; Robson, 2011: 161).

Pring refers to the researcher seeking a 'reality' and objectivity which is 'independent' of his or her 'personal or socially constructed ideas' (2004: 59). Meaning of the word 'reality' is open to debate. I am using it mainly to signify that participants can help to construct the 'reality' of the situation in the researcher's search for understanding (Robson, 2011: 24). In this sense, interpretivist research can help 'reveal and convey deep insight and understanding of the concealed meanings of everyday life experiences' (2011: 151) beyond my own. This appears to be the case even in the abbreviated case study of Jane who has experienced considerable voice problems over a lengthy period but who has managed to remain in teaching despite this (5.5.1). Conducting interviews provided further such evidence (5.7.2).

Sometimes differences between the two main paradigms are described as objective and subjective divisions, as juxtapositions of two differentiated world views. Positivist epistemology, linked to so-called 'nomothetic' methodology, frames the world as if it were an 'external and objective reality' in which 'underlying themes' and general laws may be identified (Cohen, Manion and Morrison, 2011: 6). This is contrasted with the 'idiographic' world view which emphasises the 'particular and individual' seen as more accessible to qualitative or subjective investigation (2011: 6-7).

Such a dichotomous view, as though the mental ('the world of meanings) and physical are separable, cannot and does not apply (Pring, 2004: 33 and 45); no incompatibility exists between the forms of data, given that they are 'inseparable' (Robson, 2011: 162). Also, the world view supported by the AT indicates the indivisibility in use of the human organism. The term 'psychophysical' encompasses the way we apply ourselves 'as an instrument' to all our activities that make up 'experience in living' (Alexander, 2000: 95; 1985: 22) (1.8.3). This provides further support for my belief that satisfactory methods of investigation have to encompass a totality, dealing in unity rather than segregation of evidence forms, including for the psychophysical phenomenon that is voice.

4.5.2   Applying a mixed methods approach in my study

The strengths of qualitative research are said to include 'sensitivity to meaning and content' and that it is flexible to the study of 'process and change' (Punch, 2014: 304). It is a basis of my study that there is both recognition of the importance of meanings and an intention to understand what is expressed by participants. Also, as shown (1.2), I want to understand these in terms of teachers' circumstances, registering the vocal demands of being in the classroom. For instance, there is a wealth of information apparent in answers to open prompts in the questionnaire or in interviews where the conversation is taken in a chosen direction by the participants themselves.

A quantitative approach, on the other hand, can help trace 'trends and relationships' to inform comparisons (Punch, 2014: 304). From the exploration in the laboratory I expect relationships to emerge when comparing the two stances and from subsequent motion analyses and analyses of sound recordings. The way in which this process enables scrutiny of change is not dissimilar to some aspects of qualitative enquiry (2014: 304). Change is also the rationale of the AT. Therefore in this study, I view use of both forms of data as drawing on the advantages

identified by Punch (2009; 2014). The two forms of evidence appear complementary and it is said that neither 'school' on its own can 'encompass the whole research process' (Onwuegbuzie and Leech, 2005: 380).

Pring describes how 'qualitative investigation can clear the ground for the quantitative' and 'the quantitative be suggestive of differences to be explored in a more interpretive mode' (2004: 56). Examples from my study demonstrate that a mixed methods approach can 'produce more complete knowledge necessary to inform theory and practice' through the different forms of evidence available (Johnson and Onwuegbuzie, 2004: 21). The qualitative is illustrated by the deeper understanding formed as a result of teacher and student teacher comments which complement the summing of numbers for certain questionnaire responses. The qualitative leading to quantitative is exemplified in the understandings emerging from the analysis of texts on voice training and my own subjective experience of developing vocal skills (both through my voice diary and in working with others) given that these informed the setting up of the laboratory work.

There is a possibility of 'compensating' for the weaknesses of each method in contrast to their separated use (Punch, 2014: 303). This was noted in the questionnaire results which have broader scope through both numerical data and individual qualitative detail. For example, in 5.5.2.1, I discuss responses on particular voice problems reporting individual comments which elucidate the situation of teachers in the classroom. The data from responses to the questionnaire were not submitted to statistical scrutiny. Numbers are composed of individual participant responses and these are presented in tabular or graphical form. The questions were formed in such a way that enumeration and tabulation is possible, but data is not accessible to showing statistical significance. That would have required that I ask questions with more

ratings for participants to score and I did not want to confine answers in that way. The data received can be regarded as numerically descriptive.

Numerically descriptive handling of data is recognised by Punch in his explanation of going through, variable by variable, to give a 'descriptive analysis' (2014: 268). In the main, I look at and report 'frequency distributions' for problems/not problems (5.5.2.1), voice training/no voice training (5.5.6), and so on. This means I am talking about information in the form of numbers, but mainly for counting rather than for scaling, and as a descriptive tool (Punch, 2014: 84 and 270).

The theoretical framework afforded to this research is the AT (1.8.1) and the underpinning concept of use (1.8.2) which is vital to understanding the way we all function and how change might be possible. It is notable that the Technique is rooted in practical application and can be a means of changing voice (1.8.3).

4.6   ETHICAL STATEMENT

My research takes place in an ethical framework bounded by underlying principles and derived codes. I have considered how these codes might be enacted in my own study and what else this entails (Oancea, 2014: 36).

Ethics is integral to the study and set within the general epistemological framework I have described (4.5; 4.5.1). An ethical approach permeating the research influenced how I went about conceptualising the problem, raising questions, collecting data, and conducting the evaluation and presentation of evidence and conclusions. The scope of ethics extends to any dissemination of findings, so that for those who have given so much time and their personal accounts, there is an outcome within the profession.

MacNaughton and Hughes suggest considerations fall into the 'conceptual' and the 'practical' (2009: 77) and a brief discussion here is structured on that basis. Hilson refers to social science research being able to make a difference in people's lives but that this raises 'unavoidable issue[s]' about the attendant power and responsibility (2006: 32). This seems to place me, as the researcher, in the role of an intermediary. The shape and boundaries of relationships between the researcher and those taking part may be apparent or implicit within the chosen paradigm (4.5.1). It has to be clear how this stands within the newer mixed methods approach. As a researcher I receive what might be called privileged information, including any personal detail of people's situation, such as their voice problems and how they deal with them. There is a duty to use any information with respect and honesty, for instance with due regard for anonymity which is seen also in the role of the Alexander teacher.

Whenever I approached anyone for evidence, I explained the aim of the study and been explicit about the use of that evidence as a point of 'dispersing' rather than limiting power amongst participants (Hilson, 2006: 33). For instance, participants had information about how the questionnaire results on voice problems would progress towards the search for a solution for teachers. A further demonstration of this 'openness' is that, following exploration in the laboratory, we shared with participants an explanation of the procedure they had been asked to follow in adopting an adjusted stance (Appendix R). The reason for not giving the detail at an earlier point during the procedure was that it might have prejudiced outcomes (6.5.4.2).

Information-giving is part of the negotiation said to be associated with a 'democratic' style in research (Pring, 2004: 150). In this study it is exemplified by the way I have explained as much as possible, made it as convenient as possible for people to participate in the research, and ensured they are fairly reported; for instance, having recordings of interviews so that evidence could be carefully interpreted. I am not the only arbiter of evidence if I set out what

has been found and enable reader interpretation; for example, anyone may view the transcripts of an interview (Appendices B, C, D) and decide what they think the interviewee means.

The significance of the topic for teachers themselves could be one reason why I have found participants so generous with their time over the course of the research. As Cohen, Manion and Morrison observe, involvement is likely to be because the research appears to have potential 'to improve their situation', so-called 'beneficence' (2011: 377). Such participant goodwill is applicable across different forms of evidence collection, including interviews such as the one with Sean O'Callaghan where there is no discernible benefit to him.

The practical ethics of this study include a concern throughout for participants (Pring, 2004: 150). The circumstance of my relationship with them has varied; for instance, I did not meet some participants personally because, in the survey of teachers, many copies of the questionnaire were distributed by post. This meant conveying the purpose of my study through letters of approach, which I addressed to head teachers and to individual teachers and student teachers (Appendix F).

I have worked with other participants directly, for instance in the laboratory and during interviews. I requested help for the laboratory part of the study in an approach to students studying secondary education at Keele University, where I was also able to undertake a small questionnaire survey. Some student teachers in primary education at the university where I was working at the time were also willing to help and this meant I could achieve a mix of participants and a sufficient number for the laboratory work to take place. Forming these links was a matter of negotiation, giving information so each person could make an informed choice. My oral request was followed by email contact up to the point of meeting in Manchester, given that there were practical arrangements to confirm.

Without head teachers, teachers, student teachers, the actor voice trainer, and those in drama schools who responded to my queries, the study could not have taken place. This voluntary participation was the case in all data gathering. Data has been anonymised and, as raw data, is regarded as confidential for use in the study. Following initial explanations in the laboratory, participants were asked to complete a consent form which was part of the procedure at MMU (Appendix K).

To summarise, practicalities have included: making participation as easy as possible; providing information to all participants about my study, its aims and rationale; making careful and considerate use of the information anyone has provided; respecting people's rights by asking for informed consent, for instance in the laboratory; and ensuring that the voluntary nature of participation was explicit, so it was clear that withdrawal could be at any point.

The way I have conducted this study adheres to the ethical principles and guidelines of relevant bodies and institutions: the University of Birmingham but also Manchester Metropolitan University whose own code is applicable to anyone working in the laboratory there. Also, I work within codes of conduct for my roles as a schoolteacher and an AT teacher. These principles and values are integral to the methodology of the study. Necessary ethical permissions were obtained for the field work I have undertaken, both the survey and the laboratory research.

In conclusion, the conceptual and practical rationales which I have followed in my study are united through 'epistemic aims' and the paradigmatic framework I have set out. Enacting this could be said to require a process of 'situated deliberation', determining the courses of action in particular situations and contexts as they arose (Oancea, 2014: 52-53).

4.7   THE VALIDITY AND RELIABILITY OF THIS RESEARCH

In consideration of the trustworthiness or validity of this study, I examine here its representativeness: that is, whether it illustrates the phenomenon being investigated and whether the data I have collected is a valid view of the experience of people taking part and is also, as far as possible, a reliable indication of experience in UK classroom teaching. In terms of reliability, it is pertinent to check whether the study provides data that is replicable. For example, if the questionnaire survey is reliable, similar results would be likely if data were collected again in the same way, although varying participants from one time to another may mean replicability is more certain in terms of numerical evidence than for any qualitative comments.

So that the validity and reliability can be shown and judged, I intend transparent and clear explanation of what has been done, what was found out, how data has been analysed and how the outcomes have been decided.

4.7.1   Sampling in this study as an issue affecting validity and reliability

Because sampling is about how well any group of participants can be said to represent the 'population' who are the subject of the study, I report on how samples have been sought, for instance within the population of UK teachers and UK student teachers. In this sense, the choice of sample affects the 'external validity' of any findings, or whether it is possible to generalise from what is found (Robson, 2011: 270).

For the two data collection methods, that of the survey and exploration in the laboratory, I used differing strategies to gain my sample. In the laboratory exploration, the number of individuals participating was appropriate to the measures being carried out (postural configuration and voice quality). The laboratory procedures were detailed and precise and

therefore not accessible with very large numbers, which anyway were unnecessary to the form of exploration where there was to be testing of data for statistically significant outcomes; according to the usual standards for this kind of work having ten participants is viable and quite common (Loram, 2009). It is said that a sample of this size provides opportunity to gain evidence such that any noted relationships (in our case, between change of stance and changes in voice quality) can be reasonably assumed to be more than those which would have occurred by chance. Accepted levels of statistical significance were the reference point for quantitative analysis. Result such as $p < 0.05$ means judgement can relate to that basis for significance, although in analyses of results in Chapter 6 there is a preference for discussion of all implications whether the p value is shown as this level or not.

For the survey, the ideal would have been to draw on a random sample, but this was not practicably possible: I do not have access to the resources, time or opportunity needed. It is noteworthy that very few studies reported in Chapter 2 draw on random samples. For me it was not possible to know how many teachers are employed in each school in any location to calculate the size of any sample obtained. Being aware that my participants are not selected randomly, I have to assess whether I can claim to have at least found a sample which allows that '*any relationship between the variables have the maximum chance to be observed*' (Punch, 2003: 37, emphasis in original). Relevant factors for the survey are the number and type of problems and people's length of time in teaching, etc.

Having almost three hundred participants is persuasive of the sample being large enough to warrant attention to responses on a numerical basis as well as for the qualitative comments received. The size of the sample is more than in a number of other studies (2.3.1.2). Also, it can be argued that, although I collected evidence from a number of schools to which I could gain ready access, which could be called a 'convenience' or 'opportunity' sample (Cohen,

Manion and Morrison, 2011: 155 - 156), it is more aptly described as 'purposive'. That is, both the teacher and student survey enabled me to gain information, to my specific purpose, from a range of people working or training in relevant establishments (Robson, 2011: 275; Cohen, Manion and Morrison, 2011: 156-157). This is how I have aimed for appropriate credibility in the survey evidence.

The sample for the main survey of student teachers also demonstrates strength. Knowledge of the group size (the number of students registered on the particular courses at the time at the particular university in 2008 to 2009) makes it possible to determine there was a high rate of response of 81% across each course.

For both parts of the survey (teachers and student teachers) I report the profile of each group (5.4). Given that there are a range of ages, length of time in teaching and representation of both male and female participants in the teacher survey, this is further assurance of the 'representativeness' of the sample. These details show that I can claim, for my survey, validity which can underpin some limited generalisation. The point, however, is that all the survey data and evidence within the interviews and case studies (where there was no randomness of selection) amount to a broad range of qualitative and numerically descriptive evidence of voice problems and the way these modern-day professionals are dealing with them.

4.7.2   Triangulation of evidence as a means of strengthening validity and reliability

Triangulation of evidence is an element of research design helping to assure validity as well as reliability; for instance, using more than one method of data-collection to study human behaviour by mapping out further its 'richness and complexity', in my case, of the phenomena called voice and speech (Cohen, Manion and Morrison, 2011: 118; 193-19). Pring discusses

more generally a study example in which triangulation emanates from a research attitude of critiquing what one finds 'in the light of further evidence' (2004: 131-132).

For the survey, rather than employing a range of measures, the strategy of triangulation was applied within the questionnaires; that is, asking for similar information in different ways. For instance, there was a string of questions on whether the participant had voice problems, asking about types of problems, and checking their occurrence. This is termed methodological triangulation (Cohen, Manion and Morrison, 2011: 196). Similarly, triangulation occurred through use of a second 'continuation' questionnaire for a small number of volunteers from the original survey (4.6). There was also scrutiny of data across the survey of teachers compared to that of student teachers (see discussion of Table 5-4 at 5.5.2, for instance).

As shown (4.5.1), use of both quantitative and qualitative data has advantages which can be described as 'manifold' (Cohen, Manion and Morrison, 2011: 193). Triangulation design is said to occur when different approaches to data collection are combined (Punch, 2014: 158); they may draw on both normative (quantitative) and interpretive approaches (Cohen, Manion and Morrison, 2011: 196). Also, it is acknowledged that 'minimising invalidity' is as much a recognised research process as maximising validity (2011: 179). For the questionnaire, validity is maximised through care in its construction and distribution. Likewise, in the laboratory, standardisation of procedures was important.

Robson indicates that in research which has a multi-strategy (mixed methods) approach, rather than a fixed design, 'trustworthiness' can be assured through 'operationalization' which is appropriate (2011: 156). For example, this fits with the way teachers and student teachers were approached through broad personal contacts with written and often oral requests for help. This applied in all first-hand evidence-gathering: for the questionnaire, in interviews,

and for assembling participants for the laboratory work. In the survey, it meant more than thirty schools and three university courses across two establishments being represented. I show here other specific details of validity for each method of data collection before considering further how my study can be said to be reliable.

4.7.3   Validating the outcomes of the questionnaire survey

It is shown that the terminology used to discuss voice problems can present difficulty in whether there are shared understandings between participants and the researcher (2.4.2): for instance, this may affect the validation of questionnaire evidence. One query, for example, is whether we are all talking about the same phenomenon when we use the word 'hoarseness' (2.4.1.2).

Two operational decisions when constructing the questionnaire were to use the term 'voice problem' rather than 'symptom' because I was not investigating clinical detail. Also, this approach is in contrast with researchers who perhaps assume knowledge of technical terms on the part of participants without giving explanations (2.4; 2.4.2). Secondly, and to some extent conversely, I included the terminology of other published studies to enable comparisons; for instance, I incorporated 'hoarseness' as a prompt in my questionnaire having identified what problems this posed, although I did not adopt the term 'resonance' which is widespread in voice study and teaching (3.2.2.4). In Chapter 7, I return to evaluate these decisions in consideration of how I might carry out the study on another occasion.

One step to test the 'trueness' of an instrument such as a questionnaire is to pilot questions in advance of the main survey. One comment from my pilot group filling in a draft questionnaire was that questions on voice problems did not give opportunity for the range of answers that respondents thought necessary; that is, if they had minor problems or problems just

occasionally, they were not sure whether to say 'yes' they had voice problems or 'no' they did not. Therefore, I introduced the response box 'only slight' which respondents thought was a good idea. This, and other small amendments that were made, appeared to help participant responses in the full survey given that few questions went unanswered.

The pilot or trial also allowed for checking that presentation and layout of the questionnaire and its length were conducive to ease of answering (Punch, 2003: 34). Time taken to complete a questionnaire was checked so this could be stated; if responding was not seen as onerous, this may have encouraged a high number of responses.

Valid evidence requires suitable statistical testing to correspond with types of evidence being recorded. Storage and analysis was through the statistical software programme SPSS, because I was dealing with large amounts of numerical data where such software is advantageous. However, I drew only on descriptive statistics: tables and graphs, with some cross-tabulations where relevant. This is in line with what I have discussed regarding the form of data and my approach to its analysis within the overall methodology of the study; that is, data from the survey was presented as a combination of that which is numerically descriptive and that which is qualitative (4.5.2).

4.7.4   Validity of the laboratory exploration

The investigation looks at individuals in a laboratory situation with the aim of gathering quantitative evidence on postural configuration and voice. One question that therefore arises is my identification of aspects of voice quality relevant to teachers, so they can be measured in the specialist laboratory. Validation rests on the literature-based examination of voice quality which helped identify valid parameters (research question 3) and the primary evidence of practising classroom teachers gathered in both the survey and the interviews. If the chosen

criteria are well-founded and the means of measuring them (through voice recordings) is appropriate, claiming validity for the outcomes in the laboratory seems justified.

Care was taken in procedures, both in seeking and briefing participants and within the laboratory. The separate measures are described in detail in Chapter 6, which also explains how data were compared in statistical analysis. Motion analysis recordings, measures of muscle activity and skin conductance (6.5.3.2 to 6.5.3.4) are all quantitative means of evidence-gathering. Sometimes the term 'objective' is used in the sense of the measures being independent of individual view or bias because of the way they are conducted and used (Pring, 2004, 137). This includes voice measures as in the spectrographic analysis, although Pring does not disadvantage other qualitative evidence in any dichotomous way (4.5.1). Where evidence is quantified, dealing with averages or mean values rather than single instances is a more secure way of gauging 'tendencies' within the overall data.

All measures, including voice recordings, were made in the same way for each individual so that comparisons between those individuals can be regarded as comparable. The positioning of the microphone, for example, was standardised by use of a head set and a check on distance between the microphone and the lips. Instructions for the procedures were standardised as a script (Appendix N) so that they were the same for each participant and regardless of which researcher was giving instructions.

Data was stored using Matlab software; main analyses also were undertaken using this. Matlab employs high-level technical computing language; I had assistance for this aspect of the work through Ian Loram, the MMU researcher, who works with it regularly. Matlab is well-suited to interactive modelling of postural configuration, as in this investigation. Some voice analysis was undertaken using Praat software, as detailed in Chapter 6.

4.7.5 Can the study be said to have reliable evidence?

Robson describes being 'thorough, careful and honest' in the interests of reliability (2011: 101). In considering whether the data is reliable we look for consistency in the data and whether similar results would be obtained from the same data collection methods with a similar sample, 'confirmability' (2011: 155). Where qualitative evidence is being gathered, triangulation provides corroboration that the work is reliable as well as valid (4.7). The standardisation of the questionnaire given to each participant is important to reliability. Using multiple-choice questions is one option, yet having some open questions for 'free' answers is a useful consideration to 'operationalizing' a questionnaire (Cohen, Manion and Morrison, 2011: 378), perhaps helping to capture more reliably what people want to say.

During interviews, I checked my understanding of the participant's meaning with tags, such as 'so what you are saying is….'; Cohen, Manion and Morrison suggest qualitative measures should check 'the reliability, validity and consistency of responses by well-placed questioning' (2011: 208). This is a recognised and valuable interviewing technique, particularly where there is limited possibility for checking with the interviewee afterwards.

The collection of quantitative data requires appropriate measures and appropriate statistical tests of the data to ensure reliability (Cohen, Manion and Morrison, 2007: 133). Reliable evidence-gathering in the laboratory rested on clear procedures and these are set out in Chapter 6. As well as demonstrating the suitability of measures, an explanation of their use and the analysis of findings support replicability on other occasions.

4.8 METHODS OF ANALYSIS AND PRESENTATION OF RESULTS

Methods of analysis are chosen as appropriate to forms of evidence meeting the four research objectives prompting the investigative work and matching a mixed methods approach.

For Research Objective 1 (To carry out a survey, conduct interviews and use other first-hand evidence of the voice problems of teachers and student teachers to address a lack of research in this area, particularly in the UK), I present numbers, percentages and comparisons in relation to different types of data and the scale of their occurrence in the sample group. The results are presented as tables and graphs, which are numerically descriptive of this study population of 299 teaching professionals. There is also descriptive (qualitative) profiling of participants. The analysis, therefore, is in the form of words drawn from the statistical data which has been gathered. Even in showing graphs, tables and some cross-tabulation my emphasis is on understanding the experience and views of the individuals who have participated. It is possible from these analyses to have an idea of demands on teachers' voices and to understand more about voice problems, how classroom teachers and student teachers cope with them, and what is provided to help them.

For Research Objective 2 (To use analyse literature, including that denoting criteria for 'good' voice and its measurement, and use a review of other evidence as background to further exploration) it becomes possible to present ideas on different measurable voice qualities, mainly through reflective analysis of the different textual evidence and some first-hand evidence from classroom teachers and an actor/voice trainer. I draw conclusions which indicate a way forward in assessing voice quality for these classroom professionals. This combines, similarly, with the way in which I have furthered Research Objective 3 (To examine possible solutions to teachers' voice problems and draw on a consideration of voice training for actors through the writings of actor trainers in the UK and a survey of well-known UK drama schools). The outcomes point to the AT having a role in training for actors both historically and currently.

For Research Objective 4 (To gain further evidence, with a number of student teachers, of improved psychophysical use, as defined by F.M. Alexander, and accompanying changes in voice quality by exploring a practical procedure of the AT), the laboratory exploration yields a wealth of mainly quantitative data. This is statistically analysed according to commonly-used methods such as comparing variables through univariate analyses of variance (known as ANOVAs).

Raw data is not presented but key results (graphs and analyses) for voice, postural configuration, muscle activity, and electrodermal response are shown. As researchers, we were interested in comparisons of the voice measures with other data to explore possible relationships and meanings. We raised the question of whether observable variations in data for any individual or for any procedure might differ more than would happen by chance, for instance as shown in any ANOVA. I report any statistical significance which emerges, but also comment on trends in data which can indicate areas of interest, for instance for further investigation.

In summary, chosen methods of analyses are varied as appropriate to the varied measures in a mixed methods approach. This puts me in a position to progress in Research Objective 5 whose purpose is the reflection on all outcomes in order that I can fulfil the aim of identifying support for teachers.

4.9 HOW MY THESIS WILL CONCLUDE ON THE BASIS OF METHODOLOGICAL CHOICES

I move from a subjective hunch to verification through a variety of means. Reflection is a key vehicle throughout my study as I decide how to proceed according to an overarching plan or framework but with detail dependent on steps in the process itself. At each point in the

process, research objective by research objective, it was necessary to check how pieces of evidence, whether quantitative or qualitative, related to other 'known' detail. Dewey states that reflective thinking 'includes a conscious and voluntary effort to establish belief upon a firm basis of evidence and rationality' (1933: 9).

Research is aimed at reaching conclusions which can be checked against experience and 'critically scrutinized' against other beliefs (Pring, 2004: 136). Also, Pring observes that 'objectivity' is part of a 'systematic and open attempt' to check interpretations against evidence (2004: 137). In my view that research is about the real world, I (as the researcher) am part of it, not separate to what I am researching (Pring, 2004: 81-82); I am negotiating meaning in the context of the research.

The thesis concludes with an evaluation of outcomes in relation to the research questions which were raised (1.9.1). Awareness of gaps or flaws is taken into account in interpretation of findings and I suggest how I might proceed differently in some respects another time. On that basis, Chapter 7 proposes ways forward in developing support so classroom teachers can use their voices more effectively. The conclusion provides ideas for future research.

CHAPTER 5

GATHERING EVIDENCE: PART I, THE SURVEY

5.1   INTRODUCTION

Studies show that school teachers in many countries commonly report voice problems (2.3.1). Whether the data are gathered from clinic attendance or from self-reporting, it is clear that teachers are more likely than those in most other occupations to seek treatment or report voice problems (2.3.1.3; 2.3.1.5). Both medical and non-medical situations could underlie some problems.

It is apparent that comparatively fewer surveys have been carried out in the UK than in other countries (2.3.2), therefore the survey sought to address this gap in information. Also, my rationale for collecting further direct evidence in this way is so that UK teachers can contribute to the discussion initiated in studies such as those of Fritzell (1996) in Sweden (2.3.1), Smith *et al* (1998b) and Preciado-López *et al* (2008) (2.3.1.3), and other geographically-spread studies. Moreover, my survey gives present-day teachers and student teachers from a defined area of the UK, a direct 'say' in the current study; an opportunity to report their experiences of voice in the classroom (1.6.1; 4.3.1.1; 4.4.1).

The survey is small-scale compared with some, but includes 299 participants, with 174 classroom teachers and 125 student teachers, therefore providing a considerable sample of the experiences and views within the profession. The survey was carried out from 2008 to 2009 and enabled me to take a fresh look at the situation for teachers and student teachers in local classrooms. I was able to search out common factors in the collected data.

I give a justification for using a range of evidence-gathering methods which lead to both qualitative data and that which is numerically descriptive (4.5.2). This chapter reports the

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practical process of conducting the survey and presents its results. It shows individual perspectives on these experiences, reports of voice problems, and some views on solutions expressed by participants. As well as enabling participants to give an individual perspective on problems and actions taken to remedy the situation, the information provides a collective view of these teachers and student teachers in the numerical descriptions I present.

5.2   THE QUESTIONNAIRES USED IN THE SURVEY

Decisions about the format of the questionnaires and how the survey might be put into effect are discussed (4.4.1.1; 4.7.1; 4.7.2). An example questionnaire is given (Appendix E). Only one form of the questionnaire is given as all the formats used were quite similar. There was a separate one for each group in the survey: teachers, postgraduate student teachers and the undergraduate group. The continuation questionnaire was, of necessity, amended to gather more detail from a small number of teachers at a later date and the questionnaire for the small group of secondary school student teachers varied slightly, but all were broadly similar.

This chapter presents a summary of practical details for the initial survey of teachers and student teachers and of some detailed interviews giving additional evidence. The continuation questionnaire, both arrangements and outcomes, and the survey of secondary school student teachers likewise, are reported later in the chapter. All participants lived within the Midlands area of the UK. The questionnaire was piloted with a small number of personal contacts working within the teaching profession; as a result of their comments some minor amendments were made before the full survey began (4.7.3).

5.2.1   How the survey of teachers took place

The schools approached to take part in the survey were spread across the Midlands – parts of Birmingham, Walsall, Wolverhampton, Staffordshire, Shropshire, Telford and Wrekin, as well

as the local authority of Sandwell which is part of the Black Country conurbation. These locations made it practicable for me to make contact, disseminate materials, and collect responses.

A survey pack to each school was addressed to the head teacher; this included an explanatory letter along with a request letter to individual teachers (Appendix F). As well as copies of the questionnaire, there were also envelopes addressed for individual return. It was made clear that participation was voluntary.

The aim was for as many teachers as possible in any school to complete and return survey forms. Teachers in many of the schools responded. Their sealed, and therefore confidential, questionnaires were gathered in a location such as the school office and then returned via university students known to me and working in the schools at the time. Everyone appeared most helpful about this, including the students. Where necessary, I supplied stamped addressed envelopes for teacher responses, but it was notable that some schools or individuals chose to fund the postage themselves to return completed questionnaires to me.

The survey focused mainly on teachers in primary schools, with which I had most ready contact. I regard their willingness to take part as an indication not just of this link, but of an interest in the research topic by teachers themselves (4.6). Their readiness to be involved led me to think that probably responses had been completed carefully. All responses received were included in analysis.

5.2.2 The survey of student teachers

Students undertaking courses in teacher education at the University of Wolverhampton were approached for the main student survey. The profile of this sample is given in 5.4 and the outcomes are reported in 5.5. The main participant group were training to teach in primary

school, but also a few secondary school student teachers from Keele University were asked to take part. Outcomes from that small subsidiary sample of sixteen participants are reported in 5.7.1.

For the main survey, first-hand contact with student teachers was possible because of my work as a lecturer at the University of Wolverhampton. This meant I was able to request help in person, give out questionnaires and get back the completed responses in a short period of time. I was in contact with postgraduate students, enrolled to gain a Postgraduate Certificate in Education with Qualified Teacher Status (QTS) and I spoke directly to them. There was chance to explain my research briefly and answer questions. Also, each student teacher received the explanatory letter setting out the purpose of information-gathering and making clear the voluntary nature of participation. Despite its voluntary nature, the survey had a high response rate, with 54 postgraduates in a group of 67 completing questionnaires.

Similarly, a cohort of undergraduate students studying for an Honours degree with QTS was approached through one of my colleagues to ask about their participation. The survey was distributed in a study session, time was allowed for completion, and collection of responses took place at the end of the session. Again, an explanatory letter given with each questionnaire detailed my purpose and emphasised that participation was voluntary. In the group of 88 undergraduates, there was a high return rate with 71 completing questionnaires.

As the total numbers enrolled in each group was known, it was possible to calculate an overall return rate of 81% of student teachers on register. Knowing the return rate, which was high, meant I could be more definitive about the statistical basis of results for the student population group, and this influences the scope of particular findings for student teachers (4.7.1).

5.3 QUESTIONNAIRE DETAILS IN RELATION TO MY RESEARCH QUESTIONS

The questionnaires were an opportunity to build on my research questions and gather evidence by formulating questions in the field (items in the questionnaire) relating to the perspective of the teaching professionals themselves (1.6; 4.3.1.1). The field questions for gathering collection of first-hand information from classroom teachers and student teachers generated data to answer Research Question 2. Also, the field questions asked about the support received and the strategies of individuals enabling them to cope in the classroom.

The questionnaire therefore asked about the occurrence of voice problems, what helped, any medical treatment and whether training had been received at any time. Questions about training were worded broadly referring to voice work undertaken, either vocationally or in recreational pursuit. To find out about this wider experience, I gave prompts about singing and drama experience. I was interested in what might have been offered during qualification study or in teaching post. Finally, participants were asked if they would be interested in training if it were provided.

5.3.1 The terminology used in questions

I considered carefully the terminology I would use in the questionnaire in order to communicate effectively with participants. It has been shown (2.4; 2.4.1.2; 2.4.2) that some assumptions are made in studies of voice and I wanted, as far as possible, to avoid any difficulty in my survey. For example, I hoped participants would report 'everyday' impressions of their voices, rather than regard it as a survey only of medical instances, therefore I chose not to use the term 'voice symptom', as in some studies. Similarly to Russell, Oates and Greenwood (1998), I used the alternative term, 'voice problem' which could be interpreted more generally by participants and result in them giving the most

information possible. Bearing in mind that a short questionnaire is not able to define terms for participants, responses received were specific to participants' own ideas of what any term might mean.

In investigating specific problems, I included various prompts in my survey; for example, prompts such as 'throat or other discomfort' or 'effort to talk', following lines similar to Roy *et al* (2004), Sliwinska-Kowalska *et al* (2006), and others (2.4.1.3). As shown (4.3.1.2), I was uncertain whether to adopt the term, 'hoarseness', but did so with awareness that evidence should be viewed with caution. For example, lack of definition may affect what is thought helpful to someone experiencing hoarseness of voice; some studies associate hoarseness with dysphonia and, as shown (2.4.1.2), this may not advance the search for solutions. The high incidence of hoarseness shown in teachers has led even to suggestions of it being inevitable, with apparently little questioning of what underlies its non-medical occurrence (2.4.2).

For teachers, there is a general understanding of voice 'projection' as meaning 'being heard at the back of class'; it is also a term used until recently by actor trainers, but it is uncertain whether they mean the same thing, i.e. being loud enough for the context, or whether it has any implication of resonance of voice (3.2.2.4). It seems necessary to bear in mind that the term may not be used uniformly. Because of this possibility, I did not ask them about projection, only about 'difficulty being heard' (3.2.2.3). However, a few participants used the word 'projection' in response to open questions.

5.3.2   Asking about the timing of any problems

Russell, Oates and Greenwood looked at 'career' and 'year prevalence' to ascertain long term and shorter term problems (1998: 479). The emergence of any problem was a relevant consideration in my survey but I confined this to giving alternatives for a participant to select

what applied to them, for instance whether a problem seemed to originate during training or when first in post. In the later continuation questionnaire for teachers, I used a more open format asking participants to say when the problem occurred, when it was most troublesome, how long it persisted and its frequency of occurrence.

Jónsdottir *et al* (2002) collected information on the timing of 'symptoms' (such as 'while teaching' or 'in mornings'). I included similar questions in my main survey. For instance, participants were asked whether voice problems occurred at the end of the teaching day. During data analysis, akin to Simberg *et al* (2000), I used the collected data to gauge the number of different problems reported by each participant. This made it possible to describe whether participants appeared to experience multiple symptoms and, to some extent, how frequently. The survey did not, however, go into the level of detail drawn together by Thibealt *et al* (2.3.1.4), who classified the responses to their teacher survey as 'acute' (if 'sounding different' and 'interfering with communication'), or 'chronic' if lasting for four weeks or more (2004: 787).

5.4   PROFILE OF THE PARTICIPANT GROUPS

Completed questionnaires were received from 174 teachers in the surveyed schools (5.2.1) and from 125 student teachers of one university department (5.2.2). Fifty-four of the student teachers were on a postgraduate programme and 71 were in the last year of a three-year undergraduate course.

The questionnaire also gathered personal information from each participant regarding their gender, age and the length of time they had been in teaching. Because anonymity in reporting of results was assured, no name was required on responses, except where a participant chose

to give detail for further contact. However, no identity has been revealed in this account of the survey or reporting of data (4.6).

I cannot be certain that my participants are representative of the profession in primary schools in the area of my survey, but have some reassurance of this in my 'judgement of their typicality'; that is, I have engaged participants from a cross-section of locations and circumstances as befits a purposive sample (Cohen, Manion and Morrison, 2011: 156) (4.7.1). Results reported in 5.5.2 show a number of teachers saying they have no voice problem or only a minor problem. From this it can be inferred that a cross-section of teachers completed the questionnaire regardless of whether they experienced problems or not, again making it likely (although not certain) that the sample was representative.

There were some gender differences in the composition of the groups who took part. Predominantly this reflected the greater numbers of female teachers commonly known to be employed in primary education compared with a lower number of males. Informally, this can be observed to be the case in the staffing of almost any UK primary school. Also, there is a similar, although less marked, difference in gender balance within the student teacher group. The point is discussed with the presentation of these results in 5.4.2.

The survey of teachers showed various ages and varied length of time in teaching. Ages varied across the student teacher groups although not as widely as in the group of teachers; there was no way of knowing if this was similar to student or teacher groups elsewhere (4.7.1). It seems that having results for primary student teachers provides useful data to compare with qualified teachers working within the same locale at the same point in time and this may not have occurred in many other surveys.

5.4.1 The classroom teacher participants

Teachers from a variety of schools took part with a mix of rural, urban and suburban locations, and large and small schools. This is important to considerations of sampling (5.4), although it was not taken into account in analysis.

5.4.1.1 The age of teacher participants

There was a varied age distribution of teachers in this survey, although 47.1% were aged 41-60 years. Half of the qualified teacher participants (50.6%) were aged forty or under, and less than a quarter were aged thirty or less. Distribution of ages was assumed to be random; there may have been influencing factors related to the schools approached, but if so, these were unknown. For instance, one might surmise that a survey of inner city schools, which often employ younger teachers, might have produced a different age profile.

My results in the form of numbers and percentages are given in Table 5-1; Chart 5-1 shows this in graph form. In notation of data presented in this chapter, the analysis programme used (SPSS) shows 'no response' (or 'not known') on any table, but records '999' as the statistical code in any chart. For example in Table 5-1, two teachers were 'unknown' because they gave no answer and in Chart 5-1 these participants are recorded as the column marked '999'. Also in 5.4.1.2, Table 5-2 shows 'no response' for one teacher who did not respond to a question and this is designated '999' on Chart 5-2.

5.4.1.2 Length of time these teachers have been in the profession

The length of time these teachers had been in the profession is enumerated in Table 5-2 and shown as a bar graph, Chart 5-2. The table indicates 40.2% of the teachers had been teaching longer than 15 years and 31% for five years or under (including the small number of trainees qualifying via school-based training).

Table 5-1 Frequency chart for ages of teachers

	Frequency	Percent	Cumulative Percent
25 or <25	15	8.6	8.6
26-30	26	14.9	23.6
31-40	47	27.0	50.6
41/60	82	47.1	97.7
60 or >60	2	1.1	98.9
Not known	2	1.1	100.0
Total	174	100.0	

Chart 5-1 Age profile of teacher participants

Within AGE RANGE specified
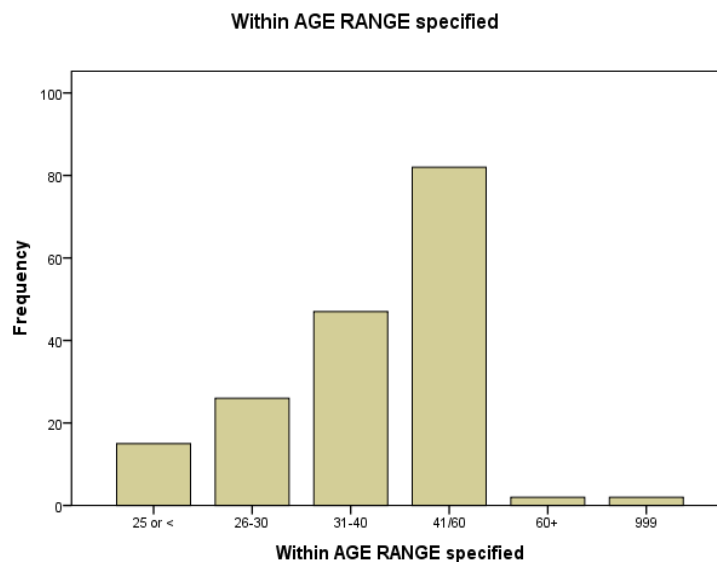
5.4.2 Gender profiles

Gender was not evenly represented in the survey. For instance, within my sample of teachers, 154 (87.4%) were female and 20 (11.5%) male. Responses across all student teachers totalled 125. Of these, 81.6% (102) were females and 18.4% (23) were males. These percentages demonstrate a different profile across the two courses, with slightly more male postgraduates (14 out of 54) than those following the undergraduate route into teaching (9 out of 71). The reason for this may be that in general more males follow a postgraduate route into teaching than choose undergraduate entry. All figures and percentages are tabulated in Table 5-3.

Table 5-2 Teacher survey: length of time in teaching

	Frequency	Percent	Cumulative Percent
Trainee	8	4.6	4.6
< 1year	10	5.7	10.3
1-5 years	36	20.7	31.0
6-10 years	24	13.8	44.8
11-15 years	25	14.4	59.2
16-20 years	18	10.3	69.5
21 or >21 years	52	29.9	99.4
No response	1	.6	100.0
Total	174	100.0	

Chart 5-2 Teacher survey: length of time in teaching
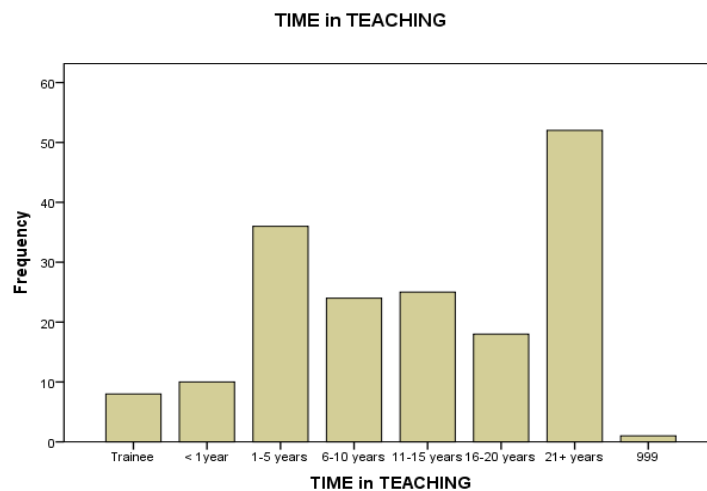
Table 5-3 Gender profile of teachers and student teachers

participating in the questionnaire surveys

	Teachers		All Student Teachers		Postgraduates only		Undergraduates only	
	No.	%	No.	%	No.	%	No.	%
Females	152	87.4	102	81.6	40	74.1	62	87.3
Males	20	11.5	23	18.4	14	25.9	9	12.7
TOTAL	**174**	**100**	**125**	**100**	**54**	**100**	**71**	**100**

5.4.2.1 The age distribution of these students

The age distribution for student teachers shows the majority of both undergraduates and postgraduates are in the younger age groups. There are proportionally more postgraduate student teachers than undergraduates in the age range 26-30 years, but other age distributions are broadly similar. Full results for the two student groupings are shown in Chart 5-3 and Chart 5-4.

Chart 5-3 Age distribution of undergraduate student teachers
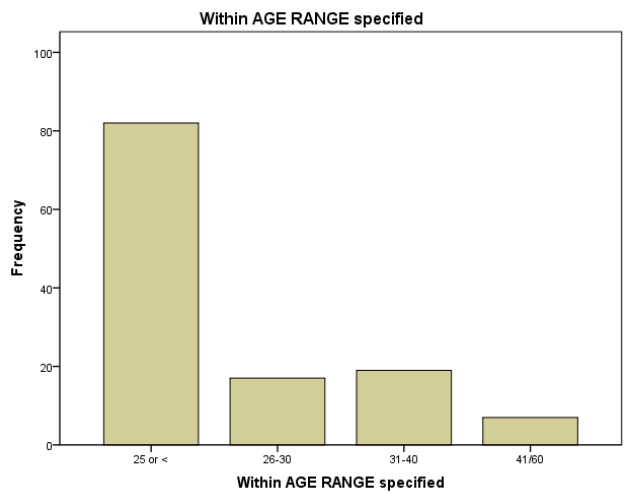
Chart 5-4 Age distribution of postgraduate student teachers
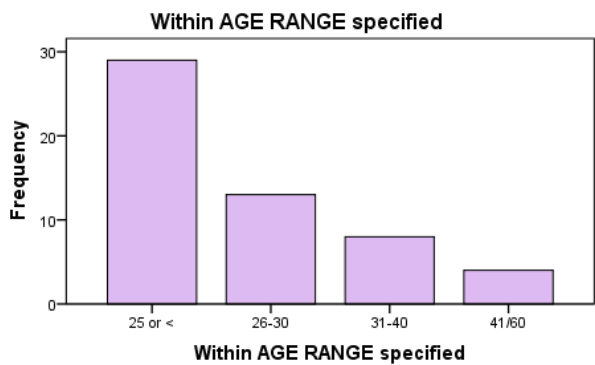
5.5 FINDINGS FROM THE SURVEY: TEACHER AND STUDENT TEACHER EXPERIENCES

In this section, data from the main questions in the survey are presented for discussion in tabulation, sometimes with accompanying graphs. All data were entered into SPSS for analysis (4.4.1.1). Percentage results are given for voice problems, details of voice training and any reported medical intervention. In addition, analyses examine any possible link between voice problems and other factors.

No further analysis of gender considerations was carried out, partly because of the small numbers of males participating in the survey. Whether or not the lower number of males to females in my study occurs because this is the 'usual' proportion in primary education, mine is not the first study to have unequal numbers. Chen *et al* (2010), conducting a study in Taiwan, collected information with 98 females and 19 males; in Spain, Bermúdez de Alvear *et al* (2010) also drew on data from females to males in the ratio 3:1; and this was similar for Smolander and Huttenen (2006) whose study took place in Finnish secondary schools.

Below, I show the occurrence of problems (5.5.2), the reporting of specific problems (5.5.2.1) and the number of problems reported (5.5.2.2). There is also data on medical or other support (5.5.5.2) and any training received (5.5.6). Later, I present some of the direct statements from teacher and student teacher participants, adding greater detail of their experience; for instance, comments on training (5.5.6.1). Firstly, I give two short case studies of individuals. The profiles of Jane and James appear under fictional names to maintain anonymity (4.6).

5.5.1   Two case studies: the individual experiences of a teacher and a student teacher

Jane – a teacher

Jane is a female primary school teacher, aged over 41 years. She has been in the teaching profession for between sixteen and twenty years. Jane describes voice problems such as 'dry throat', 'throat discomfort without virus', 'clearing the throat before speaking', 'hoarseness', and 'vocal fatigue as the day goes on'. She notes voice difficulties occurring far more after she became a teacher, although this implies that the problem was present to some degree in advance of her classroom career.

Jane says she has tried not to take time off from her work in school, but has had laryngitis, resulting in one short term absence. She reports that sore throat, loss of voice, or voice strain caused her to take sick leave 'on a few occasions'.

For Jane, it appears a major consideration that she ensures her voice problem does not worsen so she can carry on working. She describes that 'at the end of almost every half term' she has throat discomfort or a sore throat without a virus and it *'lasts about a week'*. She also says she experiences tightness in the throat in term time, *'especially towards end of day, or after too much singing'*. This occurs 'only on teaching days', but throughout the year. Jane links this with what she describes as *'vocal fatigue',* occurring every day *'especially after creative or practical sessions when children are naturally noisier'*. Jane describes her difficulty with being heard, saying: 'I *cannot <u>now</u> project my voice adequately to a hall or yard of children'* [her underlining]. This suggests that previously she did not find it difficult to make her voice audible.

Jane tries to rest her voice at times, including when she is in the classroom. For instance, she might cope on some days by writing messages for pupils on the class whiteboard. She drinks

lots of water and sometimes uses a whispered voice. On first questioning, Jane mentions only self-chosen herbal remedies; it emerges in answers to the continuation questionnaire that, on occasions, she has needed prescribed medicines. However, she does not regard her problems as 'medical'. In order to remain in teaching Jane has reduced her hours to part-time and takes regular self-medication. She now teaches about sixteen hours a week, rather than the twenty-five to thirty that a full-time teacher might undertake.

She says she attended some voice training delivered by a drama specialist during her initial training as a teacher. This was a short lecture with a hand-out which was '*helpful because it made you aware of the problems that could occur.*' The trainer also '*demonstrated techniques such as deepening your voice, projecting more effectively and adapting the voice to reduce strain and fatigue*'. Jane has had other experiences of voice training over the years, through singing in a choir. She describes '*technique training of the head and body to create different vocal effects*'.

Jane thinks that the voice qualities of an effective speaker are: calmness; a clear voice with no strong regional accent; '*use of expression and not speaking too quickly*'. She would be interested in voice training if available and recommends receiving '*more specific advice at the teacher training stage – about conserving your voice, adapting it to different situations, projecting without strain*'. Perhaps she is implying she herself did not receive sufficient help.

James – a student teacher

James is a male primary school student teacher; he is under 25 years of age and undertaking a postgraduate certificate in education course (PGCE) at the time of the survey. James says he has had no voice training or voice-related experience before coming into teaching.

He has already been absent 'occasionally' from school-based work because of a voice-related problem. He identifies this problem as laryngitis which became evident, he says, when he first began training and first worked in school.

James has asked for medical help and was advised to use a non-alcoholic mouthwash but he has not been prescribed any medication such as an antibiotic. He would be interested in voice training if it was offered because he thinks it might be useful to prevent voice loss, and also *'in use of the voice as a dramatic tool'*. Having some vocal difficulty has not put James off becoming a teacher.

Note: because James has sought medical advice it is possible that his labelling of the voice problem as 'laryngitis' is connected with this; it is also probable that any infection was of viral origin, given the advice he has received. However, the interest in voice training that he expresses in the questionnaire indicates he is perhaps thinking beyond his current situation and wanting broader help.

Detail about James and his voice is brief; as a relative newcomer to the profession he has less experience to report than Jane.

These individual experiences and those of others in the survey, captured as individual comments, are taken into account in the overall discussion of results and in deciding next steps in this study and beyond.

5.5.2 Reported incidence of voice problems

The number and percentage of teachers who reported voice problems, along with results for student teachers, are presented in Table 5-4.

Table 5-4 reporting of voice problems by teachers and student teachers

QUESTION: *Have you ever experienced any problem in using your voice as a teacher,*

no matter how minor?

Response	Teachers		All Student Teachers		Postgraduates only		Undergraduates only	
	No.	%	No.	%	No.	%	No.	%
'NO'	28	16.1	41	32.8	15	27.8	26	36.6
'SLIGHT'	52	29.9	59	47.2	31	57.4	28	39.4
'YES'	58	33.3	17	13.6	7	13.0	10	14.1
No response	36	20.7	8	6.4	1	1.9	7	9.9
TOTAL	174	100	125	100	54	100	71	100

These results require further interpretation: for instance, to examine the instances where the answer box was left blank with 'no response'. Of the 36 teachers who submitted 'no response' to the general question about experiencing any voice problem, all except one then demonstrated voice problems by giving details of specifics. As regards the undergraduate student teachers, of seven who did not respond to the general question about voice problems, all except one reported problems in answer to subsequent questions. Only one postgraduate student had 'no response' to the first question, yet this participant reported a specific voice problem in a subsequent answer. These details indicate that most of the missing responses could not be interpreted as 'no problems'. Therefore, the figures in Table 4 for 'yes' or 'slight' problems may represent a minor underestimate of the voice problems of those taking part in the survey.

The figures shown do not take account of what has just been shown on the problems of 35 teachers, six undergraduates, and one postgraduate student teacher. This lends further weight to the incidence of voice problems amongst both teachers and student teachers. Conversely, the 'No' responses in Table 5-4, where participants were saying they had no voice problems,

are likely to be accurate except for one or two missing responses (therefore, accurate within 1% for both teachers and student teachers in the survey).

Regarding the comparisons between responses from teachers and student teachers, there were evidently more teachers than student teachers reporting problems. Amongst teachers, 33.3% recorded the answer 'Yes' compared with 13.6% of student teachers. If 'slight' problems are included, then incidence is rather more comparable between the two study populations, 63.2% of teacher participants compared with 60.8% of students. The high percentage of student teachers experiencing at least 'slight' voice problems might be regarded as cause for concern, given this occurrence in the early stages of teaching careers.

Table 5-5 gives a cross-tabulation between the teachers' responses on voice problems and length of time they have been in teaching. It shows greater incidence of problems (both 'yes' and 'slight') after 21 years as a teacher and also in the period one-to-five years of teaching. Incidence at the time when someone comes into teaching and whilst she or he is a student teacher appears to indicate attention to voice is required at an early stage in someone's career.

Table 5-5 Voice problems/Time in teaching

Cross-tabulation of responses given

	TIME in TEACHING							
	Trainee	< 1yr	1-5 yrs	6-10 yrs	11-15 yrs	16-20 yrs	21+ yrs	Total
NO problems	1	3	4	5	4	3	8	28
SLIGHT problems	3	0	17	8	6	5	13	52
YES has problems	3	4	13	8	8	6	16	58
Total	7	7	34	21	18	14	37	138

5.5.2.1   Responses on specific voice problems

Both teachers and student teachers were asked to report specific problems. There were eleven voice problems listed and an additional space for participants to name and comment on any 'other' problem. Responses from teachers are shown in Table 5-6; this is followed by information on student teacher responses in Table 5-7. Percentages given are those calculated in relation to total numbers in the particular group of either teachers or student teachers.

Table 5-6 Teachers' responses on specific voice problems (in rank order)

Question: *Please tick as many of the following as apply to you – regarding any point in your adult [working or social] life – even if you have not experienced them recently*

YES responses	Frequency	Percentage
Shortage of breath when speaking	16	9.2
Difficulty being heard	28	16.1
Discomfort of pain when speaking	29	16.7
Frequent coughing	41	23.6
Frequent colds	41	23.6
Tightness in throat	54	31.0
Vocal fatigue as day goes on	55	31.6
Throat clearing	73	42.0
Hoarseness	75	43.1
Discomfort or sore throat	90	51.7
Dry throat	124	71.3
Other voice-related problem	*10*	*5.7*

Similarities between the two sets of results emerged: for instance, greater percentages of both teachers and student teachers reported 'dry throat', 'throat discomfort', and 'throat clearing'. All these figures were greater than 40% for both groups. Some throat problems were shown to affect more than 50% of teachers. More than 60% of student teachers reported throat clearing.

For student teachers, the voice-related problem identified by participants who said they had 'other' problems was having a throat infection. Amongst the teachers reporting 'other'

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problems, two listed tonsillitis, two reported losing their voice (one in the early days of being employed), one talked of a dry cough, and one teacher mentioned *'feeling of lump in throat'*.

Table 5-7 Student teacher responses on specific voice problems (in rank order)

Question: *Please tick as many of the following as apply to you – regarding any point in your adult [working or social] life – even if you have not experienced them recently*

YES responses	Frequency	Percentage
Discomfort or pain when speaking	12	9.6
Shortage of breath when speaking	12	9.6
Difficulty being heard	24	19.2
Vocal fatigue as day goes on	26	20.8
Frequent coughing	28	22.4
Hoarseness	29	23.2
Tightness in throat	33	26.4
Frequent colds	37	29.6
Discomfort or sore throat	53	42.4
Throat clearing	63	50.4
Dry throat	82	64.6
Other voice-related problem	*4*	*3.2*

Comments from different individuals were: *'voice becomes gruff as if I have a cold'; 'cannot project any more – my voice feels weak'; 'I have lost the upper range of my singing voice'; 'I am unable to sing – my throat closes and I choke'.* As with the students, some of these appeared to relate to throat problems.

There were 16.1% of teachers and 19.2% percent of student teachers saying they had difficulty being heard in class. More than 30 percent of teachers reported experiencing vocal fatigue as the day went on. One teacher had sought medical help because of experiencing problems with vocal fatigue and wanting to clear the throat before speaking. This had occurred at the end of every teaching day over a career of more than twenty-one years. This teacher had been told to *just "rest" voice'.* When another teacher mentioned vocal fatigue to

a doctor, '*it was dismissed as inevitable!*' The exclamation mark was shown in the response. Hoarseness was reported as a problem by 43.1% of teachers.

Despite this high incidence of problems, overall less than 20% of teachers indicated a problem which they had thought at the time required medical attention. For student teachers this was a smaller percentage – 11% of the group. The inference is that large numbers of voice problems were not regarded as medical. In the next section, I show calculations for the numbers of teachers and student teachers recorded as experiencing multiple voice problems.

5.5.2.2   Number of voice problems reported by individuals

Bar chart results and tabulations summing numbers of problems reported by individual teachers and student teachers are given in Table 5-8/Chart 5-5 and Table 5-9/Chart 5-6 respectively. From these figures it was clear that more teachers reported experiencing a greater number of problems than did student teachers. Almost a quarter of teachers participating in this survey (24.8%) said they had three or more voice-related problems. Of student teachers, 11.2% (14 participants) reported three or more problems.

Table 5-8 Number of problems reported by individual teachers

Summation of reported voice problems

No. of possibles ticked	Frequency	Percentage
None	37	21.3
1	60	34.5
2	33	19.0
3	25	14.4
4	12	6.9
5	4	2.3
6	1	0.6
7	1	0.6
Total	173	99.2
Missing responses	1	0.8
Sample TOTAL	**174**	**100**

Chart 5-5 Number of problems reported by individual teachers

Summation of reported voice problems

NUMBER of possibles ticked as being applicable
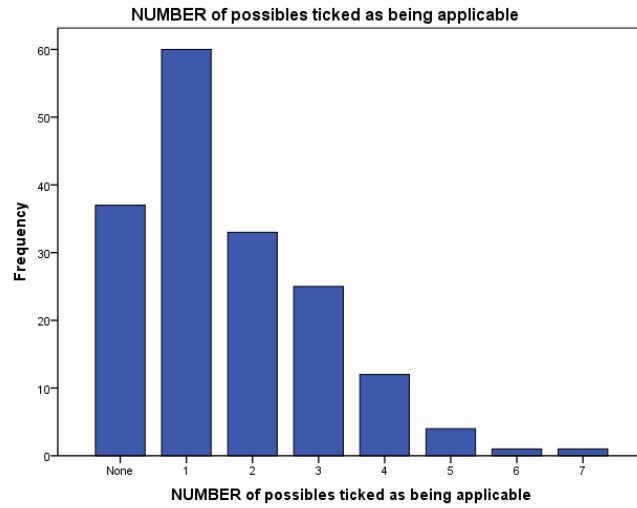
Table 5-9 Number of problems reported by individual student teachers

Summation of reported voice problems

No. of possibles ticked	Frequency	Percentage
None	9	7.2
1	50	40.3
2	34	27.2
3	11	8.8
4	1	0.8
5	0	0.0
6	1	0.8
7	1	0.8
Total	107	85.6
Missing responses	18	14.4
Sample TOTAL	**125**	**100**

Chart 5-6 Number of problems reported by student teachers

Summation of reported voice problems

NUMBER of possibles ticked as being applicable
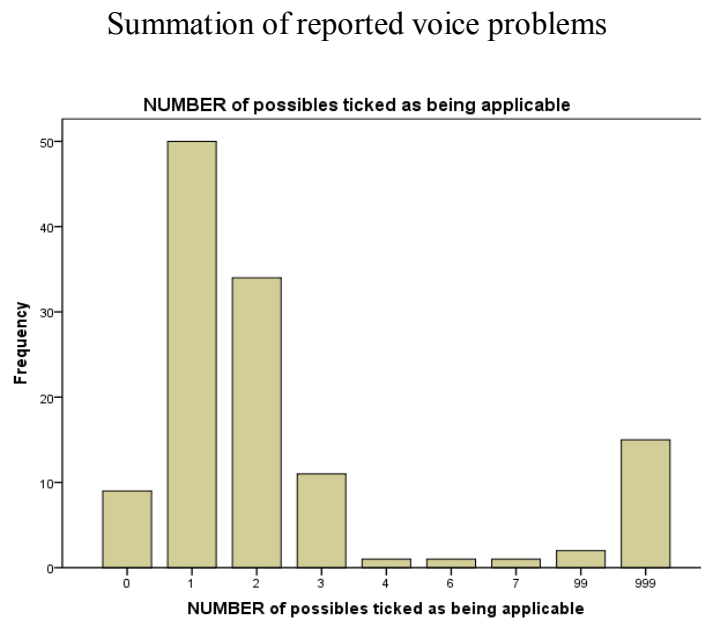
Amongst the student teachers, 40.3% reported experiencing at least one voice problem; amongst the teachers this was 34.5%. Only 7.2% of student teachers reported 'no' specific voice problems; amongst participant teachers this figure was 21.3%. This was at variance with answers reported in 5.5.2 (Table 5-4) where a smaller percentage of teachers report problems than in Table 5-8; but this is the opposite for student teachers given that the percentage reporting 'no problems' is far less here than shown in Table 5-4. Although statistics from different questions did not tally for either student teachers or teachers, the data all pointed in the direction of substantial numbers of both teachers and student teachers experiencing voice problems.

Several features emerge through cross-tabulation of the number of problems recorded for each individual teacher and their time in teaching. Table 5-10 shows that approximately one third of teachers with one or two voice problems have been in teaching for more than 21 years. Forty percent of teachers with three or more problems have been teaching for 1-5 years. These frequencies are marked in bold font in Table 5-10.

Table 5-10 Cross-tabulation for number of problems reported and time in teaching

| Number of possible problems | TIME IN TEACHING | | | | | | | | TOTALS |
	Trainee	< 1 year	1-5 yrs	6-10 yrs	11-15 yrs	16-20 yrs	21+ yrs	No responsee	
None	0	4	5	6	7	4	10	1	37
1	3	1	9	10	10	7	**21**	0	61
2	3	2	6	4	4	3	**11**	0	33
3	2	1	**10**	1	3	2	6	0	25
4	0	2	3	2	1	2	2	0	12
5	0	0	3	0	0	0	1	0	**4**
6	0	0	0	1	0	0	0	0	**1**
7	0	0	0	0	0	0	1	0	**1**
TOTAL	**8**	**10**	**36**	**24**	**25**	**18**	**52**	**1**	**174**

The figures confirm what emerges from data in Table 5-5 where it is those entering teaching and those who have been in the profession some time who appear to have most problems. Particularly amongst those coming into teaching most recently (less than a year before or 1-5 years previously), the prevalence of problems is higher than expected according to numbers of teachers in that 'experience' band; that is, 21% of the sample are in this band but their reported incidence of three problems (40%) was almost double what might be commensurate with that.

Participants also reported when their problems first began or were evident, and this is discussed more fully in the next section.

5.5.2.3 'Timing' of voice problems amongst teachers and student teachers

Reports of when particular problems occurred for teachers and student teachers are set out in Table 5-11 giving the frequencies for individuals making that response and percentages of the particular group.

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Table 5-11 When problems occur (as reported by teachers and student teachers)

Question: *Would you say any of these signs were evident: before you began teaching? etc*

When signs evident	TEACHERS		STUDENT TEACHERS	
	Frequency	Percentage	Frequency	Percentage
Before began teaching	29	*16.7*	24	*19.2*
First began training or worked in school	62	*35.6*	28	*22.4*
First employed as a full-time teacher	72	*41.4*	-	-
Start of school week	16	*9.2*	1	*0.8*
Start of every term	32	*18.4*	-	-
Every day (when teaching)	20	*14.5*	4	*3.2*
At end of day (when teaching)	50	*28.7*	38	*30.4*
All the time	4	*2.3*	2	*1.6*

It is evident that, for many teachers and student teachers, problems emerged at the start of training or when first being employed full-time in school. Of student teachers, just over 20% noticed the problems on beginning training. According to responses from teachers, problems occurred for 35.6% when they were training and for more than 40% at first employment.

Four teachers and two student teachers reported recurring problems, to the extent that they said they had a problem or problems 'all the time'. Both students were undergraduates and one referred to having a dry throat and the other to difficulty being heard. Of the four teachers, two had a problem with throat clearing 'all the time', one teacher reported throat discomfort 'all the time', and the fourth, without distinguishing between the eight reported problems, said that some problems occurred at the end of every teaching day and some 'all the time'. There were also a considerable number of others within the survey groups experiencing

problems at the end of a teaching day or every day when teaching. For 28.7% of teachers and 30.4% of student teachers some problem was apparent by the end of the day.

Specific comments made by teachers regarding when their problems occurred provides additional information. These included:

'Discomfort or pain when speaking at end of day when teaching'

'Difficulty with being heard because lost voice a couple of times'

'Vocal fatigue occurring start of term and every day when teaching'

One teacher reported she had *'considerable problems at the end of every day and vocal fatigue as day goes on'*. This is Jane, whose case study is reported in 5.5.1.

5.5.3 Absences from work due to voice-related problems

Responses to the question about voice-related absence from work are shown for both teachers and student teachers in one frequency table (Table 5-12). Such information may not clearly show the impact on work attendance attributable solely to voice problems because absences may include instances of cold and chest infections. In other words, the results were likely to reflect how participants interpreted the question and their opinion on what constitutes a voice problem. Conversely, in comparison with daily or termly voice problems reported by many in the survey groups, absence rates are lower than might be expected. This implies that many carry on at work regardless of such problems.

The implication described above was borne out by individual comments, for instance where one teacher said she was *'never absent';* but added, *'I feel I have a weak voice now because of my job and having to constantly use it all day'*. She also said: *'always loved singing but don't unless have to now – I feel it straining my voice'*.

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Table 5-12 Work absences (as reported by teachers and student teachers)

Question: *Have you ever needed to be absent from work because of a voice-related problem?*

	Teachers		Student Teachers	
	Frequency	Percentage	Frequency	Percentage
Never	95	54.6	95	77.6
Rarely	32	18.4	20	93.6
On a few occasions	42	24.1	8	6.4
More than once a term	3	1.7	-	-
Total	172	98.9	123	98.4
Missing data	2	1.1	2	1.6
TOTAL	**174**	**100**	**125**	**100**

5.5.4 Evidence that some people with voice problems consider leaving teaching

Five teachers in the survey (2.9% of the sample) had considered leaving teaching. The teacher, Jane (5.5.1), had made considerable adjustments in order to remain as a classroom teacher. She continued by working part-time so she could *'rest'* her voice on the other days.

A number of teachers (22, which is 12.6% of the sample) reported they knew of others who had given up the profession because of voice-related problems. One teacher wrote about someone who had *'constant throat infections, tonsillitis'. S*omeone else reported knowing a teacher whose *'voice problems contributed largely to decision to leave teaching early'.* Two students knew someone who had left teaching reportedly because of voice-related problems.

5.5.5 How teachers and student teachers deal with their voice problems

Voice-related absences occurred for the minority of those taking part in my survey, despite the high percentage of participants reporting voice problems. Teachers, such as those reporting absences (5.5.3), appeared to search for ways of dealing with voice problems to avoid effects on their work. Some strategies can be generalised; others were sometimes specific to the individual. I give further detail and examples in 5.5.5.1. I also report on medical provision for the small number who said they had sought it (5.5.5.2).

5.5.5.1 Non-medical courses of action or solutions

Because the incidence of reported problems was higher for both teachers and student teachers than the figures for those seeking medical or SLT advice, it can be assumed that many courses of action were non-medical or non-clinical. It was not possible to quantify this from the questions posed in my survey, but in several instances professionals reported 'self-prescribed medication' such as throat and cough lozenges. As discussed previously at 3.3.2.2, there is sometimes reliance on hydration as a 'passive or conservative' measure along with ' "speak softly" and "use amplifiers" ' (Yiu, 2002: 223). However, Yiu indicated that in this respect the problem is not being solved and this needs to be understood. Many individuals in the teacher survey reported these and other strategies of 'voice conservation' or vocal hygiene, as denoted by Aronson and Bless (2009) (3.3.2.2).

Some teachers also recommended that anyone coming into teaching should find ways of attracting pupils' attention without constantly raising the voice. Also, someone like Jane (5.5.1), who has seemingly more intractable problems, might opt to engage in 'modified' voice use such as writing messages on boards to replace verbal communication, or might reduce their teaching hours, if that was an option.

5.5.5.2 Medical interventions or solutions

Some teachers considered their voice-related problems required medical help and 34 of the 174 participants (19.5%) sought this. Not all of the medical appointments led to prescriptions. For instance, one teacher reported fatigue to a doctor only to find it was regarded as 'inevitable'. Fourteen student teachers (11.2%) sought medical advice.

At some time, 28 teachers (16.1%) and 24 student teachers (19.2%) had been referred to ENT specialists. No further information was gathered in the survey and the study did not

investigate this further. Seven teachers (four percent) and three students (2.4%) were seen by therapists. Five teachers and all the students said this had helped to resolve their problem. Of the two teachers who said they were not helped by this consultation, one had persistent problems with a 'tickly cough', and the other, who was referred to a specialist, had undergone a tonsillectomy and two nose operations 'to help ease my sore throat', but still experienced problems.

In view of these findings that medical intervention applies only for a minority and that non-medical strategies are preferred by many teachers, it appears pertinent to be investigating training as a solution to voice problems. The questionnaire asked about participation in any training related to voice, requesting comment.

5.5.6   Participation in voice and voice-related training

Teachers and student teachers were asked, *'Have you ever had training for using your voice as a teacher?'* They were also asked to report other 'voice-related' training. The *'yes'/'no'* tabulations for teachers and student teachers are shown in Table 5-13.

The predominant point to emerge in these data is how little training has been provided for these particular teachers. It is also apparent that varied amounts of training are accessible, presumably depending on where and when initial teacher education was undertaken, and what particular schools or local authorities might offer subsequently. The same can be said of students in this survey who are completing initial teacher training in England. I am specific here about England because there is evidence that in Scotland an overall strategy has been considered by the regulatory body for teachers (The General Teaching Council for Scotland, 2003).

Table 5-13 Voice training of teachers/student teachers

Question*: Have you ever had training for using your voice as a teacher?*

Question*: Have you had other voice-related training or experience?*
For example: singing, drama

		Teachers		Student teachers	
		Frequency	% age	Frequency	% age
Had voice training for teaching	No	151	86.8	121	98.6
	Yes	23	13.2	4	3.2
Type of voice training	ITE	15	8.6	2	1.6
	CPD	7	4.0	-	-
	Outside education system	1	0.6	2	1.6
Duration of voice training	< 1 week	15	8.6	2	1.6
	1week – month	0	0	1	0.8
	>1 month	3	1.7	1	0.8
	No information	5	2.9	-	-
Other voice-related training (drama, singing)	No	132	75.9	99	79.2
	Yes	42	24.1	26	20.8

In some English universities, although it seems not a common occurrence at present, student teachers might be offered training. This was not the case in the university where I conducted the main survey, although those completing questionnaires at Keele University (see 5.7.1) had been offered a short voice training session in their secondary teacher training there.

5.5.6.1 Reports of training from teachers and student teachers

Teachers and student teachers who participated in the survey gave a variety of individual comments on training they had received; some remarks are presented here as indicative of their experience. Much of the training was short and comments indicated limited impact.

Examples of comments received are as follows: *'Short lecture with hand out'*. The teacher commented that, *'It was helpful because it made you aware of the problems that could occur.'* One teacher reported a one day course whilst working for one particular education authority and that it gave *'useful tips'*.

Evidence of a school approach came from just two teachers out of the 174 in the survey group: *'INSET DAY [in-service training] at previous school'*. One of them said that it was *'useful to remind staff, but nothing previously unknown'*. The other reported: *'One day school training - by speech and language service'* of the local authority.

A school approach appears to be unusual as these two were the only such survey responses. In my years of teaching, I have not previously come across voice training provision for a whole staff team in any school.

Of the teachers receiving vocal help during their initial training, some of the comments received were:

'Half day whilst training at university'

'One day course when training'

'Half a day with helpful hints on breathing, posture, relaxation'

'A little advice on some occasions during my B.Ed. degree course'

Again this confirms that there was very little support and that it was of short duration. One teacher received some ideas on 'voice' during PGCE training and said it was '*good to put into practice*'. However, the same teacher also reported voice problems occurring at the end of each school day at the time of the survey. Another teacher, who spoke of receiving a *'small amount'* of vocal input during initial training, said it was *'helpful at the time'*. However, at the time of the survey she or he wanted *'training on voice control'*. It is not clear what was meant

by this but it nevertheless gave an impression that the teacher did not feel adequately prepared by training for a role seen as vocally demanding.

As part of a PGCE course, one teacher commented on being videoed, saying this was *'extremely helpful'* as a reminder *'not to use a monotone'*. The teacher also mentioned learning to *'throw voice for effect'*. One teacher reported having one lecture during initial training but said, *'This was not particularly helpful, as more time is needed to develop an effective voice regime.'* In another account of teacher training experience, one teacher spoke of help which *'has preserved my voice for 33 years of teaching'*. However, the teacher also reported persistent voice problems and that she had developed *'an inability to sing, even though I have been in choirs previously'*.

Post training, one teacher had been able to observe other staff during her or his first year of qualified teaching. The individual thought that any interest they had in CPD on voice was *'not relevant'*, because *'it's own choice how to use voice'*.

The idea of being able to project the voice was mentioned by someone describing: a *'short training session which mainly focused on projection – it was okay'*. No detail was given but it did not sound as though the teacher found the session of major help in the classroom. The topic of 'projection' is discussed further in 5.8 when survey findings are summarised in the light of literature sources.

Compared with researching by interview there is no opportunity to find out the reasons for such answers to a questionnaire and these responses would all have been worthy of further discussion had that been possible. No one in this sample of teachers and student teachers indicated that they were well prepared by training to use their voices in class so that, overall,

the support offered to this sample of teachers and student teachers appears inadequate. In the next section, responses on voice-related training outside the teacher training context is given.

5.5.6.2 Reports of voice-related training

Some other participants mentioned training associated with drama-related activities: 24.1% of teachers and 20.8% of student teachers in the survey. Again the term 'projection' was used to describe some of this. For example a teacher spoke of '*one term during initial 3 year training (1968-71)*' and that it covered '*drama/voice projection*'. One teacher had studied drama as a main subject at college and thought this had '*helped voice projection*'. It was not possible to discern within brief questionnaire responses whether these comments implied thinking of 'projection' as something more than being sufficiently loud to be heard at the back of a room (3.2.2.3).

Describing other drama training, some comments were: '*One day's training around 1996, mainly based on drama*'; and '*One-day drama course, plus singing lessons on how to conserve voice*'. The latter teacher commented: '*not shouting, different tonations, ways to use it.*'

One participant had experience of singing, described as '*singing in a choir*' and '*using chest voice*'. The teacher commented, '*this was for three months*' but she or he was '*not sure it helped voice projection when speaking*'. One participant undertook a singing course in 'Sing Up' which around the time of the survey was becoming part of primary school music provision. She or he said that '*part of that was about use of voice, but very limited*'. Another teacher reported, '*training in choral singing, breathing techniques*'; this was not undertaken in school time.

Other training occurring outside education provision was provided by therapy services, such as the teacher who had '*speech therapy and breathing exercises, advice on what to avoid and lubrication of throat'*. This sounds partly like a form of vocal hygiene approach, as discussed in 3.3.2.2.

One teacher reported attending two short courses of more detailed vocal training at a local university. It was not clear how she or he had come to enrol, but it was reported as a *'voluntary four-session course for teachers; six-session evening course for general voice at X University'*. She thought: *'They were very helpful'*. The course appeared to be exceptional in that it was of greater length than that received by any other teacher or student teacher in the survey apart from the few training in drama. Responses in the survey regarding participation in courses and other vocal activities appear to show many teachers interested in training, even if it meant giving time to it voluntarily.

5.5.6.3   Interest in voice training expressed by participants in the survey

Student teachers in the survey answered a question about whether they would be interested in voice training if it was offered, with 65% of students saying 'yes'. Although still representing a majority of participants, the percentage figure for teachers in the survey saying 'yes' to training (52%) was less than for student teachers.

Closer analysis of the profile of teachers interested in training is informative. For instance, 28% of those responding 'yes' were in the 31-40 year age range and 46% were in the age range 41-60 years. In other words, interest in training did not decline with age; this is perhaps against expectations. A further detailed comparison with length of time in teaching showed that, for the 20% who had been in teaching for only one to five years, three-quarters of them were interested in voice work. Thirty percent of the sample had been teaching for longer than

21 years, yet more than half of those teachers said 'yes' they would like voice training, if offered. This is substantial evidence of a wish for such support; whatever their length of experience, teachers appear to recognise they have a need for vocal support.

When Yiu investigated possible prevention of problems amongst teachers including the idea of having some preventive measure in teacher training, he indicated that the teachers 'were hardly ever consulted on what they would like to get out of these programs' (2002: 223). However, in the instance of my survey it appears that asking about what might be required by teachers meets a problem that they are not necessarily sure what they need or what will work. This is investigated further in 5.8.1.

5.6   PURPOSE, FORMAT AND RESULTS OF THE CONTINUATION QUESTIONNAIRE

A purpose of this questionnaire was to draw on the willingness of some teachers to answer further questions. It gave opportunity to refine some of the original questions and to request more detailed answers. For instance, I asked participants to be more specific about any training they had received. As another example, I 'classified' voice problems differently, giving broad choices of 'tonsillitis', 'laryngitis', 'general sore throat', 'loss of voice', 'voice strain'. This idea was a result of my further reading and also consideration of answers to the first questionnaire.

Once I had made contact to confirm whether volunteers were still agreeable to further participation, the questionnaire was circulated and responses were received from 12 teachers. All responses were from female teachers, because no males responded at this point. Otherwise, the group was a cross-section of those who considered they had no voice problems contrasting with some teachers who described considerable problems. This provided an

opportunity to double check the actions individuals took in response to a voice problem. As in the first questionnaire, there was space and therefore scope for participants to add their own comments as they wished. These details are shown in Appendix G.

Having noted in my further reading that some surveys ask teachers about weekly hours of teaching, I included this within the continuation questionnaire. In retrospect, that might have been a useful aspect to check in the original survey. The amount of vocal use has been referred to as 'vocal load' by some clinicians and researchers (see for instance, Dejonckere, 2001: viii). In one published study, researchers aimed to discover this by asking about hours of 'vocal effort' per week (Sliwinska-Kowalska *et al*, 2006: 98).

The second questionnaire allowed me, therefore, to further verify or clarify points in addition to responses received in the initial survey. Particularly, responses to this continuation questionnaire endorsed the view that few teachers amongst the twelve were able to say that their professional voice use was problem-free.

As with the initial questionnaire, there appeared to be a continuing concern among individuals about their own care and well-being when experiencing vocal problems. It emerged that individuals might be uncertain what to do to remedy any problems, other than seeking medical help, regardless of whether it appeared to be a medical problem.

The findings confirmed little training being received by teachers but again there was a strong interest in this being provided. For instance, in response to an open query: '*What you think could be done to help others in teaching*', almost all participants suggested voice training. Comments included:

'Training at university – using your voice'

'Better training on how to use your voice and also how to look after it

'To be given voice training'

'Voice projection training'

'Voice training is so central to a teaching role that it should become part of teacher training courses'

'Voice training, with awareness of minor symptoms which could lead to problems'

'Proper voice training for NQTs'

Two teachers also linked their responses to broader considerations. One said: *'training to control nerves'* and the other spoke of: *'perhaps knowing that tension, anger, fear cause vocal problems'*. Also, these participants demonstrated awareness of their situation when identifying the 'challenges' of speaking before a class or 'audience' of children and/or adults for the first time. One said: *'psychological fear of being unable to articulate a coherent sentence by not collecting thoughts properly'*. The other wrote about being *'very nervous'* when returning to teaching after a career break. This aspect of reactivity is discussed in relation to the AT (1.8.3) and drawn into my conclusions (7.6).

One participant recorded no voice training but no voice problems either. It might be wondered, therefore, what could be drawn from this teacher's responses as a 'successful' voice user that might help others or aid my search for evidence. The teacher said she learned to *'project voice in drama group'*. She explained that she *'could always do this and speak in large rooms, e.g. hall, and can be heard'*. This teacher also suggested that voice qualities for an effective speaker involve: *'clear speech without rushing. Good breathing, confidence to project. Not shouting. Good intonation to keep interest'*. The teacher was in the age range 41-60 years, and had been teaching for more than thirty years. Her one spell of tonsillitis had not required absence from work and she took antibiotic and analgesic medication to recover and *'tried not to over use voice'*. There are points being made by this teacher that are part of

further discussion in this chapter, such as that on 'projection' in 5.8. The drama training link was one that I began to make early in my study, as investigated in the review of voice teacher texts (3.4.2).

Teachers responding to either the initial or continuation questionnaire appeared to describe their voice problems as a multiplicity of factors, referring to a range of 'coping' strategies. Note: the information in Appendix G is drawn into discussion in other sections, as appropriate.

5.7 FURTHER EVIDENCE FROM THE EXPERIENCES OF STUDENT TEACHERS AND TEACHERS

Further evidence which I have taken into account came through a small number of questionnaire responses from student teachers qualifying to teach in secondary schools, and from two teacher interviews.

5.7.1 The small survey of secondary school student teachers

Secondary school student teachers were contacted through, and with the permission of, Keele University staff. Information was gathered from a small number of individuals agreeing to participate. The questionnaire followed closely the format of the original but asked one additional question: their main reason for helping with information in such a survey; responses on that confirmed that these students took the view of helping others. This outlook appeared akin to 'beneficence' (as discussed in 4.6). Similar reasons may have prompted the many primary school teachers to give time voluntarily in their survey.

Responses to the questionnaire for secondary school student teachers are shown in Appendix J. The numerical information emerging from the responses of the sixteen students taking part is discussed here. Firstly, there is detail of the 'group' profile.

Four of the 16 student teachers were male so that the proportion of males to females was higher at 25% of participants than in the main survey of primary student teachers (5.4.2). It is the case that male to female ratios in secondary school teaching tend to be more balanced than in primary. However the sample was too small to be considered representative. There was a spread of ages, with six student teachers aged 'under 26', two aged 26-30, three in the 31-40 age group, and five in the 41-60 age range.

The student teachers were following different subject specialisms: Information Communication Technology (ICT), Science, and Modern Foreign Languages (French, German, or Spanish). However, I did not have sufficient participants to make any valid comparison with the secondary student teacher survey of Fairfield and Richards (2007) who had 171 participants. The majority of the students in my survey (eleven of the sixteen) were teaching for 10-15 hours per week, and the remaining five taught 16-20 hours. Before commencing the one-year training programme, six of the 16 students had already worked in schools, perhaps as teaching or language assistants.

Qualitative information on voice gained from the secondary student teachers is given here. In respect of voice training, all student teachers in this small survey had attended some training, that is, a short two-hour course offered within their teacher education department. One student also indicated attending a weekend course led by a voice coach, and experiencing one day of training in using the whole range of the voice, presented by a shiatsu practitioner.

Comments on the short course offered by the university varied between student teacher participants but included commentary such as: '*simple warm up technique*'; '*helped with projecting voice*'; '*breathing techniques*' or '*exercises*'. One student teacher thought it was '*good for staying calm and keeping voice strong*'. One participant showed she found the

training helpful with *'advice to speak not from throat but nasal area'*, but she commented she *'couldn't sustain it'*.

Thirteen of the student teachers wanted further training and gave various suggestions for what this might include. Comments were: *'more classroom specific'*; *'more focus on applying it to teaching'*; *'more projection (talking loudly without straining the voice)'*; *'regular longer sessions as forget the advice – more about how to project'; 'classroom based training and mentoring'*. There was comparison with the training already undertaken so one participant wanted something different *'to see if there are any other techniques we could learn'*. Another suggested: *'maybe different as I feel I need to make my voice stronger/louder'*; and a third student teacher said: *'some of the same, but more things as well'*. Four participants said they had other voice-related training – two in singing, and two from the singing and drama experiences of their own schooldays.

Three of the group said they had not found the voice training offered at their university helpful; one was *'not sure'*. These students gave no indication of why this was the case for them. Although the same individuals indicated they would like further voice work, they did not suggest what other training might be better for them. Across the group as a whole there appeared to be some problem with knowing what training might have to offer and this was also identified in connection with the main survey (5.5.6.3; 5.8.1)

Three of the student teachers had taken a 'rare' absence from work in school because of a voice-related problem. One gave the reason as *'tonsillitis'*; another student had a *'general sore throat'* (which she said occurred *'most years'*); and the third individual reported waking one day with *'no voice'*. Other voice problems, not involving absence from work, did not appear a major concern for any participants in this questionnaire survey. Half of participants responded

to the question about whether they had any voice problems saying 'slight problems when using voice as a teacher'; a further five indicated 'minor problems which needed just small steps to remedy'. These were different prompts in my questionnaire to the ones used in the main survey and this is noted for any future work. One participant said the question was not applicable to them, and two students gave no response to the particular question, even though one then listed two specific problems: 'throat discomfort' and 'vocal fatigue as day goes on'. This student teacher was also the individual who said they could not sustain a change in the voice during or after the short training session offered at university.

5.7.2   Interviews with two teachers

A newly-qualified teacher (NQT), working in an urban secondary school, agreed to meet for an interview. Although this teacher had no difficulties akin to those of some teachers who responded to the survey, she indicated a wish to improve her voice. Her own interest originated in her master's level study on classroom teaching. Some key points arising from her interview are discussed in 5.7.2.1.

Later in the course of my research, I met a student teacher just completing her work-based training. She also was willing to take part in an interview and to talk about her experience of studying to become a primary school teacher having previously trained at drama school to become an actor. The interview took place as she was about to begin her post as a qualified teacher. A short report on some of her comments is given in 5.7.2.2.

Both interviews were semi-structured and informal, what may be termed an 'interpersonal encounter or dialogue' (Cohen, Manion and Morrison, 2011: 421) (4.4.1.3).

5.7.2.1 Interview with the secondary school teacher

I refer to this teacher under the fictional name of Claire. She had experienced no problems in using her voice in the classroom, had worked in school as a teaching assistant prior to her training, and also had undertaken a teacher qualification course based in school. Claire therefore had considerable classroom experience even at the start of her training, but a year after qualification wanted to enhance her use of voice in class. The interview covered many voice-related topics, those which were included in my prepared schedule of questions, those where I asked her to elaborate on what she was saying, and those which she introduced into the conversation. The transcript (Appendix C) demonstrates an informal dialogue between us, as intended (5.7.2)

The main ideas and information for my research emerging from Claire's interview were that a teacher may be dissatisfied with their voice, even when able to get on well in classroom situations. Claire had found out certain qualities of her own voice which could be improved. She said: '*I am a loud* speaker', and '*I tend to be at one level in the class or louder if getting attention'*. It had been pointed out to her that some teachers have a much quieter manner to '*draw the children in using their voice*'. Claire thought that what counted was being '*loud enough to be heard'* (in other words, to suit the circumstances of the situation) but she wanted to be able to vary her voice more in terms of contrasts in loudness.

Claire also suggested that for interesting the children, the teacher's choice of language was important and that pace in speaking should be not too rapid for their understanding, but not so slow that they could lose interest. When asked about 'hoarseness' or 'voice loss', Claire said she had never experienced these herself but that she had noticed on occasion someone who was speaking '*too loud*[ly] *or at too high a pitch'* and whose voice '*has just gone'*. She

described how sometimes a teacher might get really angry and raise their voice '*to a certain level*' so it '*disappeared on them!*'

The interview responses indicated Claire being aware of voice qualities of loudness, pace, and variation (or what she later called 'tone') and recognising these, at least when she heard other people's voices. It was of interest that apparently she recognised her own loudness only from the comments of others. Claire made the point that '*you stop hearing your own voice*' and she had found it useful to get feedback from observers and also through video recordings of her voice when teaching. She had also learned about voice in the classroom '*mainly through observing other members of staff as I saw how they did it*'. This led to her adopting '*bits of good practice*' which she said then '*become your own*'. Claire seemed to think that this could include her own trial and error as well as observation of self and others.

Claire suggested that training '*is probably personal for everyone, it's not going to be the same*', and that the form of in-school training she experienced did not allow her time '*to experiment with different types of voice*'. She talked about the problem of changing her voice and voice use, and having to do something '*consciously*' which she hoped would in time become '*subconscious*'.

The interview also substantiated the idea that most teachers speak for substantial lengths of time daily in the classroom. Claire said she taught for five or six of the forty-minute periods in a school day, and that sometimes she might teach all morning (that is, 8.30 a.m. to 1.00 p.m. with only a fifteen-minute break). This is a considerable length of time and, as shown through the interview with an actor (1.8), is longer than any actor's time on stage in one spell. As a teacher, Claire said she was aware of trying not to use her voice too much, but that sustained use of voice appeared necessary in class. She described working around this via a technique

for providing a written task on the board ('*like on the interactive whiteboard for them to refer to during the lesson*'), as well as giving oral instructions (Appendix C). She thought this would not only save her voice but help pupils who could get the idea this way, if not by oral prompt. Nevertheless, sustained use of the voice is the main means of teacher communication.

5.7.2.2 Interview with the primary school teacher and actor

This teacher, who I call Debbie, attended a drama school and began a professional acting career before deciding to re-train as a teacher because she thought she was not going to get consistent work as an actor. Also, she wanted to continue enjoying being on stage as a performer and had remained in an amateur dramatic group. In other spare time, she was continuing to organise a local drama group for school-age youngsters.

Like Claire, Debbie described long hours using her voice in the classroom, saying: '*So a day - 9 'til 12, three hours, and then to half three. I'd say six hours – and I don't shut up anyway! I'll talk all lunchtime and all through break*'. I commented on there not being much time out of the primary classroom and Debbie agreed with this: that even an NQT would be in class over long hours on the equivalent of four days out of five. Debbie also said that her own drama group and the youth theatre meant she was rehearsing or teaching an additional three hours on three nights of the week and all day on Sunday.

At the start of Debbie's teacher training, there was little organised support for using the voice in class. Debbie remembered '*tips and reminders*' where student teachers were told not to use their voice as a behaviour management technique, for instance by speaking loudly much of the time. No one gave 'solutions' but just suggested '*don't use your voice so much*'.

The full interview transcript is given in Appendix D but some main points are discussed here. Debbie clearly knew that school teaching was demanding on the voice and she was able to

suggest ways in which her drama training might have been of help. For example, she said she did '*a lot of work to make it lower in tone*'. She also spoke of exercises '*to make it carry further*'. When first teaching in school she said she would '*forget all about voice work and drama school training and everything*', so '*I used to have to shout to get the children's attention, and I did find to start with I was losing my voice*'. Debbie added, '*as soon as the head teacher said to me, you need to use your voice - the pitch of your voice - more, because I'd had my acting training I knew exactly what she meant. I knew how I needed to be using my voice. I didn't find.... I didn't have to do much research into it; I thought, "oh yes, it's obvious"* '.

Debbie described how actors use their voice instead of shouting: '*It's more about projection and things like that – and looking about pitching it in different places*'. If she needed to be loud, she said she would think about projecting. It was unclear what this meant in practice but it appeared to work so she did not lose her voice. Several times she emphasised that her own training was about doing exercises. She had been introduced to the AT during her drama training.

During the interview, we discussed strategies for addressing any voice problems. At first Debbie said she had experienced no particular voice problem in either acting or teaching, although she made adjustments to her voice during drama school, changing her Midlands accent and lowering the pitch. Also it emerged that she suffered sore throats as well as incidence of lost voice such as that described above. She said that sore throats had persisted since she was younger. She was not specific about the age this started, just saying '*when I was a child*'. There was no mention of long term medical intervention, even though it seemed to be an on-going problem. One date scheduled for the interview was cancelled because Debbie contacted me (by text) to say she had no voice. I later learned that on this occasion medication

was needed for a throat problem. She described other instances where she had gone to her amateur drama group and '*done voice warm ups*', which seemed to ease the problem. She reported losing her voice when she was performing a play and said: '*By doing an hour-long voice warm up before the show, I managed to get my voice back a bit for the show*'.

Debbie's accounts of her experiences seemed to indicate no simple relationship between being trained in drama and avoiding voice problems. She admitted that her accent was more evident again after her return to the Midlands. She did not comment on the lower pitching of her voice as to whether she considered she had maintained what had been taught at drama school. There is uncertainty, from what she said, whether her recurring voice loss or throat problem might have an organic or medical cause or some other underlying factor.

5.8   RELATING THIS PRIMARY EVIDENCE TO MY RESEARCH QUESTIONS AND THE LITERATURE

As shown through strands of the discussion in this chapter, the pattern and detail of data received first-hand from teachers and student teachers relate to aspects of the topic considered within the literature review. For instance, the problems associated with classroom demands on the voice were analysed in Chapter 2 and are evident from numerical incidence and qualitative remarks received in the survey.

Detail relevant to my research questions emerges in analysis of the survey evidence. For example, there is considerable evidence on the vocal demands of teaching and on qualities of voice observed and 'assessed' in practice by teachers and student teachers themselves (Research Questions 2 and 3). It is particularly pertinent and informative to hear this expressed in their words. Data from all questionnaires used in the survey are relevant, as are the detailed comments expressed in interviews.

The problems described by participants in the survey and during interviews also addressed subsidiary questions (signposting the literature review) arising in Chapter 1 (1.9.3). The questions led to direct evidence rather than only that available from secondary sources such as the literature; that is, information on specific voice problems and strategies and solutions to them.

5.8.1 Teachers' voice problems in comparison with other professions

Akin to evidence from other surveys, the data from my survey showed considerable numbers of teachers and student teachers experiencing voice problems. My survey had no access to other employment groups for comparison with teachers. This means that my evidence is similar to that presented by researchers such as Neto *et al* (2008), Morton and Watson (1998), and others (2.3.1.1). However, this survey is different to many in providing comparative information on teachers and student teachers at a particular time and in one geographical area of the UK in a way which may not have taken place previously (1.6.1).

Some similarities emerged between teachers and student teachers in my survey, for instance incidence and types of problems (5.5.2; 5.5.2.1). The survey also confirmed that amongst those reporting voice problems, only a small number had sought medical help. This verified that many of those experiencing a difficulty dealt with it in a non-medical manner. My questionnaire gathered data which was numerically accessible and describable but it adopted an exploratory approach in keeping with Pring's suggestion that such evidence may help me 'reshape' my 'social construction' of the situation (2004: 56), presumably adding to the impressions of my own prior experience (2004: 56). Combined forms of evidence reveal different aspects of the topic accessible to the different approaches (4.5.1; 4.5.2).

5.8.2 My survey in relation to the kinds of problems teachers experience and the qualities of voice needed

The types of problems reported by participating teachers and student teachers were often throat-related, for example throat discomfort, having a dry throat, and throat clearing before speaking. There were lesser-occurring problems described as hoarseness and vocal fatigue at the ends of teaching days. Nevertheless, the teachers with any of these problems presumably found speaking difficult.

Several teachers in the survey indicated that being heard was one of the most important voice qualities for a teacher. Filling in the continuation questionnaire, one teacher suggested desirable qualities as: clear speech '*without rushing*', '*not shouting*' but '*confidence to project*' or be heard (5.6). This teacher also said '*good intonation to keep interest*'. The points from the survey concur with what Claire talked about in her interview (5.7.2.1): that it was important to be loud enough, but not too loud and that, in her experience, pace of speaking was influential to pupil understanding. In voice quality criteria useful to identifying 'good' voice, I have discussed what voice scientists suggest for loudness appropriate to context, and shown that pace is acknowledged also. For instance, Hollien lists both 'softer than average vocal intensity' and speaking 'at rates somewhat slower than average' when he defines 'good' voice (2000: 22) (3.2.1).

Amongst both teachers and student teachers in the survey there was some reported difficulty with being heard, despite it being the desirable 'stock in trade' of the profession when it comes to pupils being enabled to learn. If so-called hoarseness or throat problems affect clarity of voice, they too might be an issue for audible communications in the classroom and around school. In the interview with Debbie, it emerged that she regarded her work during drama training to lower the pitch of her voice as important to clarity when it came to speaking

as a teacher in class (5.7.2.2). Hollien referred to speaking 'at lower-than-average fundamental frequencies' (3.2.1).

As apparent in other writings, such as Martin (1994), Vilkman (1998; 2004) and McGlashen and Howard (2001), the vocally-demanding role of teaching can be examined, yet there still remains the issue of some teachers experiencing problems (or greater problems) and others not. In this survey, I did not attempt to investigate ideas or opinions on specific causes of voice problems. It may be that teaching is contributory to voice problems or causes problems to manifest themselves, but that is not evidence of causation. Listening to the views of my own participants revealed no-one in effect saying: 'I know what is causing my problem', and there were some who appeared not to have found any answer or solution leading to definitive change in their troublesome voice problems. The inference from one teacher answering both the initial and continuation questionnaires, was that cutting down on teaching hours and even changing teaching role in an attempt to avoid her voice problem, had not altered the underlying difficulty experienced when speaking for any length of time. She reported maintaining this regime so that the situation was manageable, but not resolved (5.5.1).

5.8.3   My survey in relation to the question of solutions

The main solutions applied by those taking part in my survey were drinking water, using throat lozenges or sprays, and resting the voice when possible. This approach matched strategies often classed as vocal hygiene (3.3.2.2). Some of the 'training' reported by teachers and student teachers in my survey also matched this framework, including receiving information or 'education' on possible problems. My survey outcomes revealed these professionals utilised considerable strategies, for instance to gain pupil attention. These may count as part of a solution because they indicate adapting the situation to make it manageable.

A fuller list of teacher and student teacher ideas for managing voice problems, their suggestions for others coming into the profession, is included as Appendix H. These suggestions demonstrate varying awareness of the situation. One teacher indicated a sound system to support pupils had just been installed in her classroom and how it was helping teachers as well. One student suggested buying a head set and microphone, presumably to amplify voice but did not say how this would be connected and used. As shown in my review of solutions, such provision is unlikely to become widespread and does not remedy underlying problems in voice production (3.3.1.1; 3.3.1.2; 3.3.1.3). In investigating the use of amplification for teachers, Morrow and Connor pointed to the 'amount and constancy' of voice use by teachers as a factor in their on-going problems (2011: 446). Also, research summarised by McGlashen and Howard indicated a problem in the *way* that both males and females use the voice and that this could be a factor beyond having to raise the voice in class (2001: 179).

Some teachers in my survey referred to training in voice 'projection' as a good idea. Although much talked about, including in evidence on solutions considered in my literature review (Berry, 1973; 2000; Duffy and Hazlett, 2004), it is uncertain what is meant beyond the common meaning of 'being heard'. It may be relevant to be aware of the space in which one is speaking and to speak to a particular person or point in the room (3.2.2.3) and possibly projection has some links with resonance (for instance, Martin and Darnley, 2004; Berry, 2000; and others) (3.2.2.4).

Links with voice quality literature, such as Hollien (2000) have been discussed (3.2.1). If there were 28% of teachers and 30% of student teacher participants, who had on-going voice problems of various kinds at the end of the teaching day, a question remains as to how any

change, referred to as voice 'projection' or any other, could be achieved. The situation indicated training as a main consideration.

5.8.4   Further consideration of voice training as a solution

For the participants in my own survey there seemed little voice training provision: only 13.2% of teachers and 3.2% of student teachers had received any training. Even where teachers in the survey experienced considerable voice problems, causing them difficulty every day in class, there was little evidence of vocal training being suggested or available. In addition, some teachers sometimes found that doctors were unable or unwilling to help them; occasionally a doctor appeared disinterested and regarded a teacher's problems as unsolvable. This was reflected in teacher comments (5.5.2.1). Also, in literature such as da Costa *et al* (2012), it appeared that some teachers themselves regarded it as 'normal' or a matter of course that they experienced some problems (2.4.2). A sense of inevitability emerged and my intention of going on to further information-gathering can be seen in this context.

My survey results confirm that many teachers would welcome the opportunity for training. Even amongst those longest in teaching, participants with 21 years or more in the profession, the majority were in favour of receiving such help. Interest did not decline with age; teachers in the older age group were shown to be in favour of voice training almost as much as those who were younger (5.5.6.3). Student teachers also were interested, with 65% of the sample responding 'yes' to training if offered (5.5.6.3). These data are upheld by results in the small continuation questionnaire (5.6). Comments from teachers responding to an open question of what can be done to help others coming into teaching focused predominantly on training to use the voice. The view was exemplified in one teacher's comment: *'Voice training is so central to a teaching role that it should become part of teacher training courses'*.

Although seven of twelve teachers in the continuation survey reported voice-related activities such as choir, other musical interests, or drama group membership, they said that this provided 'experience' rather than 'training'. One teacher reported enrolling in a local school of acting and attending classes for two years because she said: '*it incorporates some voice training. This has been helpful but it needs personal discipline to remember to use*' (5.5.6.2). There were no further details available in her questionnaire responses. For instance, it was unknown what the content of this voice-related training was and unclear whether or how it was effective, not least because of this teacher's considerable medical problems.

The analysis of findings from other surveys cited in Chapter 2 indicates that a non-medical solution, yet one with a sound anatomical and physiological basis, is necessary. Because voice training is one commonly suggested possibility, the comparison with actor voice training appeared relevant to finding anything that could be applicable to teachers and also to informing the view of qualities of voice required by those who 'perform'. In her interview, the teacher Debbie described how her actor training provided her with some ideas that she thought helped her to lower the pitch of her voice in class (5.7.2.2).

5.9   IMPLICATIONS OF THIS FIRST-HAND DATA GATHERING FOR NEXT STEPS IN MY RESEARCH STUDY

At this point in my study, as may emerge for any small-scale yet long-term research, there were alternative routes possible to pursue. For instance, it was feasible to seek further information from this survey population or from similar groups of teachers or student teachers. It is not uncommon to follow a broad questionnaire survey with a range of more detailed interviews. However, other than the two specific teacher interviews, I chose rather to ask further questions of interested participants via the continuation questionnaire (5.6; 5.8.4).

Having verified first-hand that teachers, and some student teachers, experienced voice problems, and noted that many are interested in specific training, the other dominant question was the measurement of improvement in voice quality for such professionals (Research Question 4). One teacher in the survey had taken part in extended drama training which gave voice-related work and one teacher who I interviewed could be termed a teacher/actor.

Having drawn on voice science texts (3.2.1), I explored the writings of four key voice teachers all still currently working in drama training (3.4.3). I also conducted an analysis of drama school approaches (3.4.2.1) with the purpose of determining measurable criteria of voice quality. This was leading towards further exploratory work linked to the AT as a relevant solution current in drama school and in my own experience (1.8.1; 3.4.2.1). The AT was identified as addressing the integrated mechanisms of voice production (1.5.2; 1.8.2) and possibly helping teachers meet the vocal demands of their role (1.4.2; 2.1).

For the majority of participants in my survey, medical circumstances seem not to be the complete background (5.5.5.1). There are examples of teachers having an inkling of trouble which appears to become more problematic over time (5.5.1: 5.5.2.1). Some issues can be quantified as convincing evidence of the extent of the problem for both teachers and student teachers (5.5.2.2: 5.5.2.3); this matches Alexander's experience of recurring and persistent hoarseness sometimes leading to 'a complete loss of voice' (1985: 24). Assuming no underlying medical cause, some teachers think any problem with their voice is due to the demands of speaking a lot or speaking loudly. This tendency to look for cause of a problem within the activity leaves aside thinking about how the activity is approached; that is use (Door, 2003: 12-13).

It appeared a useful way forward to seek further specificity in examining support for teachers to improve their use (as defined in the AT), as in my main research question. Therefore, I determined how to explore further its relevance for a small number of classroom teaching professionals.

CHAPTER 6

GATHERING EVIDENCE: PART II, A LABORATORY EXPLORATION

6.1   INTRODUCTION

This chapter provides detail regarding the exploration of change in voice quality during adoption of a procedure of the Alexander Technique. I set the context by further consideration of studies relating to posture (3.3.2.3) and discussion of other studies based on the AT. I show how my exploration differs from those that do not have as their basis the understanding of use (as shown, 1.8.2), and how the work builds on and extends studies such as that of Jones (1972).

Having identified, through the second research question, the perceived vocal demands on UK teachers in the classroom, currently (1.4.2; 2.1; 5.9), I consider means for measuring voice quality meaningfully for teachers (as in the third research question, 3.2; 3.2.2; 3.2.3). Also, the chapter addresses my first and main question (1.9.1).

Exploration takes place in a specialist laboratory at MMU, where I work with two AT teacher colleagues to gather quantitative data of postural configuration and voice. The quantitative method of evidence-gathering in the laboratory contributes to information on the situation of teachers. In line with my chosen research paradigm of mixed methods (4.5.1; 4.5.2), I draw on the numerically descriptive and qualitative evidence gained from interviews and questionnaires as reported in Chapter 5. The approach in the laboratory proceeds to collect information on voice quality in relation to use.

6.2 USE AND VOICE QUALITY: SETTING THE CONTEXT FOR FURTHER EXPLORATORY WORK

Having explained use previously (1.8.2), I give a brief recapitulation of some key points, before adding detail of specific aspects in the pattern of use justifying what is measured in the laboratory exploration.

Use can be described in certain patterns whatever the activity; Alexander said:

> I discovered that a certain use of the head and neck, and of the head and neck in relation to the torso and the other parts of the organism, if consciously and continuously employed, ensures, as was shown in my own case, the establishment of a manner of use of the self *as a whole* which provides the best conditions for raising the standard of the functioning of the various mechanisms, organs, and systems. (2000: 8)

Similarly, what Alexander discovered in observing his misuse was not just related to the vocal mechanism or solely to what he was doing in one area such as his neck; it was 'pulling out of shape' in general. In misuse, the head is pulled back (or forward) on the neck and undue muscular effort in the neck leads to distortion in other parts of the frame, for instance 'lifting the chest' and so 'narrowing the back' (Alexander, 1985: 30).

If the soft tissue of the chest and abdomen is pulled out of shape, breathing is restricted (1.8.2). The modification or articulation of the sound within the upper tract relies on adapting the size, shape and aerodynamics of the pharynx, nose, and mouth (including in relation to the mandible or jaw), any of which may be affected by undue muscular activity (1.8.3). The flexible structure of the larynx and its mobility within the throat impacts on its functioning (1.8.2; 1.8.3). Any movement (or immobility) of the larynx and other structures through

muscular activity (Zemlin, 1998: 121) affects the size of the cavity above the larynx which will, in turn, alter the resonating characteristics in association with pitch variations (3.2.2.4).

In the laboratory we explored how applying a procedure of the AT could enable improved functioning of the vocal mechanisms. As shown, this requires consideration of the whole organism (1.8.3) in a relationship of mechanics which is directed (by the brain) in a more or less advantageous way. Mechanisms of the body enable movement of 'the jointed rods (bones)' 'one on another' by muscles (Door, 2003: 25); the bones act as lever arms, the joints are the pivots, and muscles effect the movement (The University of Waikatu, 2007). There is said to be improved 'mechanical advantage' when the system works efficiently, for instance if we maintain being in the upright with minimal muscular effort; that is, less energy is required to enact the activity, assuming each part is aligned in an optimal relationship (Basmajian and De Luca, 1985: 255) (1.8.2).

Applying the principles and practice of the AT, such as poising the head, means that mechanical advantage is possible in our activities, enabling the optimal functioning of the psychophysical organism (1.8.3), whereas habitual pulling out of shape means there is 'mechanical disadvantage' in the system. The stance (the intervention) in the laboratory investigation in this study is mechanically advantageous. The head is balanced or poised on the topmost vertebra, rather than being pulled out of alignment and there is a suggested distance between the heels and for the angle of the feet one to another to achieve 'the natural neutral position of the foot' (Door, 2003: 96-98). The stance enables a stable base and is termed 'MA stance' in this study.

6.3   STUDIES ON POSTURE AND VOICE

Posture, as understood in the AT, is about *'a co-ordinated use of the mechanisms in general'* (Alexander, 2004: 100, emphasis in original) (1.8.2). The study of Arboleda and Frederick (2008) acknowledges that postural configuration as a whole is important to voice, but does not refer to the psychophysical nature of use and the role of habit (1.8.3). Instead, the study discusses 'physical' means, for instance related to the mechanical workings of muscles as length-tension relationship, suggesting this will address any postural problem (2008: 90 and 98).

Alexander's view on exercise is of consideration in reviewing Arboleda and Frederick, and the study by Schneider, Dennehy and Saxon (1997). Neither study seems to follow the idea set out by Alexander: that a learner will approach any work with their habitual misuse unless they learn how to prevent their usual way of going about the activity (3.4.3).

There is also some doubt on whether the concept of use is recognised within studies such as Kooijman *et al* (2005) creating a posture/tension index (3.3.2.3). Their consideration seems to be of static posture, whereas posture has to be considered as dynamic (Gray, 1995: 898 and Basmajian and De Luca, 1985: 255). Also, it is emphasised that 'in posture the individual is mobilized (integrated) for movement according to a definite pattern'; this means 'in posture the individual is as truly active as in movement' (Coghill in Alexander, 2000: xx).

The approach in the exploration at MMU demonstrates a research study different to some others. For instance, we helped individuals to apply a procedure for upright stance to improve their psychophysical use by following the defined basis in the AT (6.2), rather than talking through an 'exercise' bound to be carried out on the basis of habit. Our measures were in contrast to Kooijman's study (2005) which relied on gauging posture through the perception

of clinicians or therapists. Also, we gave instructions for participants to bring about the change in psychophysical use themselves. For example, there was guidance on poising the head on the topmost vertebra and instructions for adjusting the base created by the feet; these can assist in achieving reduced muscular activity throughout the mechanisms (6.2). What we studied was participants putting this into effect; we had opportunity, therefore, to assess improved psychophysical use and any effect this had on voice quality.

6.4   STUDIES OF THE ALEXANDER TECHNIQUE AND VOICE

There has been little research on the Technique since F.M. Alexander's investigation into his own voice. Before reporting my study, I will summarise what has occurred in the few studies that I am aware have taken place and demonstrate how the exploration at MMU is different.

6.4.1   Research using mainly qualitative methods of data collection

Barlow (1990), Duarte (1981), Lloyd (1986), Macdonald (1997), and Zipperer (1991) have all collected qualitative evidence.

6.4.1.1 Zipperer's study

David Zipperer conducted a survey of voice teachers in US colleges; he received responses from 42 of the 155 who were contacted. His analysis comprises qualitative research into singing, reporting 'overwhelmingly' positive benefits of the AT (Zipperer, 1991: 16). More cautiously, it was reported that: 'none of the respondents observed consistently negative effects from the Technique'; 62% 'stated that they would recommend that the Technique be taught concurrently or in conjunction with voice lessons' (1991: 17).

The survey also sought to find out whether the singing teachers had any 'misconceptions' of the AT. A list of statements purportedly relating to the Technique was taken from the writing and work of Frank Pierce Jones when he attempted 'to more clearly define the Technique'

(1997: 195). Zipperer probes the remarks, presumably to know what explanations of the AT the college voice teachers communicated to their students and whether they might be misrepresenting the Technique (1991: 14). Zipperer's questionnaire appeared not to elicit clear responses to the questions about misconceptions. For instance, a number of statements in Zipperer's questionnaire were counted as 'true' by the singing teachers even where there was 'an element in the description which did not apply' (1991: 17). This means the statements are misleading, for example: 'AT requires that a student must hold himself in a good posture' and 'AT is a relaxation technique which emphasises postural changes' elicited responses of 'true'. Zipperer's point was to show that understanding of these statements appeared to change after lessons in the Technique (1991: 17). It seems that precise use of language is important to both teaching and research with which I concur.

6.4.1.2 Lloyd's study

Gwyneth Lloyd studied the singing voice; she conducted five case studies considering participants before and after thirty AT lessons (Harer and Munden, 2009: 54-55). By the use of case studies Lloyd provides detailed qualitative evidence of her perceptions as tutor in singing and the AT and of her pupils developing their skills.

After initial assessment for possible vocal 'concerns' and teaching the lessons, Lloyd asked each individual to give explanations of their experiences. Her conclusions summarise what has occurred in breathing and balanced stance (both standing and sitting); also in 'interferences' which she says are 'inappropriate actions'; and 'the reality of tension' where the AT may assist the singer to 'find the balance between effort and ease' (1986: 154). Lloyd appears to be indicating habitual misuse; she interprets any effect on singing (1986: 122 and 124). It is noted that Lloyd's evidence of misuse includes detail of muscular activity which fixes the neck and stiffens the jaw, affecting the singing voice (1986: 16).

6.4.1.3 Macdonald's study

Glyn Macdonald collected case study detail by working on Shakespearean text with three actor students; AT 'instruction' was given to each individual by the researcher. Macdonald's data is detailed; it includes transcribed audio taped conversations from the lessons he gives, notes from lessons, the diaries of each student actor, and questionnaires which they complete (1997: 68).

I discuss these detailed case notes and Macdonald's analysis of teaching transcripts briefly. For instance, he chooses to look at six 'metaclusters' of information relating to: 'misdirected effort in performance'; 'indications of improvement'; 'theoretical and performance issues' in voice and the use of Shakespearean text; issues concerning his communication with the students; and the role of audio-visual as well as so-called 'mirror image feedback', which appears to be using a mirror in rehearsal and in Alexander Technique lessons (1997: 68).

One aspect of the study is that it looks at a principle of the AT known as 'sensory appreciation', that is interpretation of information from the senses. Macdonald appears to focus on Alexander's thought that this may be unreliable so that if someone is told how to do something, it cannot be assumed they will know how to do it (1997: 5). This may link with the idea of using a mirror, which is something Macdonald does not wholly explain. Perhaps Macdonald is linking his teaching to the way Alexander himself worked with a mirror so that he had visual feedback on what he was doing. Our problem in not having accurate information about our actions can begin to change if we find out what occurs, although it should be noted that the knowledge alone is not sufficient; it also requires the decision not to proceed on the basis of habitual misuse (Alexander, 1985: 38). As a principle of the AT, this withholding of response to the stimulus is most apparent in Macdonald's first chapter.

Macdonald likens his work to action research; he describes his focus as improving his practice, presumably both his AT teaching and singing work. He also reports on progress for the three student actors; he says they make significant improvements with Alexander training. His approach is qualitative assessment rather than quantifiable measures.

6.4.1.4 Barlow's studies

Wilfred Barlow (1916-1994) was a medical doctor and Alexander teacher; much of his research of a general nature regarding the AT was published in medical journals. My purpose here is to give a brief synopsis of his work which provides observational and photographic evidence that he discusses as habitual misuse (Barlow, 1990). Barlow describes some generalisations regarding this qualitative data from varying groups such as army cadets, children and physical education students (Staring, 2005: 274).

Barlow also collected evidence on students undertaking an opera course at the Royal College of Music (RCM) where he gave Alexander lessons. Photographs were used to contrast individuals at the start and end of a course of lessons showing the various changes that had taken place (Staring, 2005: 274). Zipperer credits the work to Wodeman and Warrack as RCM teaching professors (1991: 11), suggesting that they were the ones who assessed any 'improvements', including what was called 'a marked physical improvement' 1991: 11 and 12). This focus on solely 'physical' outcome appears to conflict with my understanding of the psychophysical nature of the Technique and the idea of improvement in use as a whole (1.8.2).

Barlow and staff at Central in the time of Thurburn proposed research with student actors 'as applied to voice training' (Susi, 2006: 107), although this did not take place (3.4.4.1).

6.4.1.5   Duarte's study with singers

Fernando Duarte's study gives an analysis of applying the Technique, considering its implications for singing (1981: 4-17). His review of the AT is followed by an experimental study with six voice students (1981: 17). Following initial observation of any problems, they all received Alexander lessons. It seemed that lessons were tailored to address the specific singing problems observed; some detail is given of each individual student (1981: 17 and 18).

As a means to measuring outcomes, students were asked to complete questionnaires at the first two of four weekly singing lessons each received. At the final meeting, a further questionnaire was completed by each student. Duarte's paper reports their qualitative responses (1981: 18). Duarte's reports on the questionnaires are meant to be 'immediate responses to lessons'; he says he does not intend 'a scientific "corpus" of data' (1981: 18).

6.4.2   Quantitative research on voice

Jones (1972) and also McGlone and Barstow (1979) adopt a quantitative approach to investigating voice.

6.4.2.1   Jones' research on voice using sound spectrograms or voiceprints

None of the research described so far includes quantitative measures of voice and the AT, but Jones began to use cameras to track markers on the skeletal frame as a form of motion analysis (Jones *et al,* 1959). Jones later research was with a singer; he looked 'specifically at voice production' and two postural conditions, comparing habitual with experimental; the experimental situation involved Jones as the AT teacher assisting the singer with poising their head (1972: 210 and 211).

In particular, Jones made voice recordings and carried out an analysis of the spectrograms called voiceprints ('Spectrogram', 2015) (4.3.2.2). They show in visual representation the

amount of vibration occurring at each individual frequency (see also 6.5.6.4). Jones reported from analysis of three second samples of the two recordings that there was increased resonance, 'under the experimental conditions' (1972: 214). This was the only measure of voice quality extracted from the recordings. The work was predicated on Jones' earlier research: with multiple image photography (Jones and Narva, 1955; Jones *et al*. 1959); work with EMG (Jones, Hanson and Gray, 1961); and use of the force platform (Jones and Hanson, 1970).

6.4.2.2 McGlone and Barstow's study

McGlone and Barstow used voiceprints for spectrographic analysis. They studied the voices of ten trained singers (five male, five female) who were experienced in both solo and choral performance (1979: 67). Their analysis does not appear to include any postural measurements, although it is unclear whether this is the case or not.

From the voice recordings, the researchers speak of 'increased energy in the upper harmonics' for all singers (1979: 68). Also, they discuss 'vibrato' being added to the voice, which is applicable to music. McGlone and Barstow describe their use of the spectrograms as 'subjective evaluations'. They conclude that changes in the higher harmonics are due to application of the AT (1979: 69), although how they know this is not made explicit in the study report.

How the singers learn the Technique is not explained; McGlone and Barstow say 'the appropriate Alexander modifications were applied' (1979: 67), but it is not apparent what these were or on what basis they were 'chosen'. There is no explanation of who was involved in this 'application'. A question arises as to whether, like Jones, a teacher assisted in this

(6.4.2.1). If so, this would make the research different to my own where participants were responsible for applying the AT procedure themselves.

The definition of the Technique given by McGlone and Barstow is that it is 'a method of teaching body awareness' and that it is 'difficult to define in more precise scientific terms' (1979: 66). As shown, my thesis does not concur with this view (1.8.1; 1.8.2; 6.2).

6.4.3 Austin and Ausubel's voice-related research using clinical examination of the breathing mechanisms

Further quantitative research on the Technique and voice has been conducted by Austin and Ausubel (1992). Breathing is instrumental in the production of voice and a major factor in voice quality (1.8.3; 6.2). Austin and Ausubel investigated the effects of AT instruction on respiratory function, looking at ten healthy adult volunteers, with no previous AT experience, matched with a control group.

Individuals in the experimental group attended twenty individual AT lessons at weekly intervals. Specialist tests of breathing (1.7.1) (e.g. checking rate of flow) show significant changes in breathing capacity registered amongst those who received Alexander teaching in comparison with measures obtained in the control group.

Austin and Ausubel's conclusion was that AT 'musculoskeletal education' may enhance respiratory muscular function. This is useful background corroborating changes in voice, but the AT must be seen as broader than its effect on the musculoskeletal system (1.8.1; 1.8.2). Presumably, Austin and Ausubel are pointing to more capacity for breath, or more efficient use of the breathing mechanisms, enabling improved voice quality, although they do not discuss this or its basis in any detail.

6.4.4   How the current study differs from that of others

I have no access to clinical data, but draw on the findings of studies such as that of Austin and Ausubel (6.4.3). Chapter 2 refers to studies involving clinical data but demonstrates that non-medical evidence is important, as problems of use are often not diagnosed at all, or not in full, by clinical diagnosis (5.5.5.2). Dealing with non-medical incidence falls upon individual classroom teachers and students themselves (5.5.5.1).

My study combines qualitative and quantitative measures, some similar to previous studies, but with some differences. Predominantly, my qualitative evidence comes from the detailed questionnaire survey, three individual interviews and two short case studies. I also draw on my own voice diary and unrecorded experience as a trained classroom teacher, a teacher educator, and an Alexander teacher. My own work can be said to be descriptive and numerically descriptive in presenting the survey results.

The main forms of evidence from the laboratory exploration are quantitative measurements of posture and voice quality. Sound recordings of the spoken voice, digital voiceprints or spectograms, in both habitual and adjusted stance were collected. These recordings were subjected to detailed analysis with up-to-date software programmes. The chosen parameters for analysis relate to criteria defined by Hollien and Zemlin (3.2.1). The study presents these varied forms of evidence and discusses what can be construed that may be of relevance to any proposal of a solution to voice problems for a teacher in the classroom.

My work at MMU with Alexander Technique colleagues is, to my knowledge, the first in some time to look at voice and the Technique through sound recordings and postural measurements. The laboratory exploration at MMU has more elaborate data collection than

that open to some previous researchers, such as Jones (1972); this is made possible through modern equipment and software.

6.5 GATHERING OF EVIDENCE ON TEACHERS' VOICE AT THE HEALTH CARE RESEARCH SCIENCE INSTITUTE AT MMU

This study took place at Manchester Metropolitan University in the purpose-built bio-mechanics laboratory previously known as the Institute for Biomedical Research into Human Movement and Health. I show what the exploration has in common with Jones (1972) and I discuss differences between this new work and that of Jones. The exploration is based on knowledge that a change in use is essentially a change in functioning (1.8.3; 6.2); this warrants exploration of voice quality in the laboratory context in relation to measures of change in use.

6.5.1 Means of data collection and analysis

As shown (4.4.4), the specialist laboratory with Vicon installations meant infra-red cameras recording details of postural configuration and Matlab software being used for motion analysis of the data. Matlab enabled analysis of the voice data with additional use of Praat software to review the recordings; data was then analysable with the tool SPSS.

6.5.1.1 Experimental and practical considerations in data collection at MMU

We chose to collect a particular kind of data at MMU; quantitative evidence was combined with qualitative results from the survey in order to address different research questions. Our choice of participants was related to the focus of the research in general, that is classroom teachers.

There is observational evidence about the efficacy of the AT in voice change from other work. Examples include short courses at Keele University in the early 2000s, teaching by a member

of staff at the University of Birmingham working with drama students since 2000, and training in the PAAT course for AT teachers based in Birmingham. However, the practical and research consideration in this study is to verify the procedure in relation to voice quality in a way probably not undertaken previously (1.6.1).

6.5.1.2 Differences between this study and that of Jones (1972)

The following is a summary of differences between Jones' and this study. Participants at MMU were either student teachers or teachers. I investigated the speaking voice compared with Jones' recordings of the singing voice. At MMU we had ten participants compared with Jones working with one individual. Having ten participants in such laboratory work gives an assurance that results have not occurred by chance (4.7.1). The participants brought about changes in stance themselves whereas Jones helped adjust the stance of his participant by helping her poise her head (1972: 211).

Data comparing voice recordings and postural measures were used in Jones (1972), but recent technological advances in equipment mean that more data was collected and analysed in the MMU exploration. The subjective reports of participants noted at the end of the MMU laboratory session were subsidiary rather than the primary aspect of data gathering and comparisons. Jones, on the other hand, presents the subjective reports of the singer and of listeners as a main aspect of his study (1972: 214).

6.5.2 The context of the voice exploration

The overall aim in the laboratory, addressing Research Question 4 (1.9.1), was to explore the possibility of improvement in voice quality through adoption of a procedure based on the AT. It was indicated in my fourth research objective (1.9.2) that this was to be carried out with teaching professionals. The work is an examination of voice in habitual stance compared with

voice in an adjusted stance following a procedure of the AT described by Door (2003: 102). The adjustments bring about a more mechanically advantageous way of standing (MA); that is, they help improved use (6.2).

6.5.3   Measures undertaken in the laboratory at MMU

As well as voice recordings, other measures allowed comparisons of each stance in respect of postural configuration, muscle activity and another physiological response termed skin conductance, explained in 6.5.3.3. In common with some of Jones' work, the exploration at MMU also incorporated use of a force plate (6.4.2.1).

6.5.3.1   Voice recordings of a sentence

Voice recordings were obtained for speaking in the two different stances (habitual and MA) so that voice quality measures of each incidence of speaking could be compared one with another (3.2.1) and with data from all other measures: motion analysis, muscle activity, and EDA responses. Each participant was asked to use the same sentence during each procedure; it was a few lines taken from Shakespeare, creating a demand in terms of articulation and a range of different speech sounds and meant to be material different from people's everyday speaking experience (Appendix M).

Participants saw a printed copy of the sentence in advance of the procedure and were asked to memorise it so that they did not have to hold a piece of paper during the recordings. Raising the arm to hold the paper would have an effect on someone's overall configuration, which would be an unnecessary complication. If someone forgot the words and needed prompting by the researcher, this was not problematic, as the total duration of recordings or accuracy of saying a sentence was not significant in the outcomes of the study.

The microphone was part of a head set worn by each participant so that it could be set at a standardised distance from the lips. The voice recordings were stored in digital format for analysis using the Matlab and Praat software (6.5.1). Praat enabled me to listen to the recordings, to view sound spectrograms, and to extract portions of each recording. The detailed analysis of any extract takes mean values such as those for pitch or frequency and amplitude or intensity. The mean value for such parameters is useful for comparisons between recordings because it represents what is occurring across the voice sample obtained. Other measures in analysis via Praat include those for jitter and the harmonics/noise (H/N) ratio of the voice (see 3.2.1).

6.5.3.2 Motion analysis

Infra-red cameras record images to a Matlab computer programme. The camera images are created by tracking movement via small sensors attached with adhesive tape to strategic parts of the head, neck, torso and legs. Movement traces are recorded and stored digitally on computer for further analysis. All equipment at MMU, including the force plate, is the most up-to-date available at the time of the laboratory's installation in 2010.

Measurements from the force plate made it possible to check where the mass of the body was falling, mass being the measure of the amount of matter. There is a contact force between the force plate and part or parts of the person; in this case, their feet. We were interested in whether the force, the 'centre of pressure' with the platform varied, indicating possible sway. This was of interest because there is a normal sway to be expected (Basmajian and De Luca, 1985: 255) and if this is not the case for some participants, it might be another indicator of stiffening, for instance in the legs (1.8.2).

6.5.3.3 Electromyography (EMG)

EMG recordings (2.4.1.4) were used to collect information about the activity of certain muscles. Because we are interested in upright stance with least muscular effort and unnecessary muscle activity in the legs is part of the pattern of misuse (Door, 2003: 98) (1.8.2), we chose to monitor muscles mainly in that area. Trapezius, a muscle of the upper torso and neck (Fig. 6-1) was also included as a means to monitoring of muscular activity elsewhere. Appendix Q gives the full list of monitored muscles.

Fig. 6-1

View of the trapezius muscle
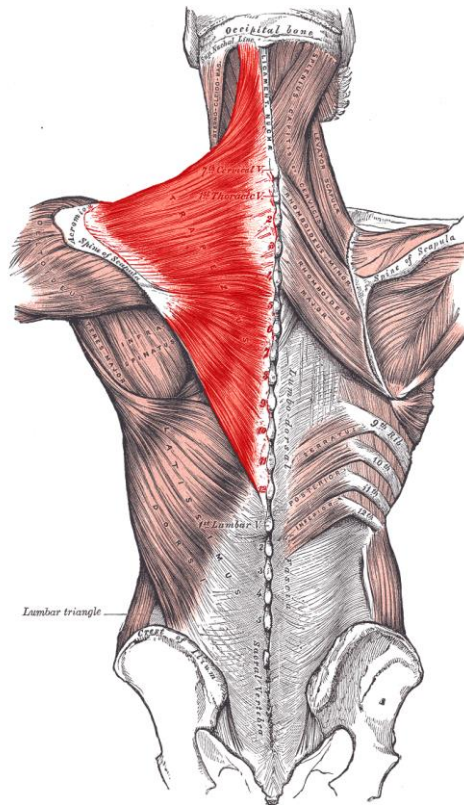
(Häggström, 2014)

We gathered this information to compare what occurred for each individual in the two stances (habitual and MA) making it possible to observe the relationship with voice quality in the

recordings. Our expectation was that in reduced muscular effort and changes in postural configuration, there might be an improvement in voice quality.

6.5.3.4 Skin conductance measures

In addition to other measures in the laboratory investigation at MMU, we also used tests of skin conductance levels. Skin conductance is referred to as electrodermal activity (EDA). The skin is regarded as a useful organ in studying changes indicative of responses within the nervous system by means of the measurable electrical change that is called EDA (Dawson, Schell and Filion, 2007: 160). EDA is measurable through the activity of the sweat glands in what is called 'psychologically induced' or 'emotion-evoked' sweating; it is sometimes referred to as physiological arousal (2007: 160).

It is suggested that the sweat ducts, leading from the sweat glands to the pores on the surface of the skin, can be regarded as a set of variable electrical resistors wired in parallel. The rising sweat in the ducts makes a more conductive path so that resistance in the variable resistor is lowered; therefore, the current can flow more freely. Changes in levels of sweat dependent on activation by the nervous system mean the values of the variable resistors change; this creates the variations in EDA which are recorded (2007: 161).

The mechanisms of EDA continue to be debated, but it appears there is a level of understanding justifying its wide use in current research. Researchers talk about different stimuli, both discrete and continuous. Dawson, Schell and Filion term responses: ' "anxiety" ', ' "anger" ' and ' "attentional" ' when they occur as discrete stimuli (2007: 168). As well as studying psychological responses of this kind in the laboratory, EDA has been associated with tests of facial recognition used to demonstrate that such a stimulus results in skin conductance

responses, over and above the novelty of the stimulus. There is also the 'Guilty Knowledge Test', a so-called 'lie detector' (2007: 169 and 170).

From review of the complexities surrounding several studies, Dawson, Schell and Filion say the skin conductance response may be 'highly sensitive to stimulus significance' even 'where the reasons for that significance may not be consciously processed' (2007: 169-170). In other words, we may react to stimuli to varying extent without knowing why this is the case. Some of these fields of enquiry are unrelated to the situation being investigated at MMU, but the sensitivity of EDA to gauging that a response has taken place and that the response may be triggered by discrete or continuous stimuli, is important. In the laboratory at MMU, there is the on-going stimulus of the task of standing and also the discrete stimulus at the actual moment of being asked to speak.

Our expectation of skin conductance measures in the MA stance were that they would reduce, in that change in use might be associated with less reaction to stimuli (1.8.4). The question is whether the skin conductance level changes during the tasks in the laboratory and, if so, what those changes are and with which procedure. There are alternative sites on the hand for monitoring EDA; the alternative we chose at MMU meant attachment of sensors to digits two and four on the left hand.

6.5.4 People involved

The laboratory work was set up and conducted in collaboration with two other members of PAAT: Professor Ian Loram is a member of academic staff at MMU and use of the laboratory was at his invitation; Dr Rose Whyman is a member of staff in the Department of Drama and Theatre Arts at the University of Birmingham. I shared responsibility with Rose Whyman for talking through the standard procedure for each participant and making any observation notes.

Of the ten participants, nine were student teachers and one was a newly qualified teacher at the time of the study. All had volunteered to take part after an initial briefing given in person well in advance of dates in the laboratory; I made this introduction by visiting Keele University with the cooperation of a member of teacher education staff, Dr Victoria Door. One substitution occurred on the day: a doctoral student at MMU was recruited because a participant was ill and unable to attend. Participation was voluntary. All ethical procedures were followed (4.6). No one appeared to have experience of the AT in advance of their involvement in this study.

6.5.4.1 Familiarisation

Familiarisation with the laboratory for the two visiting researchers took place in advance of the exploration and we had opportunity to go through the procedure for the change of stance with measurements being recorded. This gave us experience of the exploratory situation and helped us confirm how to explain the procedures; it also meant that we knew first-hand what it was like to stand in the 'experimental' area.

At the start of the week set aside for the exploration, we took time to go through the procedures, the instructions to be given to participants, and the workings of the laboratory equipment. There was familiarisation time for each participant at the beginning of their visit with a tour of the laboratory, explanatory detail and opportunity for questions. Their familiarisation occurred in advance of the set up with Vicon markers (6.5.4.2).

6.5.4.2 Explanation for participants

The sequence and detail of our explanation to each participant was scripted to ensure that individuals were given the same information (Appendix N). Each participant was briefly introduced to the idea that voice training can be based on a change through simple

adjustments to postural configuration according to the principles of the AT; this was a brief comment because further detail on the AT was given only *after* the laboratory session, so as not to compromise the experiment by setting expectations that might have intervened in participants approaching the work as 'exploration' (Appendix R).

Participants knew that they were going to be 'talked through' procedures at the time. The different measures that we wanted to use within our exploration were explained to participants in terms of what it would mean for her or him and what it would enable us to measure, i.e. postural configuration, muscle activity, EDA, and voice quality. The Vicon markers were attached in specific places on legs, torso and head. Fig. 6-2 shows markers being attached with self-adhesive stickers. The points where these markers are deployed are similar to two locations used at MMU (Appendix P).

Fig. 6-2 Vicon markers

(Murnau Trauma Center, 2014)

Fig. 6-3 shows a typical image as appearing on a computer screen with markers joined by vector lines. Note: we did not use arm markers.

Full details of the procedures are given as appendices (Appendix P, attachments of Vicon sensors; Appendix Q, muscle (EMG) attachments; Appendix N, script for the laboratory work; Appendix R, script for post-laboratory explanation).

Fig. 6-3 Computer screen Vicon image
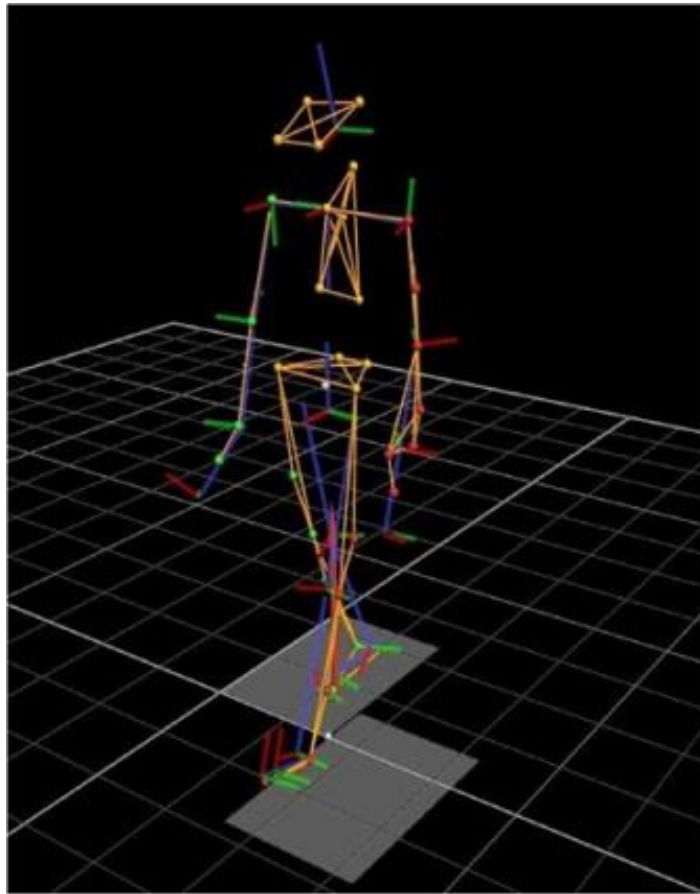
(University of Malaya, 2008)

6.5.5   Conducting the tests

Each procedure is outlined; scripted detail of the adjusted (MA) stance is given. Motion analysis and voice recordings for the stance on both occasions, habitual and adjusted (MA) stance, were initiated after the participant walked onto the force plate which was the location for all recordings

6.5.5.1   Habitual stance

It was assumed that the participant was in their usual or habitual stance on this occasion because no comment or instructions were given other than the request to speak after she or he came to a stop on the force plate. This was repeated.

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6.5.5.2 Adjusted (MA) stance

The intervention, using a procedure of the AT, is meant to put the participant in adjusted configuration (denoted as MA stance), that is with the possibility of improved use. The instructions for this adjusted stance are given in full (Appendix N).

6.6 REPORTING EVIDENCE

In the laboratory we were exploring the adoption of a procedure of the AT bringing about an improvement in postural configuration (that is, the maintenance of upright posture with optimal muscular effort) and a concomitant improvement in voice quality, as measured in quantitative data.

The measures of voice quality used in this empirical research project have been extracted as quantifiable criteria identified by voice scientists (3.2.1). Bringing about change in postural configuration is linked with mechanical advantage and reduced muscular effort measurable through EMG recordings. In comparing the two stances, we were looking for any measurable difference in voice quality corresponding with other changes, such as EMG.

All data were subject to computer-generated analyses following the exploratory sessions in the laboratory. Results are given for all measures beginning with analysis of voice recordings, followed by reporting on the motion analysis recordings, the EMG measures, and the measure of EDA. The results, and an understanding of the way all measures have been analysed, are predicated on certain background information which is given first.

Two slight problems were the unexpected illness of one participant requiring a substitution and factors to do with the skin of one participant which meant she had difficulty keeping the markers on; this may have slightly skewed some results, but not in any way affecting overall conclusions.

6.6.1   Background to the voice analyses

Work on voice quality is based on understanding of sound waves (3.2.2.1). The voice is a complex sound wave and the frequency of the lowest of the waves is the 'fundamental' (Behrman, 2013: 36). Intensity or amplitude can be referred to as power, being energy transported over a given area over a given unit of time. 'The greater the displacement of the adjacent air particles from rest position' the more power in the sound (Behrman, 2013: 25). This is perceived as loudness, but referred to as 'power' (3.2.2.3); the term power is used in Matlab analyses.

The descriptions by both Hollien (2000) and Zemlin (1998) indicate that resonance is also an important feature of 'good' voice; Hollien describes 'a well-organised spectrum' which appears to equate with resonance (2000: 22) (3.2.1). As resonance is about matter being 'energized' to vibrate at its own 'natural' frequency (Zemlin, 1998: 294), analysis which shows the fundamental frequency and harmonic content in a voice is relevant to an assessment of differences between voices and between the same voice in different circumstances, such as with change in stance.

In a voice recording, a smaller number of regular peaks in the wave formation (see Fig. 3-1) indicate more harmonious 'voice energy', with the signal more related to fundamental frequency. Therefore, a further criterion for voice quality in relation to pitch (being assessed in voice recordings obtained in the laboratory) was harmonic content contrasted with noise as the non-periodic part of the sound (Behrman, 2013: 262); this is discussed further (6.6.2.8).

The voice recordings of a spoken sentence by each participant relate to the two stances: that which is the individual's habitual stance and that based on a procedure of the AT enabling the adoption of a way of standing upright that is mechanically advantageous (MA stance) (6.2).

There were four recordings for each participant, one for each condition and a repetition of each. The order of 'trials' was: speaking in habitual stance; repetition in habitual stance; speaking in MA stance; repetition in MA stance. From the point of view of the AT, it would have been preferable not to take measurements for the procedure on a second occasion, on the understanding that a habit (the response pattern in the brain) would have occurred after the first occasion so a participant would not think through the procedure without preconceptions.

In total, forty-four voice recordings for the ten participants were obtained. There are reasons for the four additional recordings. For example, some equipment might have malfunctioned on occasion, so that there had to be a re-start of the trial in order to capture a full range of other recordings, such as EMG. In such an event, any intact voice recording has been kept and used in analysis because it is still valid voice data for inclusion.

The first set of voice measures were analysed using Matlab software by Ian Loram in the week following the procedure (6.6.2). The voice measures are entitled: whole trial mean frequency, mean frequency, main peak, number of main peaks, normalised fundamental multiple power, fundamental harmonic power and speech duration. Any newly-introduced terms are explained as part of the presentation of results, which are shown as bar graphs, analyses of variance (ANOVAs) and line graphs (Appendix S). In this chapter, some files names appear in bold print for ease of reading.

Many results are viewed as mean values; the mean or average is obtained when all relevant values are summed and divided by the number of instances. Median refers to the middle value of a string of values. The mean or median demonstrates the pattern of responses when viewed as a whole 'group'; the mean or median indicates the central tendency of the data.

An ANOVA is a statistical model used to analyse the difference between the group means in associated procedures; there are different forms of ANOVA, but we used univariate analyses which enable comparison of two or more elements of data, one of which is variable. What is referred to as the F statistic in such an ANOVA is used to determine whether the test shows a significant result (Punch, 2014: 257). In common-usage statistical tables, a 'p' value equal to or smaller than 0.05 indicates statistical significance ($p \leq 0.05$) with a corresponding $\geq 95\%$ certainty of the model being accurate as a predictor of future results, i.e. that repetitions of the test would produce the same results. Any result with $p \leq 0.01$ demonstrates an even higher level of certainty; $\geq 99\%$ likelihood that the model is a predictor of future results (Punch, 2014: 270-271).

The intention in our analyses was to demonstrate any changes occurring not just as an effect of time and chance. Specifically, we used comparisons of how the effect of mechanical advantage changes through time and how the effect of repetition changes through time, the question being whether the effect was greater for one than the other. Basically, this was meant to show that if the procedure of the AT bringing about a mechanically advantageous way of standing is concomitant with improved voice quality, the effect of the procedure is greater than the effect of repeating the trial; that is, the improvement is not because the participants' voice improves on a second attempt when they are more familiar with what to do and possibly more 'at ease'.

6.6.2   Results for the sentence recordings with analyses in Matlab

Results are presented according to the file names shown in Appendix S. In any bar graphs, participants are numbered 1 to 10 across the horizontal axis and column 12 is the average of all 10 participants. In discussion, I refer to participants as P1, P2, etc. The height of the

column shows the measure (e.g. frequency is measured in Hertz (Hz) as the number of cycles per second) which here refers to cycles in a sound wave (Behrman, 2013: 21).

The line graphs reported for some measures in this section represent a way of referring to 'quantities at different times after the start of speaking' (Appendix S); that is, within blocks of time taking the start of speaking as zero, the means across participants are used for the further analysis shown within each graph. The term 'blocked duration' appears on graphs but each is entitled 'significance of quantities' which is the terminology in discussion below. The lines on each graph plot the mean values at points in time relating to stance, habitual or MA, and their repetition. Blue lines indicate stance; green shows repeated instances. Values for each participant occur as a red line; I make no comment on this line trace, given that considerable individual differences occur which are mediated by using mean values. My interpretations of the line graphs are from visual assessment.

The first measures being reported are related to the qualities of frequency or pitch (shown at S-1a and b, S-2a to S-2c, S-3a to S-3c, S-3b, S-4a to S-4c, and S-5a to S-5d); other results relate to power or loudness, and the last measures in the report (S-9a and b) show results for speech duration. As discussed (3.2.2.4), resonance is a voice quality in relationship with both the characteristics of power and pitch. The harmonic relationships discussed for results reported as S-6a and b, and S-7a and b are therefore relevant to discussion of 'good' voice (3.2.1) and the efficacy of MA stance in influencing vocal outcomes.

6.6.2.1 Whole trial mean frequency

Bar graph S-1a. The mean frequency throughout the trial is concerned with average pitch over the whole spoken sentence (3.2.1; 3.2.2.2). When this was compared for all participants (bar graph, S-1a), almost all had a mean frequency that was less in the MA stance than in the

habitual. The fundamental frequency had not changed, but the number of other frequencies reduced. With less 'spread' of frequencies in the sound, the sound could be said to be 'more focused' in recordings obtained for the MA stance, than those for habitual. The sound spectrum will change considerably over the recording because of the different characteristics of consonants and vowels (e.g. Behrman, 2013: 295-298; 234-235) and the variations apparent in contextual speech (Zemlin, 1998: 308). This is why mean values are most useful for comparisons, taking account of the whole speech.

The observed change in frequency levels during MA stance is most consistent for P2; that is, it is shown more clearly with this individual that the mean frequency is lower in MA stance than in habitual stance. When the mean across all participants is shown (column 12 of the bar graph), the change is apparent for the group as a whole: there is a shift from higher mean frequency to lower mean frequency when comparing speaking in habitual stance and speaking in MA stance. That is, for all participants, average pitch fell in MA stance and it was lowered even further in the repetition of MA stance.

ANOVA S-1b. A resulting ANOVA for this measure shows $p = 0.0098$. This means there is more than 99.9% certainty that the model of improvement for mean pitch (3.2.2.2) when speaking in MA stance was accurate across this sample.

6.6.2.2 Mean frequency

Bar graph S-2a. Taking measured intervals or blocks of time during the recorded speech, the mean frequency in each time block was calculated. Results for each participant for mean frequency are shown in the bar graph (6-2a); the mean frequency shows variation for the two stances. The lowered mean frequency is apparent in both first and second trials for MA stance for P1, P5 and P10. Combined means in column 12 for all participants also show a lower

mean frequency in MA stance compared to habitual. The difference in this vocal quality for both results in MA stance, compared with results for habitual stance, shows that any effect of repetition is not as marked as the effect of being in MA stance.

ANOVA S-2b. The ANOVA for mean frequency shows statistical significance (with p = 0.0178), when MA stance is compared with habitual stance.

Line graph S-2c. Considering 'significance of quantities' for these results, the lines on the graph show similar traces over the initial five seconds of the recording for stance and repetition, although the trace for stance falls below the other at some points. For example, the significance of quantities at 2.5, 3.5 and 4 seconds from the start of speaking is less in MA stance than in habitual. This shows reduced mean frequency at some points in time near the start of speaking which is in line with expectations.

6.6.2.3 Mean frequency of main peak

Bar graph S-3a. A main peak is that where there is most power; that is, where the participant's voice was loudest. We were interested in finding out whether this frequency was lowered; that is, about any shift in the frequency of most power (3.2.2.3). It is shown that the frequency for the main peak is lowered in MA stance, apparent in the mean for all participants (column 12) being lower in MA stance than in habitual. Marked differences occur between habitual and MA stance particularly for P1, P3, P5, P8 and to some extent in results for P7; this is most consistent for P8. However, the effect is contrary for P2, where a higher main peak frequency is shown for MA stance than for habitual.

ANOVA S-3b. The ANOVA for this measure shows p = 0.001 for MA stance, compared with repetition (p = 0.1381); that is, there is a greater effect of adjusted stance than of repeating a trial and the outcome for MA stance is statistically significant. There is 99.9% accuracy for

predicting lowered main peak frequency in the intervention. As with whole trial mean frequency, this result demonstrates main peak frequency fits the criterion for lowered pitch as advanced by Hollien (2000: 22) (3.2.1).

Line graph S-3. The line graph for these results (showing 'significance of quantities') has similar line traces for stance and repetition. The trace for stance dips below that for repetition at some moments at the start of speaking, denoting points in time when the main peak frequency best matches the criterion for lowered pitch. For example, this occurs at 2, 2.5 and 4 seconds from the start of recording. As commented with regard to whole trial mean frequency (S-1a), the effect of variations for different consonant and vowel characteristics suggest caution in interpreting this as improvement, but using mean values is a safeguard.

6.6.2.4   The number of main peaks

The number of main peaks is determined by the number of formants, the frequency components, in a voice. A formant is 'the concentration of energy' around a particular frequency in the acoustic soundwave (Behrman, 2013: 222). Formants are demonstrated in the so-called resonance curves (charting frequency and amplitude or power) where 'the peaks of the curves represent the spectral peaks' or formants of the particular vocal tract (Behrman, 2013: 224). As a voice quality measure, the lower number of peaks demonstrates energy more related to the fundamental (Behrman, 2013: 36) (3.3.2.1). It could be said that this equates with our perceptual assessment of how 'pleasant' a sound might be. Given that the voice is a complex, rather than a 'pure' tone, the more 'periodicity' it has, the more likely it is to be perceived as pleasant (Behrman, 2013: 35-37); periodicity relates to component frequencies in the voice having a mathematical relationship. Behrman refers to formants as particularly affecting production of vowels (2013: 222).

Bar graph S-4a. In the bar graph, the average number of main peaks taken across all participants (column 12) shows little difference between the two stances. There are variations evident only for a small number of participants; for instance, P1 and P6 have a lower number of main peaks in recordings in MA stance compared with habitual.

ANOVA S-4b. Although there are some differences across participants, the ANOVA for the number of main peaks in each recording does not show differences to be statistically significant across the group for either change in stance or repetition of the procedure (p = 0.9958 and p = 0. 8913 respectively).

Line graph S-4c. The graph shows the line for MA stance falling below that for repetition at several points in the first five seconds of speaking. For instance, this occurs at approximately 0.75, 1.25, 1.75, and 3.5 seconds. It might be interpreted that, although results overall were not statistically significant, there were points near the start of speaking when MA stance was related to a reduction in the number of main peaks; that is, there was a reduced number of frequencies demonstrating energy being more related to the fundamental and suggesting voice in MA stance shows a trend to be more perceptually pleasant (Behrman, 2013: 36-37); Zuckerman and Miyake's study suggests that subjective assessment of 'vocal attractiveness' may be associated with some quantifiable measures (for instance, of pitch and resonance), although they indicate a relationship that is far from straightforward (1993: 128).

6.6.2.5 Bandwidth

Bar graph S-5a. The bar graph for bandwidth, which is another indication of the range of frequencies in the voice recording, shows some improvements (lower mean values in MA stance) for two individuals, P6 and P8.

ANOVA S5b. The associated ANOVA has p values showing no statistically significant finding (p = 0.7015 for MA; p = 0.7781 for habitual stance).

Line graph S5c. The line graph for 'significance of quantities' shows bandwidth is steadier in MA stance following the first 0.5 seconds of starting to speak. Also, the line representing stance falls below that for repetition at 1 second and 4 seconds from the start of speaking. It is possible to conclude there has been change and, from our understanding, this is positive change.

6.6.2.6   Main peak frequency

Bar graph S-6a. The bar graph of mean peak frequency shows that there is an improvement (a lowering of main peak frequency) across the group (column 12) when in MA stance. This is particularly the case for individual participants: P1, P3, P5 and P7.

ANOVA S-6b. The ANOVA for mean peak frequency shows statistical significance for stance (p = 0.001); that is, there is statistical significance with 99.9% certainty.

Line graph S-6c. Visual inspection of the line graph for this measure shows data in MA stance is more consistent after the first 3 seconds of speaking. There is no overall change, but the line for stance falls below that for repetition in the ranges 2 to 2.5 seconds and 4 to 5 seconds after beginning to speak.

6.6.2.7   Power

Results at S-7a and at S-8a to S-8d report on power presented in the recordings, but measures are also related to the associated harmonics. Some indication is given 6.6.2.8 of the relationship between power, frequency and harmonics.

Bar graph S-7a. The bar graph for power demonstrates a reduction in mean values for the whole group of participants (column 12). This means speaking must have been quieter in MA stance, yet there was no difficulty being heard, leading to a surmise that the voice carried sufficiently even in the large space of the laboratory. There are also some participants with a particularly marked reduction in power: P1, P5, P8 and P10.

6.6.2.8 Power and harmonics (normalised fundamental multiple power and total harmonic power)

Loudness of voice is represented by the measure of power, but the normalised value shows what proportion of power in the speech is harmonic. The harmonics are formed as multiples of the fundamental frequency (3.2.2.2); for example, if the fundamental frequency is 100Hz, the harmonics will be 200Hz, 300 Hz, 400Hz, and so on. Normally we do not hear the harmonics as separate tones, but they 'are nevertheless present in the sound', and they add 'a lot of richness to the sound of a human voice' as well as other sounds (Chung, 2011). This explains why power is not viewed in isolation in the following discussion.

Normalised measurement takes the sum of the power measured at different harmonic frequencies divided by the total power in the signal. This may signify a participant speaking more quietly but with the harmonic quality of the voice in relation to frequency or pitch giving it more carrying power or resonance (3.2.2.4) (Behrman, 2013: 44). The total harmonic power (S-8d) gives a further measure of this voice quality.

Bar graph S-8a. The results for normalised fundamental power indicate variations for all participants that are not representative of any pattern. For example, the column of mean values in the bar graph across all participants (column 12) shows no improved levels of

fundamental power in MA stance when compared with habitual. For this variable, no participant has consistent change of measurement across the trials.

ANOVA S-8b. The analysis of variance shows there is no statistically significant difference in this measure; $p = 0.783$ for comparison of stance.

Line graph S-8c. The line graph for this measure shows 'significance of quantities' in MA stance falling below that for repetition at certain points: for instance, at 0.75, 1.25, 3.0 and 4.5 seconds from the start of speaking. In common with the result for number of main peaks, this indicates points near the beginning of the recording when MA stance was related to a reduction in this measure of power, without there being statistical significance for the measure overall.

Line graph for total harmonic power S-8d. It is noted that the line graph showing 'significance of quantities' in different time blocks for total harmonic power, has values for MA stance falling below those for repetition at two seconds from the start. The graph also indicates variation becomes less throughout the first five seconds of speaking. This is indicative of change and, based on our understanding, can be interpreted as positive change in the fundamental and its harmonic components when the stance is adjusted. This outcome would benefit from further exploration.

6.6.2.9 Speech duration

Bar graph S-9a. The bar graph for speech duration takes measurements over five second portions of the recorded speech for comparison. The value is sometimes shorter in MA stance than in habitual (as for P3, P8 and P10) but that is not always the case, as for P4. In some instances, there is a change when it comes to repeating a procedure (as for P1, where change is demonstrated for both the repeat of habitual stance and that of MA stance); sometimes there

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is no change in mean value. Column 12 showing means of the values for all participants indicates little difference between trials.

ANOVA S-9b. In the ANOVA for this measure, there are no statistically significant differences (p = 0.554 for MA stance). It was noted that pace of speech, related to duration, would not be investigated in this trial as it is not of importance in our context (3.2). The result is included only for completeness.

6.6.3   Short voice extracts analysed in Matlab

Some short extracts obtained were for the initial 'oh' sound of the sentence. Analysis of a vowel sound appears to be useful to clinicians who sometimes employ vowels to check action at the glottis (the space between the vocal folds) through 'an efficient mapping of the physiology of *vocal fold vibration*' (Baken and Orlikoff, 2000: 115). Vowel sounds may feature in other aspects of clinical voice analysis such as checking jitter (irregularity in frequency), again connected with the activity of the glottis (2000: 192). Usually recording of a sustained vowel sound such as /a/ is used in these clinical contexts; our exploration of the recordings did not include such procedures.

Speech and language therapists often use 'oh' and 'ah' sounds in their work with clients. Producing vowel sounds makes less demand on the vocal apparatus because they are produced with a relatively 'free passage of the air-stream through the larynx and oral cavity' (Behrman, 2013: 218). This led us to think that a simple vowel sound might give useful comparative analysis. However, when the 'oh' extracts from our recordings were analysed in Matlab, no meaningful results emerged. Perhaps this was because the extracts were short, some only 0.12 of a second, which may have influenced statistical comparison. This made the extracts less useful to the required comparisons.

There is also a difficulty in extracting the pure vowel sound when dealing with running speech, where there is 'a continuous dynamic sequencing of vocal tract movements produced in rapid succession' (Behrman, 2013: 294). This means there is an overlap between the movements for articulating one sound with movements for articulation of the next. Possibly, this explains our difficulty in processing the vowel separately compared with analysis of prolonged vowels by a therapist.

6.6.4   The Praat analyses of short voice extracts

Due to the difficulty of analysing a short vowel sound in running speech, we proceeded with slightly longer portions of speech extracted from the original recordings on a timed rather than phoneme basis. In obtaining a Praat report for each extract, the values extracted were for a range of measures; those used in analyses were: mean pitch, number of periods and pulses, jitter %, jitter E6, shimmer %, shimmer dB, noise-to-harmonics (N/H) ratio, harmonics to noise (H/N) ratio. The terms will all be explained subsequently. As with values handled in Matlab, mean values were extracted; in this case, relationships were analysed statistically using SPSS considering comparisons for stance and repetition.

Knowing the mean and median for frequency is important to further analysis on this measure: calculating the ANOVA relies on a 'normal' distribution of data (that is, data within a statistically normal spread, where most cases are grouped close to the median with little data far away from the median). It is possible to verify such a normal distribution for values drawn from the MMU voice recordings, indicating use of ANOVA is justified for the values obtained from Praat reports.

Reports in Praat also give the number of pulses and number of periods for any recording. In voice, each pulse is caused by glottal activity (the movement of the vocal folds). Measures of

pulses take account also of the period, i.e. the time between low and high pressure points in the sound wave of what are called alternating compressions and rarefactions (Behrman, 2013: 24). There is a relationship between frequency or pitch and period, such that 'the longer the period, the lower the frequency' or pitch; the shorter the period, the higher the frequency' (2013: 24). This is apparent for obtained measures in Table 6-1 which is part of an Excel spreadsheet of values taken from Praat data ready for analysis. For example, the T1 extract has 39 periods and a mean pitch of 275.669 Hz, whereas T24 has 19 periods and the pitch is correspondingly lower with a mean pitch of 144.516 Hz. In Table 6-1 T refers to 'Trial number' which was a random allocation for each recording.

Table 6-1 Values taken from Praat data ready for analysis

Random Code	Duration	Pitch - Med	Pitch – Mean	Pulses – No	No. of periods
T1	0.25	270.210	275.669	41	39
T21	0.25	281.800	280.627	50	49
T10	0.25	273.659	269.519	36	34
T28	0.25	270.371	255.117	34	32
T45	0.25	321.340	328.839	53	49
T23	0.25	329.349	327.828	52	49
T39	0.25	223.723	238.430	38	34
T4	0.25	272.006	274.978	37	36
T44	0.25	298.461	296.849	41	39
T31	0.25	142.197	142.213	21	29
T24	0.25	141.416	144.516	21	19
T25	0.25	166.846	163.993	23	21

To clarify the terms 'jitter', 'shimmer' and 'harmonics-to-noise' ratio, I give detail of sound spectrograms, which are the visual representation of recorded sound in terms of the amount of

vibration occurring at each individual frequency. The harmonics-to-noise ratio is considered a numerical measure of voice quality and is accepted and widely-cited in the field of voice science because it helps clinicians to distinguish voice problems associated with variations which produce 'noise' (Behrman, 2013: 262 and 264) (4.3.1.2). Noise can be understood in this context as the 'erratic, intermittent, or statistically random oscillation' of the vocal folds (Zemlin, 1998: 574) (3.2.2). It is explained further below with spectrograms for illustration.

Fig. 6-4 is a spectrogram with time shown on the x-axis and frequency on the vertical axis. The words being spoken for the recording are shown underneath the corresponding part of the spectrogram.

Fig. 6-4 Example spectrogram of spoken sentence
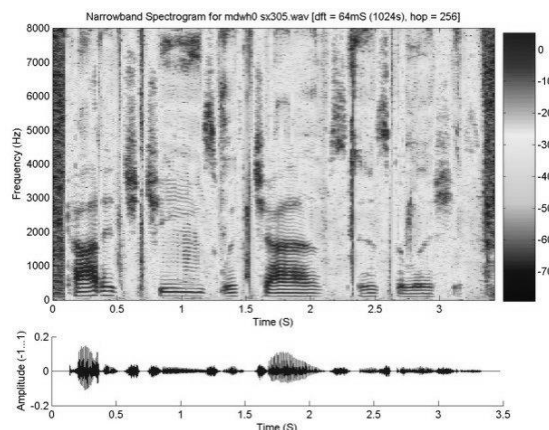
Cottage cheese with chives is delicious

(Gillespie, 2009)

The energy in the sound is represented light-to-dark, with lighter indicative of less energy. Fig. 6-5 shows spectrograms from recordings of a vowel at a level pitch or steady frequency. White represents no energy in the spectrogram and black represents 'lots of energy'. Similarly

in Fig. 6-4, we can see that the highest energy occurs in the /o/ of 'cottage' and the /aɪ/ in 'chives'.

The left-hand 'wideband' spectrogram in Fig. 6-5 shows broad horizontal bands of dark grey which are the underlying characteristics of the individual voice, in part determined by the length of the vocal tract in that individual (Behrman, 2013: 225). Within the 'envelope' of any sound, these characteristics, known as formant frequencies, can be complex, transient and 'difficult to characterize' (Encyclopædia Britannica, 2015).

Fig. 6-5 Spectrograms from recordings of a vowel at a level pitch
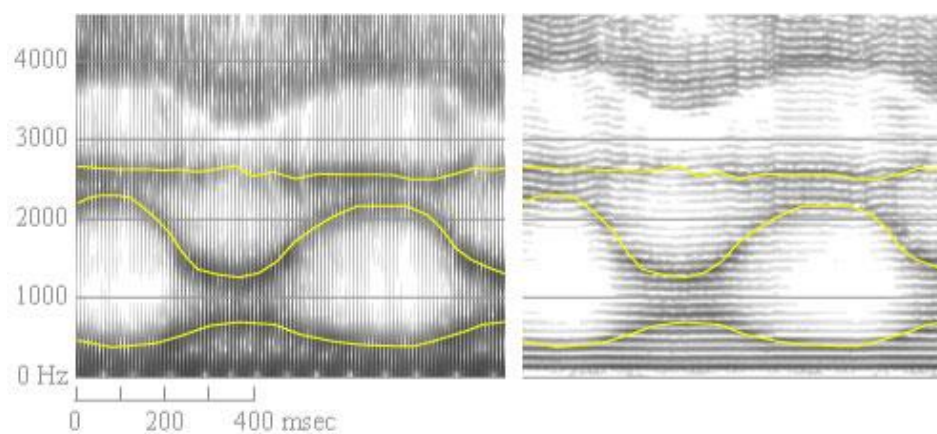
(Hagiwara, 2009)

The spectrogram (Fig. 6-5) shows the harmonics within the sound which can be identified as horizontal lines of equally spaced components in the narrowband spectrogram on the right. The harmonics are related to the fundamental frequency of the lowest wave in the series making up the complex and distinctive sound of an individual voice.

Human voice is 'almost, but not quite, periodic'; that is, within the distinct and identifiable frequencies occurring in an almost orderly pattern, there may be disturbances for which the term 'aperiodic' can be used (Behrman, 2013: 40). The aperiodicity can be continuous or

transient. It presents as a form of 'noise' in the voice. Seen as a 'cloudy shadow' recognisably visible within any spectrogram (Yumoto, Sasaki and Okamura, 1984: 2), it is 'the energy between the harmonics' (Behrman, 2013: 262).

The H/N ratio is expressed in decibels (4.2.3). If the H/N ratio is 0 dB, it means that there is equal energy in the harmonics and in the noise. Twenty dB is also an example of low noise; it represents a sound where 99% of the energy of the signal is the periodic (harmonic) part and 1% is noise (Boersma and Weenink, 2003). However, the noise component of the signal will vary with the frequency of sounds; high frequency sounds have a lower H/N ratio.

Shimmer is defined as: 'the short-term variability in the amplitude in the acoustic waveform', where the amplitude indicates 'the amount of energy' or power in the wave (2013: 181). This might be shown in decibels for a ratio of two adjacent cycles in the sound wave averaged over the length of the sample, but it might be expressed as a percentage of the mean amplitude value known as shimmer percent; both forms appear in Praat reports. Although any voice will exhibit some variations in shimmer (for instance, changes associated with the effect of consonants) a high measure of such irregularity is sometimes symptomatic of problems.

Jitter (irregularity in frequency, 4.3.2.1) can be measured by different methods or formulae; for instance, jitter ratio takes the difference in period of each adjacent pair of cycles, averages across the speech sample and is shown as a percentage. Alternatively, jitter can measured in milliseconds (ms) (Behrman, 2013: 180). Both these formats appear in Praat reports.

In the view of Yumoto, Sasaki and Okamura (1984: 2) although visual assessment of the spectrogram enables hoarseness of voice to be identified, possibly as H/N problems, this is subjective. Jitter and shimmer are not distinguishable from the spectrogram (Behrman, 2015: 180-182). The measures for H/N ratio, taken from the acoustic signal (as measures generated

in Praat) are a quantitative means of registering the sound quality; Praat also enables differentiation between voices to be more exact with detection of the variations of jitter and shimmer being possible (1984: 2).

6.6.5   Results from the SPSS analyses of Praat data

SPSS data from Praat reports were compiled for short extracts: Extract 1 over the interval 0 to 0.25 seconds; Extract 2 as 0.25 to 0.5 seconds; Extract 3, 0 to 0.5 seconds. The full-length recording of the whole sentence was also investigated using Praat. Results across the means of all variables have been calculated and the p values are presented in Table 6-2.

The table shows p values for stance and repetition for all extracts and all variables, with emboldened type indicating any p value which is lower for stance (for that variable) than the p value for repetition. Across all three short extracts and the whole sentence, only one analysis of variance shows a result at a level of statistical significance, that for shimmer (dB) for Extract 3.

When the p values for the variables for all extracts are taken in rank order (as denoted by the small integers to the right of each variable name in Table 6-2), the variable most linked with the effect of stance being greater than repetition is shimmer (dB). This is ranked first for Extracts 2 and 3 and ranked second for the other two recordings. Such consistency of outcome is not apparent for any of the other variables. This suggests shimmer dB is the measure most linked with the change of stance, as shown in the p values (0.325 for Extract 1; $p = 0.041$ for Extract 2; $p = 0.006$ for Extract 3; and $p = 0.067$ for the whole sentence).

Table 6-2 Drawing Praat univariate results together

Recording/ extracts	9 variables	p values	
	- mean values	Stance	Repetition
0 to 0.25 secs	Pitch	.796	.684
	Pulses [3]	**.426**	**.852**
	Periods [4]	**.512**	**.815**
	Jitter	.494	.482
	Jitter E6	.582	.208
	Shimmer % [5]	**.526**	**.678**
	Shimmer dB [2]	**.325**	**.749**
	N/H ratio	.519	.401
	H/N dB [1]	**.134**	**.293**
0.25 to 0.5 secs	Pitch	.796	.684
	Pulses [2]	**.103**	**.466**
	Periods [5]	**.175**	**.298**
	Jitter	.494	.482
	Jitter E6	.582	.208
	Shimmer % [4]	**.158**	**.382**
	Shimmer dB [1]	**.041**	**.247**
	N/H ratio	.519	.401
	H/N dB [3]	**.134**	**.293**
0 to 0.5 secs	Pitch	.891	.500
	Pulses [5]	**.187**	**.739**
	Periods [3]	**.107**	**.886**
	Jitter %	.612	.410
	Jitter E6	.452	.173
	Shimmer % [2]	**.098**	**.178**
	Shimmer dB [1]	**.006**	**.012**
	N/H ratio [6]	**.433**	**.450**
	H/N dB [4]	**.124**	**.863**
Whole sentence	**Pitch** [5]	**.268**	**.352**
	Pulses [8]	**.541**	**.621**
	Periods [9]	**.574**	**.670**
	Jitter % [1]	**.033**	**.114**
	Jitter E6 [4]	**.197**	**.689**
	Shimmer % [6]	**.279**	**.686**
	Shimmer dB [2]	**.067**	**.127**
	N/H ratio [7]	**.352**	**.636**
	H/N dB [3]	**.098**	**.411**

The recordings most in line with the expectation that adjusted or MA stance is more influential than repetition are those for the whole sentence in that all 9 variables assessed within whole sentence recordings (Table 6-2) have a lower p value for stance than for repetition. The rank order is: jitter %, shimmer dB, H/N dB, jitter E6, pitch, shimmer %, N/H ratio, pulses, and periods. Praat analysis also includes a tenth measure, median pitch which is not included in the table, but which follows the same pattern in being lower for stance than for repetition. Taking this into account, when results for median pitch are added to the other nine results considered for the whole sentence recording, a 100% match (ten out of ten variables) is noted indicating MA stance is more influential on the outcome than repetition of the task. This result is statistically significant in that it demonstrates a probability level of $p = 0.001$.'

Box plots were obtained also for all the values from the voice recordings; they confirmed the other results but added no further point of interest. Examples of a small number of ANOVA tables are given in Appendix T. It would be possible to look at other analyses forms such as those called 'repeat measures' and also to take account of 'within-subject' variables as well as 'between-subject' variations, although any benefit is unclear until further work is undertaken.

By way of summary of the results (6.6.1 to 6.6.5), it can be said that the criteria for 'good' voice (3.2.1) are borne out in the quantitative data that have been collected. There are results showing lowered pitch and power, as well as improved resonance characteristics, such as demonstrated in normalised fundamental power (6.6.2.8). These measures and the results are in line with the voice quality criteria identified for this exploration (3.2.1).

In addition, it has been shown that measures for the harmonic/noise ratio and for shimmer and jitter in a voice recording may change when stance is adjusted; there appear to be

improvements associated with adoption of the AT procedure (6.5.4.2). It now remains to show results for postural configuration, EMG, and EDA as further evidence in this exploration.

6.6.6   Results and analyses for motion analysis

My discussion of results from the motion analysis considers outcomes in terms of the researchers' expectations as AT teachers: what we expected to see happening when people adopted the MA stance compared with their configuration in habitual stance. For instance, the head might be shown to be poised, or not. Also, our expectation was that people would not be pulling themselves forward at the ankles as much; that is, if muscles in the legs were less active, there might be less stiffening allowing the participant to sway back at the ankles (6.2). Also, we expected 'lengthening and widening' of the back compared with its shortening and narrowing in misuse. Alexander explains that when he came to recitation, putting a demand on the voice, he noted a tendency to 'lift the chest' and 'increase the arch of the spine' (1985: 30; 1996: 206) (1.8.2). Door provides further practical explanation (2003: 27-28).

Appendix U has motion analysis files, e.g. MA U-1 is 'placement of feet'. As with the voice data, individual participants are referred to as P1, etc. according to numbers on the bar graphs showing S1, etc.

MA U-1 indicates foot placement. It is possible from the images to see that all participants increased the angle of their feet, therefore creating a more stable base (6.2). Everyone altered the distance between the heels, some widening the base, some narrowing it to approximate the target of 10-15 centimetres. In other words, the changes suggested in the procedure (Appendix N) have been put into action and are evidenced in the presented images.

MA U-2 shows whole body images for each participant (three pages: 2a, 2b, 2c). The images demonstrate changes occurring in MA stance with most people swaying back, as indicated by

red lines on each diagram and red dash lines showing the repeated occurrences. For P1 in particular, there are notable differences between the habitual and MA stances. In other words, observation of data confirms our expectation of swaying back in the MA stance; this is likely because the individual is doing less muscular work to remain upright when s/he has a more stable base (6.2). P4 appears to be an exception to this.

MA U-3 is a bar chart representing the increased length of the back in all participants when MA stance is adopted. The distance from C_7 (the lowest cervical vertebra in the upper region of the spine) to the sacrum marker increased in MA stance compared to the distance in the habitual stance; that is, the back lengthens because the curves in the spine become less marked when the head is poised. The mean results for all participants (column 12) demonstrate the reported change. Note: one column is missing for P4, but other data columns appear unaffected. The average increase for all participants was 6 mm in the MA stance which demonstrates a statistically significant difference compared to the habitual stance. The ANOVA, FigU-3b shows $p = 0$. The probability column for repetition is $p = 0.8029$, i.e. the effect of being asked to repeat the trial did not produce a statistically significant result.

MA U-4 is the bar graph for results when the anterior chest is measured in the distance from clavicle to a point on the pelvis, the anterior superior iliac spine. The associated ANOVA (MA U-4b) indicates that change in this measurement was not at the level of statistical significance ($p = 0.3044$ for stance). We consider the possibility that 'lifting the chest' (6.2) might be cancelled out by 'shortening in front' which can occur (e.g. when the shoulders are rounded in misuse, Alexander, 2000: 47). Not finding anything of significance in this measure does not conflict with our expectation that lengthening and widening of the back takes place in MA stance, as demonstrated to an extent in MA U-3.

6.6.7   Results and analyses from the EMG recordings for muscle activity

Appendix V has files labelled as EMG V-1, etc. Recording only took place during speaking. In balanced upright posture in the MA stance, our expectation was that there would be less work in the leg muscles. Basmajian and De Luca confirm activity in gastrocnemius and soleus in standing varies depending on the 'almost imperceptible forward-and-backward swaying of the body' (1985: 255), but that in 'quiet, symmetric standing' tibialis anterior is inactive (1985: 257). As suggested in 6.5.6.6, undue muscular activity in the legs is likely to accompany pulling oneself forward from the ankles.

Activity in soleus might vary depending on which foot is forward when the particular stance of mechanical advantage is adopted (Appendix N), particularly if the weight has not been evenly distributed between the feet as intended. Results showing any lessened activity in trapezius can be regarded as an indication that other muscles (beyond those in the leg) are doing less work when the adjusted stance is adopted during the intervention.

A reduction in activity in several of the muscles is borne out in the results. Particularly when comparing the means for all participants for all four instances, there is reduced muscular activity in the MA stance compared with the habitual stance, confirming our expectation. Details are shown for each of four data files which record the means compared in different trials. The results were tested for statistical significance; on the bar graphs, a comparison reaching a level of statistical significance is indicated by titles in red; those with titles in green are close to statistical significance.

EMG V-1 shows mean values across all four trials (habitual stance and MA stance and their repetitions) and across all participants 1-10; column 12 shows summed means for all participants during each trial. The statistically significant results are: soleus (on the left),

vastus medialis (right), semimembranosus (left and right), and trapezius (right). Tibialis anterior (both left and right) and trapezius on the left are close to significance. **EMG V-2** uses standard deviations to compare the results across all four trials. The following muscles have statistically significant differences occurring in the comparison between habitual and MA stance: tibialis anterior (left and right), soleus (left and right), semimembranosus (right) and trapezius (right). The standard deviation shows the spread of data in relation to the mean in any distribution such as a 'normal curve' (6.6.4), (Connolly, 2007: 48).

EMG V-3 and **EMG V-4**, in line graph format, show fluctuations in the activity of each muscle over time during the procedure; that is, when speaking in either habitual or MA stance. Those muscles on the right (EMG V-3) where the activity appears lower in MA stance than in habitual are: tibialis anterior, gastrocnemius medialis, semimembranosus, vastus lateralis and trapezius, i.e. most of the muscles being recorded. On the left (EMG V-4), activity appears lower in MA stance for: soleus, vastus medialis and semimembranosus; and to a lesser extent there are differences between MA and habitual stance for tibialis anterior and trapezius.

In summary, these EMG findings corroborate the idea that there can be less activity in muscles in the leg when MA stance is adopted. Also, less activity in muscles elsewhere is demonstrated in the case of trapezius in the neck and shoulder area.

6.6.8   Results and analyses from recordings for skin conductance

The measure of skin conductance (EDA) can be interpreted in terms of detail given on physiological arousal (6.5.3.4). Participants appear to experience heightened physiological arousal when speaking but this is less so in MA stance than in habitual stance. It may be conjectured that, if psychophysical use is improved, the individual may be likely to respond 'more calmly' to a stimulus (such as the stimulus to speak). EDA W-1a and EDA W-1b are the

bar graph and associated ANOVA (Appendix W). It is shown that when the four trials are compared, there are statistically significant differences between the results for participants comparing habitual and MA stance. That is, for this sample, the difference is statistically significant with p = 0.0002 for stance, whereas repetition has a p value outside the statistically significant range (0.9722).

6.6.9 Results from the force plate readings and other measures

In Appendix X, the page of graphs show changes over time during the recording with '0' on the horizontal axis being the start of speaking. There are readings for the centre of pressure of the individual on the force plate shown as yCOP, 'breath', voice as 'the sound envelope', and skin conductance. I give detail on each; mean values are used in each graph.

The force plate enables calculation of where the centre of mass or 'centre of pressure' of any individual falls, which in these instances is akin to the centre of gravity (6.5.3.2). Fig. 6-6 is a simple representation, although it shows the feet placed close together which is not recommended in MA stance (6.5.5.2, Appendix M).

Fig. 6-6 Sway showing related centre of pressure

(a) Side view of human at two positions of sway with the resulting center of pressure represented by the arrows, and (b) view of center of pressure trajectory.

(https://posturemovementpain.files.wordpress.com/2013/03/20130303-191511.jpg)
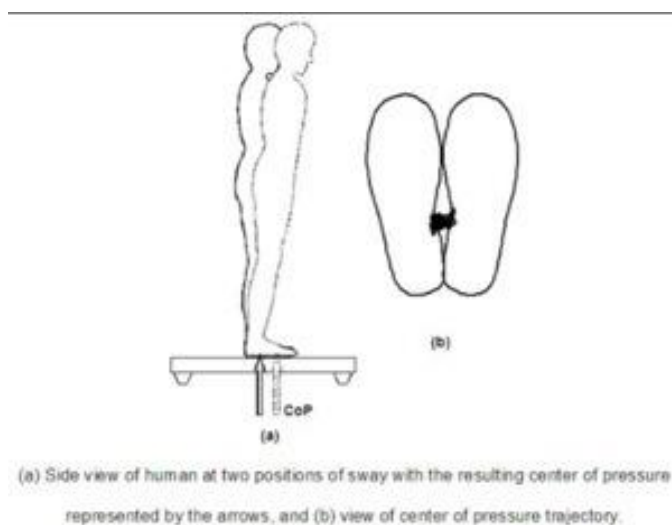
The force plate results (yCOP) can be compared across the habitual and MA procedures. There is far less fluctuation of the line of gravity observed in MA stance (represented by the green line on the graph) than in habitual stance (the blue line) and this may demonstrate that there is more stability in the adjusted stance. It can only be determined whether the stability is being achieved by 'fixing' (unnecessary contraction of muscles) if viewed in combination with EMG readings for the leg muscles. As it was demonstrated that less muscular effort is being employed in the MA stance (6.6.7), it can be said that some steadiness in the line of gravity may indicate improved use.

The graph representing 'breath' indicates expansion of the rib cage in millimetres, taking the distance between markers on the back and on the anterior chest wall. The distance is less for MA stance (green line) than for habitual stance (blue line), indicative of a quieter level of respiration when the stance is adjusted. As participants did not appear short of breath for speech, possibly the result equates with more efficient use of breath when speaking the sentence in MA stance.

The further measure for voice relates to the envelope of a sound which is its 'attack, sustain and decay'; the attack is to do with changes occurring at the very start 'before the sound reaches its steady-state intensity'; sustain is that steady-state and 'decay is the rate at which it fades to silence' (Encyclopædia Britannica, 2015). The graph in Appendix X shows results when speaking during MA stance (green line) were less than those for habitual stance (blue line), particularly in the first second of speaking. In other words, there was less amplitude or power: the voice was quieter. No one was difficult to hear, therefore this may illustrate more efficient production of sound (McGlashen and Howard, 2001) (3.2.3). There may be other linked effects (6.2): reduced effort in breathing; less effortful voice and improvement in psychophysical use.

The further measure of skin conductance in Appendix W demonstrates a lower level of EDA when speaking in adjusted stance than when speaking in habitual stance. This is apparent throughout the first ten seconds of speaking according to the mean values shown.

6.7 THE QUALITATIVE MEASURE OF PARTICIPANTS' PERCEPTIONS

At the end of the laboratory session, each individual was asked her or his subjective view of what they had experienced (6.5.2). This was in advance of being given any further explanation of the procedure.

The question was in two parts:

1. *Which answer most closely applies to speaking during the two procedures? A, speaking was more effortful in procedure 1; B, it was more effortful in procedure 2; C, you can't distinguish between them.*

2. *Did you notice anything about your voice during the experiments?*

Responses from participants varied, although almost no-one answered 'A' which is the answer matching the quantitative data which had been collected and which is presented in this chapter. Possible reasons for this are set out in the conclusion (6.8).

Some comments from participants were unclear or difficult to interpret. The transcript of response from one student teacher is given (Appendix Y) as an example of what she added when asked if she had noticed anything about her voice (Question 2). I also show a table of all responses that were given and any additional comments from participants.

6.8 CONCLUSION

The study presents a considerable amount of quantitative data for the ten participants and what happened when they were asked to speak a demanding sentence in laboratory conditions

whilst various measures were recorded. The links between all the discrete measures are important to interpretation of findings.

The overall design of the exploration was comparison between two stances. The data ranged across mechanical measures of muscle activity and records for postural configuration including length of the back. Combined with the EDA measure, all data indicated change occurring in MA stance. I outline some main points from the results and discuss the prime implications for this group of individuals who gave considerable time taking part in the laboratory exploration for the benefit of this research.

The measures for voice and stance demonstrate changes during the intervention. The voice quality measures derived through voice science and other literature sources, as well as the perspectives of teachers (Research Question 3), have been shown to be an effective means of assessing vocal differences for an individual in differing circumstances (that is, the change of stance). The exploration has worked effectively in assessing voice; for these teaching professionals, improvement has been demonstrated in respect of some quality measures (Research Question 4).

The intervention (a procedure of the AT which participants carried out with scripted, standardised instructions) appeared to yield the outcomes expected by the three AT teachers carrying out the exploratory work. That is, measures such as length of the back and poise of the head (demonstrated as improved for some participants in MA U-2, 6.6.6) are endorsed by changes in voice along the lines for 'good' voice quality as proposed by Hollien (3.2.1).

It is a notable outcome being able to say, often with 99% certainty, that the proposed model of improvement (change in voice quality when speaking with the stance adjusted) was accurate. Reduction in pitch demonstrated in some measures was seen as corroborating one expectation

(6.6.2.1 to 6.6.2.3). In a few instances for pitch and other voice qualities the level of certainty was 99.9% (6.6.2.1; 6.6.2.3; 6.6.2.6). Similar statistically significant results of 99% certainty occurred with reduced power or intensity, yet it was demonstrated that the power of the voice (shown by several measures) meant it was loud enough but possibly requiring less effort (e.g. line graphs at 6.6.2.8). The reduced effort was substantiated also by quantitative measurement of muscle activity, primarily in the legs, but also muscles elsewhere doing less work as shown for one muscle in the neck/shoulder area (6.6.7).

On voice measures, there were some indications that reductions occur in MA stance for shimmer and sometimes for the H/N ratio and jitter (6.6.4). However, on the whole, analyses using Praat were less informative, perhaps because the measures are usually used to review a broad range of voices, some being investigated for disorder. It is noted that this sample of participants had measures of H/N ratio well within normal values. The recorded ratio was rarely above the 20 dB considered a threshold for 'normality' (Williamson, 2014). Raw data shows means for H/N ratio across the group and across the trials with values in the range 14-15 decibels.

Combined data in the exploration gave corroboration that there were several changes in an individual when MA stance was initiated. For example, there was reduced muscular activity and, combined with changes in the EDA measure, this indicates change in psychophysical use. It can be surmised that individuals responded more calmly to a stimulus to speak if psychophysical use was improved (6.6.8).

A final consideration in this evaluation of the laboratory work is that the qualitative comments of participants did not match the quantitative data obtained. Only two participants thought that speaking when in habitual stance was most effortful, giving a probable corollary that they

were the only individuals to perceive speaking as less effortful when adopting MA stance. To interpret this outcome one might consider that speaking in the laboratory was unlike communicating in class where there is a response from the 'audience'. The questions I asked participants were not necessarily the best ones, as it was difficult to pose questions which were open enough not to 'lead' but directed enough to gain short explicit responses. It might be that collection of qualitative data another time could be linked with asking participants to make a few comments about their experience in relation to the quality of their voice in each of the two stances, rather than asking specific questions.

Shortcomings in the exploration mainly centre on some voice data not showing significant findings and that some measures may not be of particular relevance to outcomes with individuals whose voices are 'good' enough. For example, H/N ratio was well within the 'normal' threshold. However, these were student teachers on their summer break; outcomes might be different at the end of a day's teaching. Also, it can be borne in mind that a greater number of participants might bring different results and that overall the outcome endorses a positive answer to the fourth research question as to whether improvement can be demonstrated for teaching professionals. It was shown to occur for measures of postural configuration (indicative of improved use) allied with elements of voice quality identified as 'good' (3.2.1).

It appears to show the robustness of the research that a breadth of measures, relating to both voice quality and psychophysical use, could be employed in the laboratory. The extent of data demonstrate that the exploration has verified strengths (4.7.4), including in its reliability (4.7.5). The laboratory work resulted in data of a quantitative nature, all of which could be associated with improved psychophysical use and improvement in voice quality.

Finally, following this laboratory exploration, the question arises as to what relevance it might have for teachers in the classroom. The purpose of the exploration was to gather quantitative data on improvement in vocal quality in using the voice procedure developed by Brian Door, founder of PAAT. The data gathered and the findings of the PhD as a whole will hopefully be of use in gaining support for further projects aimed at demonstrating the potential benefit for teachers of providing tuition in the AT as part of their training.

It is already known through the work of F.M. Alexander in the first part of the twentieth century and those who have studied such re-education subsequently, that a change in postural configuration, which can be brought about by adopting a procedure of the Alexander Technique, signifies that the question for teachers (as for other vocal performers and individuals in general) relates to its meaningful application. If someone wishes to learn the AT, they may begin with that most fundamental of human activities: being upright. An individual can work to improve this act, learning to respond with less muscular effort than they may employ habitually (Door, 2003: 26-27). Changing this reaction to maintaining upright stance against the effect of gravity, which is a constant influence on our lives, is of fundamental importance. As demonstrated by Alexander (1.8.2) and attested by others, notably Door (2003), changing habitual reactions in this basic everyday activity and in all others is the only way an individual can ensure that they are not mechanically-disadvantaged, including in the everyday act of speaking (1.8.3).

CHAPTER 7

CONCLUSIONS

7.1   INTRODUCTION

In this chapter I review the study as a whole, showing what has been achieved and indicating how I have been able to add to knowledge within the field of voice, particularly in relation to classroom teachers and student teachers.

My initial hunch was borne out: the survey of student teachers and teachers demonstrated that many find it hard to meet the vocal demand of being in the classroom. Also, my own experience of the AT proved to be informative of what might help teachers to address a situation where they have voice problems of a non-medical nature. In the course of the study, my own knowledge of voice, the vocal mechanisms and what constitutes voice quality has been advanced and I continue to gain greater insight into the Technique and its further potential.

There follows an evaluation of findings, drawing together what emerged from the literature review and from primary research conducted in the survey and the laboratory exploration. Taking account of both qualitative and quantitative evidence, I discuss how valid and authoritative my first-hand findings can be said to be. Also, I consider the potential of the survey and the laboratory exploration in providing useful insights for those who have interest in the topic or who work in allied fields. I review what I would do differently another time and propose further work on teachers' voice which might follow from this initial research.

7.2   REVIEW OF THE STUDY AS A WHOLE

I give a summation of the research objectives (1.9.2), answers to the four research questions (1.9.1), and a review of what has been achieved in fulfilment of the aim: exploring help for teachers to cope with the demands on their voices in a teaching career.

7.2.1   Meeting the research objectives

The survey was conducted to address Research Objective 1 (To carry out a survey, conduct interviews and use other first-hand evidence of the voice problems of teachers and student teachers, helping to address a lack of research in this area, particularly in the UK). With the interviews and other first-hand evidence, the survey contributes to an understanding of the situation in the UK, currently (Chapter 5).

The data gained shows the considerable vocal demands of being in the classroom for these particular teachers and student teachers, leading to the surmise that this may be the case for many others. There exists now a further body of evidence in addition to that from research predominantly conducted in other countries to suggest that classroom teaching professionals in the UK regard their role as vocally onerous and would welcome support beyond that shown to be available (Chapter 3).

A range of evidence was gathered to address Research Objective 2 (To analyse literature, including that denoting criteria for 'good' voice and its measurement, and use a review of other evidence as background to further exploration). Specifically, I have analysed literature and the views of voice teachers (Chapter 3) and investigated primary sources such as the perspective of teachers and student teachers (Chapter 5). Also, I was able to take into account my own experience including reflections on a personal voice diary. Having first-hand experience informed my interpretation of what teachers and student teachers said in response to the questionnaire and helped my engagement with participants, for instance in decisions about the format of the survey and in interview discussion with a teacher, a professional actor and an actor training as a teacher.

The following actions enabled me to meet Research Objective 3 (To examine possible solutions to teachers' voice problems and consider voice training for actors through the writings of actor trainers in the UK and a survey of well-known UK drama schools): consideration of voice training for actors; analysis of features of the training offered by major conservatoires both currently and historically (3.4.2.1; 3.3.4); attendance at two voice workshops (4.4.2); and analysis of previous investigative work involving the AT (6.4). All enabled me to gain a clearer background to what is currently provided and how teachers might be helped.

Also, I drew on the key concept of use as defined by the AT (1.8.2). My own personal experience of learning the Technique was useful in shaping an understanding of what might be taken forward as measurement criteria in the laboratory, as outlined in Research Objective 4 (1.9.2). This enabled the gaining of further evidence on improved psychophysical use through exploration at MMU of a practical procedure of the AT and voice (Chapter 6).

The participants were training or already working as teachers. Using the criteria for measuring voice quality by quantitative means (derived in Chapter 3), I worked in collaboration with Alexander teacher colleagues. A comparative exploration was conducted and detailed results were analysed in order that findings could be presented in Chapter 6. It was an important part of the procedure, which was based on principles of the Technique that the way it was suggested (in this case, in the laboratory) meant the participants were able to make changes themselves. This experience led me to believe that learning the Technique, perhaps as a short course during teacher training, could enable teachers themselves to make a difference to their situation. PAAT teachers observe this during short courses intended to introduce people to the AT.

My decisions in setting up and pursuing different methods of evidence-gathering were informed by various viewpoints taking into account voice science and drama teaching (both its early influences and development). This evaluation is based on reflection with these perspectives in mind, but it also considers the needs and expressed ideas of teachers themselves.

Finally, in accomplishment of Research Objective 5, this chapter is intended as an appraisal of the study as a whole. Overall conclusions are followed by recommendations for addressing teachers' needs. As in the early stages of initiating the study, and then carrying it forward, my own combined roles as researcher, classroom teacher and Alexander teacher are instrumental. Such personal perspectives are an integral part of the study, enabling me to conceptualise possible ways forward to help teachers and to put these into action; they support my examination and interpretation of findings, as well as proposals for the application of any new knowledge. Finally, I move towards suggestion for further research, identifying aspects of voice quality which may have been uncovered but not probed by this study.

7.2.2   Addressing the aim of the study and its research questions

The research questions (1.9.1) have been taken forward through a variety of methods, structuring the research as part of my mixed methods design based on a multi-strategy paradigm. The questions were instrumental in the formulation of objectives and in shaping the actions I took to meet these objectives. Each question and its outcomes are set out in detail and by summarising the answers to the questions it is possible to confirm that I have met the aim of the study (1.1). As a conclusion, it is evident that what I did and found out has helped to progress both my own understanding and the knowledge that exists in the field, but that more remains to be done.

In a review of the questions, I leave Research Question 1 to be discussed last. Evidence towards the second research question on the perceived vocal demands of UK teachers in the classroom has been gained through the direct answers of participants in the survey and interviews, and also through my own experiences brought to bear on interpreting what was said, so taking the study forward. Main reporting of these actions is in Chapter 5 and evidence discussed there informed other parts of the study (5.9). For example, the interviews and detailed questionnaire answers give insight into individual situations but the numerical evidence shows a 'snapshot' in time of a group of professionals.

My third research question on criteria for measuring improvement in voice quality meaningfully for classroom teachers was answered affirmatively through reviewed literature: what is written by voice scientists, voice teachers and actor trainers (Chapter 3). Insights into this aspect of the study have also been advanced by the experiences and views of classroom teachers and student teachers (5.8.1; 5.8.2), who appear to recognise vocal difficulty in their role in the classroom and know they require more support (5.8.3; 5.8.4).

The fourth research question was addressed in combination with work towards an answer to the first main question; that is, I explored improvement in voice quality through adoption of a procedure based on the AT, using this as an intervention when working with a number of individual student teachers and a teacher in a specialist laboratory (Chapter 6). The feasibility of doing so with measures of voice quality, using quantifiable criteria derived in pursuance of Research Question 3, means that it is possible to affirm improvement in voice (Research Question 4). The link between teachers' voices and improved use was also demonstrated in this study as indicated in Research Question 1. For instance, conclusions to Chapter 6 illustrate that work in assessing voice could be carried out quantitatively. The procedure of the AT was shown to bring expected outcomes as evidenced in the breadth of data gathered (6.5).

7.3   WHAT HAS BEEN ACHIEVED IN THIS RESEARCH?

It is shown through the meeting of the research objectives (7.2.1) and answering the research questions (7.2.2) that this thesis adds to knowledge in the field, as well as advancing my own understanding of voice, teachers' voice, and what might help someone to cope with vocal demands during the course of their teaching career.

7.3.1   Ways in which the study has added to knowledge in the field

The research has added original knowledge in several ways: via the questionnaire results showing the qualitative comment of teachers and student teachers and giving a numerically descriptive analysis of their situation; via analyses of texts providing insight into voice quality and its assessment; via an analysis of both text and other sources concerning voice training; and via the laboratory exploration enabling a comparison of teaching professionals speaking a sentence with and without an adjustment to their stance which they brought about themselves.

It is an important part of the latter activity in my research that basing the adjusted stance on principles of the AT meant that there was a means of considering a psychophysical, rather than a so-called physical, response to the situation of speaking (6.2). The accrual of knowledge is discussed for each of the research activities in turn.

7.3.1.1 Advancing knowledge through the first-hand survey of teachers and student teachers

Information emerging from the survey can be regarded as supplementary to what was known previously about teachers' voice from surveys world-wide. Data make evident that from a substantial sample of 174 teachers, a large proportion present with voice problems; this is also shown amongst 125 student teachers. There is additional evidence on student teachers from another university only on a small scale, although it corroborates the wider survey in many

aspects of the topic: the vocal demands of teaching, voice problems, and a view that there is not enough voice training available. All participants are engaged within the UK education system and evidence is a notable addition to previous research in the UK (2.3.2; 2.3.3; 5.9).

Although the types of problems appear similar to those shown in results of other surveys, my study takes an approach of looking for the reporting of non-medical problems as much as any which may require medical treatment. Few participants in this survey mentioned any medical treatment for vocal difficulties: less than 20% had consulted medical practitioners; fewer than that had received treatment, and very few had been offered any major medical intervention (5.5.5.2). This opens up a question of how more information might be gathered to inform help for those who do not present clinical problems and who appear to have no or little provision. This study has gone some way towards such a goal.

The questionnaire which teachers completed in my survey enabled them to give individual comments as well as answers to closed choice questions (4.4.1.1). This opportunity for participants to express their views more freely can be considered influential in the kind of information that results from any study (5.9). Again this may be broader than presented elsewhere.

Information was collected on voice training which teachers had undertaken and the shortage of provision was evident, even taking account of related training in singing or drama, opportunities which some teachers seemed to pursue in their spare time (5.5.6). In response to one particular question about whether voice training would interest them, 52% (a clear majority) indicated it would. Many of these teachers were in older age ranges, so it was apparent that interest in training did not decline with age (5.5.6.3).

The percentage of student teachers wanting voice training (65%) was higher than that for teachers (52%) (5.5.6.3). Few seemed have been offered voice work as part of their initial training; only 15 teachers had received such provision and only two student teachers in the university where the main survey was conducted. However, this was a different statistic for the particular secondary school student teachers who had been offered the short course (two hours) by their university.

For student teachers, it is particularly serious that little is provided, given previous survey evidence (2.3.1.5) and also journalistic comment on teachers' voice which I noted at the start of my study (1.1.2). Existing research and such articles appear to have made little impact on teacher training courses where I have worked, and possibly at the majority. The work of Fairfield and Richards (2007) demonstrates this appertains in other higher education provision for teachers (2.3.2) and it may still be the case. In both my survey and that of Fairfield and Richards, it was not that voice training would follow later in a course; the situation was assessed in the final weeks before qualification.

The survey revealed a lack of clarity on the part of student teachers and teachers about what voice training might comprise (5.8.1 and Appendix J). This makes it problematic to decide approach and content according to the wishes of the profession. One could consider that suggestions and guidance might be welcomed by them.

The status of the knowledge I am presenting is assured by the size of the purposive sample (4.4.1). Although not a random sample, it nevertheless is authoritative in respect of registering the experiences of relevant professionals. The numbers taking part in the survey are comparable with other small-scale studies such as Ilomäki, Mäki and Laukkenen (2005) and Morton and Watson (1998) (2.3.1.1).

In comparison with other student teacher surveys, my research is similar in numbers to that of Fairfield and Richards (2007) and Neto *et al* (2008) (2.3.1.4), although an additional dimension of my study is that it surveyed different courses, both undergraduate and postgraduate for which the profile of students differs (5.4.2; 5.4.2.1). There was a high return rate of 81% amongst student teachers for my own questionnaire (5.2.2).

As a result of my research, I can add considerable detail on what voice problems mean for these groups of professionals, both teachers and student teachers; I can give also some specific information on what it is like for individuals. The information provides a perspective on being a teaching professional in a twenty-first century classroom in the UK with little or no voice training being provided.

7.3.1.2 Advancing knowledge on voice quality and its measurable parameters

I have analysed and discussed the nature of voice as both an acoustical (quantifiable) and perceptual (qualitative) phenomenon and examined voice quality which is defined in different ways including perceptually (3.3.3.2). Measurable aspects of voice quality have been considered and criteria for improvement in voice quality have been defined (3.2.1; 3.2.3).

Conclusions were drawn about what could be studied, measured, analysed and reported in the laboratory exploration in the latter stages of this research. Some of this may be original reasoning in assembling particular forms of evidence in specific ways. The manner in which the discussion framed original exploration in the laboratory is indicative of a commitment to advancing knowledge so it can usefully underpin further research on the topic.

7.3.1.3 Advancing knowledge on voice quality in comparison with measurable parameters of postural configuration

The original work in the laboratory at MMU undertaken with two AT colleagues has enabled quantitative data to be collected, analysed and interpreted. The only other example where I am aware of such quantifiable assessment of postural configuration being used is research conducted by Jones (1959; 1972). In the study at MMU, recordings enabling postural data took advantage of advances in technological systems meaning the data were more elaborate in extent and exactitude than possible previously (4.3.4.3; 6.4.4).

In addition to measures by Jones (the use of EMG measurements of some muscles, spinal length, and use of a force platform to determine where the mass of the body was falling), I looked at some muscle activity in the legs and incorporated the measure of skin conductance (EDA) providing an indicator of psychological input. This recent work resulted therefore in original findings, particularly as we related it, not just to the procedure of the AT, but to a comparison of that stance with habitual stance as a practical exploration of use (6.2; 6.5.2). Also, the way in which we helped participants themselves to follow the procedure is original to this work, as far as is known (Appendix M). The procedure itself is copyright to Brian Door's practical application of the Technique (2003: 96-98).

Voice quality measures were carefully extracted from the recordings of voice in the adjusted stance compared with that in the habitual stance. These measures and the form of analysis (two computer software packages) (6.6.1) may also be novel to this research. Recordings known as voiceprints were incorporated by Jones (1972), but precision of data collection and management in this measure may have advanced in recent years, as demonstrated in the study at MMU. What I presented as Chapter 6 results are an outcome of the way the technology was

utilised to gain and interpret quantitative evidence and the criteria which had resulted from analysis of literature on voice quality (3.2.1) as well as writings on the Technique (6.2).

7.4 EVALUATION OF FINDINGS

An understanding of my findings and a view of their validity rests on their context and the background analysis which took place to ascertain a suitable means of collecting and utilising empirical evidence of both quantitative and qualitative form. In my multi-strategy paradigm, collection of different forms of evidence allowed a diverse range of data to be drawn together in one place.

My findings are valid for the specific context of data collection. Generalisation is considered possible from some forms of evidence some of the time; for instance, Pring refers to generalising from quantitative data (2004: 93) (4.3.4.2). However, it appears not to be a function just of data form whether generalisation is possible; it has been discussed (4.7.1) that Punch identifies it is about having the maximum chance of observing variables and their relationships (2003: 32); I have demonstrated how I have achieved this (for example, 4.4.3). My discussion also illustrates the way I conducted the study as appropriate to conditions and circumstances, what Robson (2011: 156) would say was operationalizing it appropriately (4.7.1).

Methodology, methods and procedures have been set out explicitly to support a claim to validity and reliability within the entire study (4.7) and to justify results from particular measures (4.7.2; 4.7.3). Where there is a limited claim for valid generalisation, the circumstances are made apparent for the reader to interpret; for example, in presenting particularistic interview evidence from a newly qualified teacher and a student teacher trained previously in drama. This evidence is a valid representation of what it is like for someone

coming into teaching and facing demands on the voice; it represents a specific perspective on challenges or problems that might be encountered.

The findings have some measure of authority afforded by the combination of quantitative and qualitative evidence to address my research questions in an individually-constructed multi-strategy design (Robson, 2011: 131). The two forms of data are described as 'inseparable' (Howe in Robson, 2011: 162). The key feature of this paradigm is said to be 'its methodological pluralism or eclecticism' which some compare favourably with 'monomethod research' (Johnson and Onwuegbuzie, 2004: 14). It may be judged by readers, as arbiters, to have served well in this study.

Being able to present the research from my perspective of being a classroom teacher lends a different kind of authenticity than if my profession were different. There is also some validity from being able to represent the view encapsulated in the AT, through my interpretation of Alexander's writings gained at an examinable level in AT teacher training. My negotiation of meaning in the research and in its outcomes can be viewed within these perspectives of teaching in schools and Alexander teaching; they are related as the living context in which much of the data has been gathered (Pring, 2004: 81-82).

7.4.1 What the research and its evaluated outcomes might mean for teachers

The study is not of itself confirmation of any solution for the voice problems of classroom teachers, but it is suggestive of the potential benefit of drawing on the principles laid down by F.M. Alexander, as used in the laboratory exploration. If voice is more resonant and improves in other qualities, it may be less effortful as well as clearer; there is a reduction in overall effort which can be assumed from the outcomes reported in this study (6.6.5; 6.8). This research can lead to support for teachers in the form of them learning to mechanically-

advantage, rather than disadvantage, themselves in their everyday activities including in the classroom. It has been noted in this study that such change requires recognition of the relationship between our ways of thinking and our postural configuration and that this is a constant (1.8.4). See Alexander (2000).

For the research and its outcomes to have meaningfulness for teachers, there has to be intention to broadcast its findings. The steps to do so may become more apparent over time, but there are two initial ideas. Firstly, teachers themselves need to know what has resulted from the evidence they supplied. Secondly, those who are responsible for teacher effectiveness could receive information from the study for their consideration. This might include schools themselves, including in the consortia or cluster groups which they often form for support and training (CPD). There may also be other localised bodies, as well as the nationally-based college which provides training and development for school leaders.

In addition to issues affecting teaching and learning, the matter of teacher well-being being disadvantaged by voice problems may be detrimental also to pupils (2.4.2). Teachers in my survey do not convey a sense that their well-being is fully considered given they experience unaddressed voice problems associated with the demands of the role. In describing these points broadly at this stage, I recognise that greater clarity is required for next steps, perhaps in discussion with teachers who can assess my evidence and discuss their way forward. This is also the case for those in training. It is not to say that I would not be willing to support as appropriate.

In addition, the continuance of research which I propose could take the form of short courses enabling teachers to experience the procedure for more mechanically-advantageous ways of being upright in parallel with developing greater awareness, for instance, of the quality of

their voice. Such exploration could occur in weekly sessions with an Alexander teacher with chance to register in the intervening days what it is like applying this within the classroom. At the start, as occurred in the experience of F.M. Alexander (1.8.3), it will not be clear to any individual what habitual responses they make in speaking. It emerged also in evaluation of some training that there may be an essential requirement for 'feedback' rather than 'outcome' approaches (3.4.3) and this is the case with the Technique. Also, as Alexander found, it is necessary to take time to acquire awareness and the starting point in seeking to improve vocalisation through the Technique is working on being in balance with less muscular effort (1.8.2; 6.8).

7.4.2   What the outcomes might mean for teacher training

It appears that many student teachers responding in my survey would welcome voice training. For a small number of student teachers completing questionnaires, some brief training was being provided at Keele University. It was one such session I attended as useful broadening of my own experience (4.4.3). Conversation with the actor trainer, Sean in addition to his interview, indicated students' interest in more time being provided for training.

Current student teachers, as well as course organisers need to know what my findings suggest. It seems that if I approach university-led teacher trainers with my evidence, it might meet with some interest. There is also an implication for those who train in school as part of any SCITT (school-centred initial teacher training) or School Direct scheme, or through Teach First, which is a current government initiative to increase teacher numbers and diversity.

7.4.3   General suggestions for dissemination of my research evidence

There is a task to be undertaken in disseminating information about this study to reach teachers, student teachers, school leaders and course organisers, so they learn of its extent, its

findings and implications of the results. This requires consideration of suitable avenues to pursue.

The uniqueness of this study is a key part of what can be said about it: the combined ways in which I have gathered data; the inclusion of the AT and its perspective which throws light on human use and enables a view of the psychophysical indivisibility of individuals; and a drawing together and summation of evidence discussed in this light. All are relevant to what happens next to make a difference for the teaching profession.

One study of the AT reviewed in this study (6.4.1.1) suggests via its title that the Technique forms a 'supplement to voice production' (Zipperer, 1991). I would query whether such a view and approach enable the potential of the AT, as I understand it, to be explored fully. Perhaps there needs to be more fulsome commitment for it to work effectively for more people.

The findings of the laboratory exploration in my research show that voice quality can improve when someone applies a procedure originating in the Technique to change their upright posture as an aspect of their psychophysical use (1.8.2; 6.2). This result can be verified through the voice quality criteria suggested by Hollien (2000) as indicative of 'good' voice (3.2.1), with concurrence by Zemlin (1998). Pitch, amplitude or power and resonant features were shown to change (6.6.2).

It has been demonstrated that an exercise-based approach may not be successful (Walzak, 2008, 3.4.3); it appears to be the case that a factor or underlying factors remain to be addressed in such training. Also, in the light of evidence from specific data that some approaches may not address the vocal needs of teachers, because the problems are not medical (see the case study of Jane, 4.5.1 and other survey results, 4.5.5), it is surely worth providing

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opportunity for teachers to learn to improve their use through the AT. I am committed to further evidence-gathering towards disseminated outcomes.

It might also be considered that issues in using the voice may not be dissimilar for lecturers in higher education. When I was employed in that role and presented my initial findings to colleagues some indicated they were familiar with occasional or ongoing voice problems so that what I was reporting sounded familiar. If it is the case in one small university department, this too may represent a problem of unknown proportion. There is a need for dissemination therefore to a wide audience of interested parties, in order that consideration of further action can be facilitated.

7.5 WHAT I WOULD DO DIFFERENTLY ANOTHER TIME

Firstly, I will indicate what might serve well in future study. The methods chosen in this study enabled me to meet the aim of exploring help for teachers to cope with the demands on their voices in a teaching career. My methods were selected to be appropriate to evidence-gathering for the specific research questions I raised. The underlying methodology in respect of some regard for an interpretivist framework was consistent with my world view of engaging participants in the research to provide data from their own perspective (Chapter 5). Also, this was crucial to gathering evidence about phenomena such as voice and voice quality with both perceptual (qualitative) and quantitative criteria for measurement.

I chose to collect a wide range of data because it was judged appropriate to the field of investigation. Its richness of form, as well as the variety of its meaning, perhaps indicate this as a worthwhile aspect of the research and one which might be sought in future work. The specific measures in the laboratory proved useful in gathering specific data on postural stance and the particular voice qualities under investigation. The computer software which enabled

collection and analysis was a key aspect of deploying such measures in the way we did and for the specified purpose of verifying whether changes in voice quality were measurable. This could be followed similarly in any future work; the use of modern software especially lends itself to small-scale less formal investigation but detail of its employment may require scrutiny to check that it matches what is required.

Specific measures used in the questionnaire were not just limited to numbers of instances of voice problems, particularising problems, etc. but also enabled a qualitative assessment of the meanings within the situation for individual teachers and student teachers. Corroboration, yet extension, of existing study evidence means there is more to present to interested parties in order that findings can serve a useful purpose in my intention of taking evidence forward to realise help for teachers.

Some aspects of this study require further consideration. For instance, the terminology I used in my questionnaire was partly modelled on that employed in other studies and this may not be a wholly useful way of proceeding. Interpretation of terms used in voice research is a complicated matter, resting as it does on assumptions that everyone shares common understandings. It is apparent that terms for voice have to be defined within a piece of research (2.4.2); for example, use of the term 'hoarseness' in my own survey is discussed apropos my considerations prior to data collection and afterwards (5.3.1). I might not use some designations for voice problems in future research because of the medical slant taken by many working in the field. In further study it seems relevant to continue looking at non-medical situations.

Two other terms in contention are 'projection' and 'resonance', as seen in responses to open questions in both the survey (4.4.1.1) and interviews (4.4.1.3). This leads me to suggest that a

future approach could be to ask more open questions so as to be able to pick up on teachers' own terminology for what they want to describe and to ask them to explain their thinking, such as Debbie (Appendix D) talking about resonance. Such an approach would not enable the kind of numerical description and analysis used in this study, but it would be amenable to a grounded theory approach with smaller numbers of participants either through more detailed interviewing or the use of focus groups (Punch, 2014: 146-147). Focus group discussion might provide evidence which is inaccessible in other methods, given the interaction of participants is a key aspect of such an approach.

To some extent my questionnaire probed the severity of problems, for instance by asking how long a problem had persisted for a teacher, but it is a complex issue which might be approached differently on another occasion. For example, one approach could be to categorise this as did Thibealt *et al* (2004) (2.3.1.6). However, I am not sure that going into further complexities in this way is to be preferred to gathering further particularistic evidence by more extensive use of case studies.

Great care was taken with procedures at all points in the research: the compilation, distribution and collection of questionnaires; the arrangements for interviews; the enlisting of volunteers and all procedure in the laboratory. In retrospect, it would have been better not to request repetition of the AT procedure because it runs counter to principles of the Technique (6.2). Although it did not affect the outcome in any major respect, it was a mistake on my part. This aside, I aimed to give laboratory participants a helpful experience of the AT. I personalised approaches where possible and I hope this was evident to the participants who gave so freely of their time. The responsiveness developed between those taking part in the research and me as the researcher had a sense of reciprocity about it so that the needs of the study and individuals could be met. Continuing such working relationships on future

occasions would seem the best option for research and personal outcomes to coincide; that is to say, I enjoyed the links with participants when conducting the study and appreciated their goodwill.

7.6   HOW WORK ON TEACHERS' VOICE MIGHT PROCEED FURTHER

Further research on teachers' voice is possible, and indeed desirable, on the basis of this study. For instance, a similar study could be repeated with the intention of further verification of results. This might be a case of confirming the extent of teachers' voice problems taking account of possibilities for further quantification, as discussed in 7.5.

Future study might be best arranged through the gathering of further qualitative evidence; if so, this could be combined with further AT work with participants. Those who offered to take part in the laboratory experiment were able to 'investigate' one procedure based on principles of the AT. They were introduced to this by being talked through the procedure by a qualified teacher of the Technique and it was only afterwards, due to the constraints of avoiding undue influence on outcomes in the exploration, that they were offered explanation of the basis for this work. However, it could be feasible to work with a group of teachers or student teachers or with individuals to offer AT instruction in the way currently provided by my professional association in introductory courses and lessons. Concurrently, if participants were willing, data could be collected to inform provision for themselves and others.

This would be akin to applying what has been found in this study, whilst at the same time undertaking further research; that approach is well-suited to the spirit of investigation in which I have learned and continue to learn about individual development and the Technique. The form of such work and study would be empirical and might collect both qualitative and quantitative data; it would also be open to a case study approach.

Evidence in this study supports further investigation of the AT and its role in helping school teachers meet the vocal demands of the classroom. It has been informative in this research to talk to someone, such as the NQT, Claire (5.7.2.1) who had no evident voice problems but who had an idea of making her voice a more effective instrument in her teaching. One question to raise, not unrelated to this current research, is how she might put any idea into effect.

According to parameters set for this study (1.6.1), considerations of the wider implications of voice and being in the classroom were necessarily put aside. Yet, some aspects have arisen in the course of the study. Voice teachers, such as Houseman, talk as though 'tension' were a 'physical' issue (2002: 16-17); however, Carding, Horsley and Docherty suggest an assumption that issues of 'tension' or 'personal anxiety' influence what occurs as part of any voice problem (1999: 74), therefore indicating a wider issue. Also, the study of Åhlander, Rydell and Löfquist, beginning with a clinical perspective (2.3.1.2), concludes that it is necessary to take account of daily life and 'reaction to the teaching situation' when considering voice problems (2012: 160). Two participants responding in the continuation questionnaire (5.6) raised issues of stress, expressing a wish for training 'to control nerves' and describing 'fear of not being able to articulate a sentence' in front of a class of pupils. The AT does not separate these aspects in the means it offers for change (1.8.3); it is about learning to react more positively to stimuli that are present, including within a classroom. In future study there might be examination of this aspect of the Technique in relation to the situation in class. Even a modicum of appropriate understanding and learning might mean teachers can begin to recognise that in learning the AT they can influence this circumstance for the better. Communicating this to teachers and teacher educators could enable classroom practice to become even more efficacious through 'good' voice.

7.7   SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS

My suggestions might be taken forward in both further research (7.4.3) but also in work which teachers and others instigate. I hope to be involved in such initiatives, as well as working on academic papers for wider circulation. In many respects such continuation is as much part of this research as the present data gathering has been because it is part of my conception of what Robson calls a 'transformative' design (2011: 164-165); that is, the researcher seeks to influence social change. Passing on information about my study and its findings, derived through a mixed methods or multi-strategy paradigm, might be the means to empowerment of those in the profession in the way Robson and other writers propose (4.6).

This research might be regarded as a small additional step in providing evidence of the efficacy of the Alexander Technique including its relevance to improving voice quality. My study should be seen in the context of Alexander's own work and that of others who have developed its application, significantly, in my training with PAAT. My latter years in the classroom and teaching in higher education clearly substantiate the influence for the better of the AT and this includes its influence on voice demonstrated in the qualitative comments of AT colleagues and in my personal voice diary (1.2; 1.8.1).

My own training in this work has provided the basis for this research project; that is, without the AT training, I would have been unable to undertake the study as presented here. Further work in the field might seek to combine teaching and evidence collection, both qualitative and quantitative. In this way I might help to take this forward progressively.

Reflection was identified as a unifying factor in my research thinking and practice (4.5.1). It was discussed in relation to Dewey's 'intelligent action' underpinned by reflection (1933: 17) (4.9); it might be viewed through Schön's (1983) term 'reflection-in-action'. The transactional

relationship which I form with any acquisition of knowledge in this present study and any continuing work matches a reflective approach. As I arrive at this concluding chapter of the thesis and think of moving on further, it is contiguous with the research itself to continue exploring the topic of efficacy in vocal skills for those who work in the modern-day classroom, for instance through provision and evaluation of AT-centred voice training.

**A SUMMARY OF WHAT IS CURRENTLY KNOWN ABOUT
THE WORKINGS OF THE HUMAN VOICE**

A1   Introduction

Despite advances in the fields of human anatomy and physiology, knowledge of how the voice works is still incomplete. It is being continually revised as a result of on-going research by voice and speech scientists (Behrman, 2013: 5).

The following is an outline of the mechanisms of voice production which includes some explanation of voice quality and measures of voice and an indication of some problems of vocal functioning.

A2   Voice and speech

Voice is a result of the production of sound at the larynx brought about through vibration of the vocal folds. The larynx, sometimes known as the voice box, is an organ of the body situated at the upper end of the trachea or windpipe; the vocal folds are bands of muscular tissue within the larynx (Seikel, King and Drumright, 2007: 166 and 173).

According to *Gray's Anatomy*, speech development is possible because of integration between the nervous system (conducting nerve impulses from the brain) and the organs related to speech (1995: 1628). Similarly, Behrman refers to voice and speech production as 'a complex neuromechanical activity', 'regulated by the neurologic system and the physical properties of the structures which govern it' (2013: 4).

Human beings have this capacity for voice and speech, yet it may be useful to differentiate between the two terms. Behrman does so in reference to a definition in the Oxford English Dictionary (OED) which describes 'voice' as 'the sound formed in or emitted from the human larynx in speaking, singing or other utterance' (2013: 4). Speech is regarded as: 'the natural exercise of the vocal organs; the utterance of words and sentences' in our expression of thoughts and feelings (The OED in Behrman, 2013: 4).

However, it can be shown that voice and speech are interlinked and dependent one on another, so they are difficult to separate when it comes to discussing the activity of speaking. For

example, voice production depends on characteristics of the vocal tract and is not confined to the small organ of the larynx where the sound originates. Factors such as the length of the tract (the airway containing the larynx and connecting the mouth to the lungs) mean changes in its shape and configuration can alter the acoustics of the voice (Behrman, 2013: 239-240). This gives each voice identifying features.

Not only this, but the theory of Fant (*Acoustic Theory of Speech Production*, 1960) suggests that speech is more than just the tract. He proposed that the system comprises two major components, 'the sound source and the filter, or resonator' (Behrman, 2013: 219). In other words, there is a combined influence on the voice of the larynx and also the tract, such that voice and speech appear interdependent

Also, the presence or absence of activity at the vocal folds, referred to as voicing, is an important feature of distinctive phonemes, which are individual speech sounds making up the elements of language. Voiced sounds are produced by the vibrating vocal folds, whereas sounds such as /s/ or /f/ are phonemes produced 'without the use of the vocal folds' (Seikel, King and Drumright, 2007: 165). These points on the formation of speech sounds indicate that 'speech production when sounds are voiced' includes the activity of the larynx as well as the tract (Behrman, 2013: 4). Conversely, the activity of the larynx is not of itself a complete formation of voice to explain the speech system.

The main thesis takes account of voice as a physiological and anatomical phenomenon but recognises also the perceptual nature of voice quality which is important to social communication but also to measures of voice

A2.1 Voice and other systems

Voice and speech can be categorised in terms of systems defined by their functions: the respiratory, the phonatory and the articulatory. Relevant structures can also be named: the larynx, its cartilages (small pliable components which change configuration to effect changes in the vocal folds, A3.2), the airway, and also the articulators which comprise parts of the mouth and nose such as tongue, palate, lips and nasal passages (Seikel, King and Drumright, 2010: 26).

In practice, there is interdependence between these voice and speech systems and there is an overlap with other body systems such as the muscular, skeletal, respiratory, digestive, and nervous systems (Seikel, King and Drumright, 2010: 26, 27). The circulatory or vascular system also has 'functional unity' as a system to be taken into account in voice (Zemlin, 1998: 29).

In a schematic model of speech production, Zemlin demonstrates that sensory information and motor control in activity is a two-way and interdependent process of brain and muscle (1998: 31): 'The thought or response process leads to a sequence of neural impulses that are transmitted to the musculature of the breathing mechanisms, to the larynx, and to the articulators' and the process is a complex interplay of these mechanisms (Zemlin, 1998: 30).

Production of voice and speech is evidently not confined to the vocal tract; it is an integrated psychophysical process of the whole structure. We can only speak the thoughts that are generated in our brains and the organs of speech such as the larynx can only work when impulses from the nervous system direct the muscles to operate.

A3   The speech process as a whole

The sound emitted at the larynx is only a low tone: what Zemlin calls 'an unintelligible buzz' (1998: 198). Producing this or any sound requires an initial source of energy. Modification of the sound, to produce recognisable speech sounds, takes place in other parts of the tract.

The underlying process is: ***breathing*** or respiration accounting for the airflow which provides 'energy' for speech; ***phonation*** or 'voicing' which is 'the product of the vibrating vocal folds' of the larynx (Seikel, King and Drumright, 2010: 165); and ***articulation*** which occurs due to shaping of the upper vocal tract to alter the 'acoustical properties' of the initial sound and to produce speech sounds (Zemlin, 1998: 198). The production of sound as voice, therefore, requires: initiation, phonation and articulation, with resonance also adding to the quality of voice produced.

A3.1 Structure of the airway and its primary purpose in breathing

As shown (A3.1), in order for phonation to occur there needs to be movement of air as a source of energy. The air supply for phonation comes from the flow that is the usual activity of breathing and respiration. Respiration is essential for the maintenance of life and 'in the

narrowest biological meaning' is said to refer to 'gas exchange at the level of the cell' (Behrman, 2013: 63). Gas exchange takes place through the cardiovascular (circulatory) system and it ensures that a constant supply of oxygen from the air reaches the body organs and tissues, and that removal of carbon dioxide from respiration in the cells also takes place.

The structures with a capacity for exchange of gases are the two lungs. They are within the upper chest or thorax, forming the terminus of the airways. They comprise spongy, elastic tissue well suited to their role of expansion and contraction.

The airway descends through the throat or pharynx from the nasal and oral cavities, and divides into two; the oesophagus and the trachea. The oesophagus takes a separate course for food to enter the digestive system (Fig. A1).

Fig. A1 The larynx in relation to surrounding structures
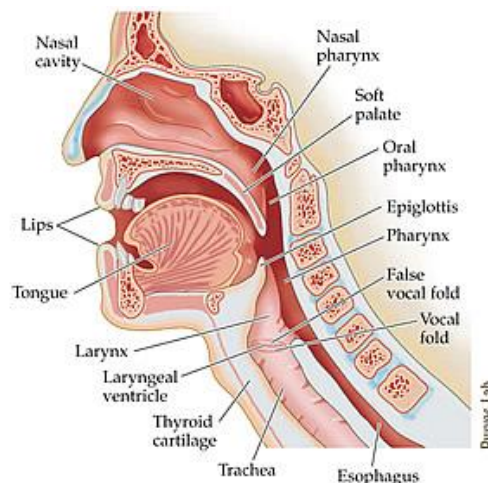
(Melindez, no date)

The airway continues as the trachea. This divides to form two bronchial tubes with one bronchus entering each lung and branching into ever smaller tubes or bronchioles. The tubes end in small sacs, called alveoli; it is from these that oxygen can diffuse into the closely-lying blood vessels, with carbon dioxide moving in the opposite direction (Fig. A2).

The lungs are well protected. They are contained, and completely enclosed, within the thorax and the surrounding bony skeleton of the spinal column, the ribs and the breastbone or sternum (see Zemlin, 1998: 43-51).

Fig. A2

(A) the lungs within the thorax

(lung.ca)

(B) The bronchial subdivisions from the trachea to the alveolar air sacs
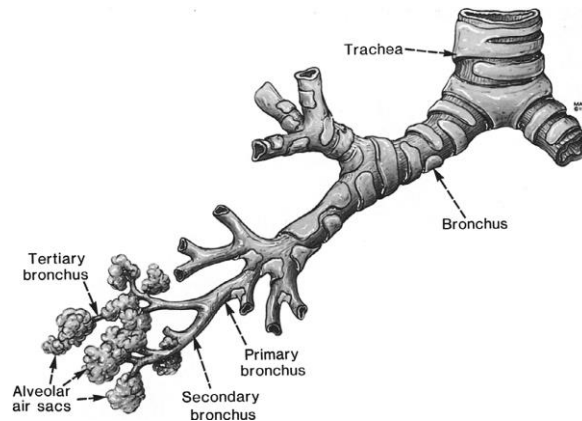
(Aronson and Bless, 2009: 330)

Muscles provide mobility of the thorax and also help accommodate movement during normal activity (Zemlin, 1998: 55 and 58-60). The base of the thorax is divided from the lower part of the torso, the abdomen, by a sheet of strong muscle called the diaphragm (Zemlin, 1998: 55-57). The diaphragm is regarded as the most important muscle associated with breathing, particularly as the primary muscle for the intake of air (Behrman, 2013: 73; Seikel, King and Drumright, 2010: 80; Boron, 2012: 631-632).

A3.1.1   The mechanism for movement of air in and out of the lungs

The intake of air, or inspiration, occurs due to the downward movement of the diaphragm in a muscular contraction, resulting in an increase in volume of the thorax or chest cavity. This may occur in combination with the movement of the ribs through activity of muscles known

as the external intercostals (Behrman, 2013:73). Seikel, King and Drumright indicate the intercostals and other muscles are 'accessory' to the work of the diaphragm (2010: 86- 90; also Boron, 2012: 632).

The lungs, made of highly elastic tissue, expand and contract following muscular action by the diaphragm (Seikel, King and Drumright, 2010: 77 & 132). Each lung and the inner wall of the thorax or chest is surrounded by a pleural lining; this provides smooth contact, as well as being 'a mechanism for translating the force of thorax enlargement' into expansion of the lungs for inspiration (Seikel, King and Drumright, 2010: 75).

The membrane lining the thorax is called the parietal pleura and 'encasing the outside of each lung' is the visceral pleura (Behrman, 2013: 74). These thin, elastic membranes are separated 'only by a viscous mucous fluid called the pleural fluid' in an area termed the 'pleural space' (2013: 74-75). The presence of the fluid causes the two membranes to adhere together; this is a surface tension between the two membranes set up by having a liquid in what would otherwise be a space. The rest of this process is not fully understood except that, when the chest cavity increases in volume, the lungs are moved along with the boundaries of the cavity because of this adhesion (2013: 76). The presence of the fluid also helps 'to reduce frictional forces that arise from inhalation and exhalation' when the lungs move against the chest wall; this allows greater 'ease of movement' of the lungs during breathing (2013: 76).

An increase in the size of the thorax causes the lungs to expand, but when muscular contraction ceases 'the lungs tend to return to their original shape and size' (Seikel, King and Drumright, 2010: 132). These so-called restorative forces, also known as elastic recoil, cause expiration to occur passively (Behrman, 2013: 74).

The intake of air is dependent on the drop in air pressure occurring within the lungs when the space within them increases. The idea that there is movement of air due to differentials in air pressure is named after an English scientist, Robert Boyle (1627-1691). Boyle's law states that, when the space increases, the pressure falls and air moves in from the external space (in this case, the surrounding atmosphere) to the place of lowered pressure. That is, there is a related movement of air to re-balance the pressure with external atmospheric pressure (Behrman, 2013: 78). Inhalation takes oxygen to the alveoli in the lungs; exhalation means that air high in carbon dioxide is expelled from the lungs.

A3.1.2 Summary of the breathing mechanisms in relation to initiating voice

Breathing will occur to satisfy requirements for oxygenated blood but the breath also acts as the 'power' for voice as it is expelled past the larynx. Gray states that, whilst 'ensuring gaseous exchange' in the processes of respiration, the system accommodates voice production but secondary to its main purpose (1995: 1628).

The description of the process above applies in 'quiet' breathing when there is no particular exertion and in powering speaking in general circumstances. In summary, the muscular activity of breathing relies principally on the diaphragm (Behrman, 2013: 61).

A3.1.3 Two considerations when there are special demands on the breathing mechanisms, such as in producing voice

Firstly, when additional air needs to be exhaled beyond that exhaled by passive means (A3.1.1), the process becomes more complex; Zemlin refers to this as 'forced' expiration (1998: 55). It may be this occurs in certain contexts such as in speaking a long utterance or when singing.

A3.1.3.1 In-take of breath through nose or mouth

The other consideration is whether when speaking, air is taken in through nose or mouth. Taking in air through the nose fulfils the three purposes which Zemlin calls '*temperature, humidity,* and *particle control*' (1998: 230). This indicates that nasal breathing is meant to ensure that the air is cooled or warmed (depending on the external temperature) and humidified, and that bacteria and dust particles are removed from the air by the mucous lining of the nose.

Behrman states that 'the mouth humidifies the air well, but does not provide the initial filtering capabilities that the nose can provide' (2013: 94). She also indicates that 'persistent oral breathing may dehydrate the superficial lining of the mucosa of the airway and vocal folds' (2013: 94).

Rubin points to inhalation during speech being brief and rapid, with most airflow passing through the mouth, not the nose (1998: 50). Exhalation through the mouth is obviously essential to producing voice, but inhalation can be either nasal or oral. The question is whether repeated inhalation through the mouth could be, as Behrman suggests, problematic.

Particularly in prolonged use of the voice, if an individual identifies that they suffer from a dry throat or throat discomfort, taking in air habitually through the mouth could be one contributory factor.

A3.1.4 Control of breathing

As with other aspects of speech, much is still unknown about the question of how breathing is controlled and to what extent this can be voluntary or involuntary. Breathing takes place as part of automatic responses within the system; that is, in response to stimuli, muscle activity takes place such that air is drawn into the lungs.

The respiratory centre, which is part of the central nervous system in the brainstem, generates neural impulses, for example to the diaphragm (Behrman, 2013: 92). Richerson and Boron say that an '*automatic rhythm* for contraction of the respiratory muscles' is established (2012: 725). They refer to the neurons that generate this rhythm as the 'central pattern generator' and that this can continue 'indefinitely', even being unchanged by circumstances such as sleep or anaesthesia (2012: 725, 727).

In order that breathing and respiration occur efficiently, there are feedback mechanisms integral to the system enabling efficient neural control of breathing without voluntary effort. Sensory receptors in muscles, joints, skin and other tissues provide feedback from areas throughout the body to the central nervous system; the receptors 'are specific to the kind of stimuli that they can detect' (Behrman, 2013: 92). Chemoreceptors respond to the concentration of carbon dioxide and oxygen in the blood to initiate appropriate changes in the rate of breathing (2013: 93).

No one can know consciously how much oxygen they need at any moment in time for any particular activity. The rate and, if necessary the depth of breathing, is regulated by demand. This is evident in exercise such as running; the respiratory system will respond to the requirement for an increased amount of oxygen (Behrman, 2013: 93) and the same is true for speaking. It is known that in animals, sensory feedback in breathing is 'essential for phonation' and this is thought to be likely in humans (2013: 93).

Another type of feedback mechanism is via mechanoreptors situated throughout the body; they are sensitive to stretch in tissues including within the chest and chest cavity, such as

within the bronchioles and alveoli (Behrman, 2013: 93). The lungs, thorax and abdomen can be thought of as 'a functional unit for respiratory purposes'; within that unit are several active forces: the lungs bound to the chest wall and the diaphragm; the downward force of abdominal contents, e.g. through the pull of gravity; and air pressures within the system of the lungs and passage ways (Zemlin, 1998: 82-83). These forces are in balance when the system is 'at rest', but this is only a 'transient' state (1998: 83) within the total pattern of inhalation and exhalation.

A3.1.5 The influence of pressure levels in the lungs

As described, initiation and any change of breathing is a direct response to pressure level in the lungs compared with that external to the body (A3.1.1). The mechanism of expiration is to a great extent passive within the given lung pressures. When pressure levels are equal in the lungs and externally in the atmosphere, exhalation can take place due to the elasticity of lung tissues (Seikel, King and Drumright, 2010: 151).

Air pressure below the larynx, known as subglottal pressure is important to controlling the flow of air and to 'achieving a constant intensity of sound' in speech (Rubin, 1998: 61). The muscular effort to enable this means, paradoxically, the muscles of inspiration are used again 'to impede the outflow of air' (Seikel, King and Drumright, 2010: 151). Control of the pressure relies on sensors located below the larynx that are extremely sensitive to changes in air pressure; the sensors work without our conscious awareness, so they are involuntary. Their influence during expiration is particularly significant for speech (Rubin, 1998: 61).

Behrman shows lung pressure is managed in a complex way through both passive and active forces of the breathing system; this can accommodate the demands of 'speech production' (2013: 83-84).

A3.1.6 Voluntary and involuntary control of the breathing mechanism

Regarding the question of how much the breathing mechanism is involuntary and how much we can consciously control it, Zemlin cites several research papers to support a contention that there can be voluntary control of the 'thoracic structure', in respect of the ribs and 'the abdominal wall' (1998: 62); this means there can be some voluntary control over breathing but detail appears unclear.

Richerson and Boulpaep emphasise the automatic as a key element of respiratory control, yet also account for some influence of the central nervous system to override the automatic elements from time to time such as during speech, although they say this can only go 'so far' (2012: 725, 743, 745). Presumably this is due to the overriding requirement for oxygenated blood to arrive at tissues throughout the body.

There is more to be discovered scientifically about the breathing processes, but its control appears to be a combination of voluntary and involuntary neural activity (Behrman, 2013: 92). Respiration is controlled in an involuntary way to ensure that the system operates efficiently to provide required amounts of oxygen, yet it is possible for the demands of speech to be met without endangering the equilibrium of the system. It is possible for breath to be taken in or held voluntarily, but this does not mean having to consciously inhale breath to begin speaking if the system is capable of accommodation to the requirements of speech.

A3.2   Producing sound at the larynx

The larynx is situated part way along the airway or vocal tract from the oral cavity, the mouth. It lies at the boundary between two parts of the tube which are known as the pharynx and the trachea (Fig. A1). The larynx is enclosed in soft tissue and is visible externally as a protrusion in the throat, particularly as the Adam's apple in males (Fig. A3).

Fig. A3

(A) External view of the throat in the region of the larynx

(B) Parts of the larynx in relation to other structures. It is suspended from the hyoid bone by muscular attachments: the extrinsic laryngeal muscles

Position of oblique line on thyroid cartilage

Hyoid bone
Thyroid notch
Laryngeal prominence
Cricothyroid ligament
Arch of cricoid

Right lobe of thyroid gland
Left lobe of thyroid gland
Isthmus of thyroid gland
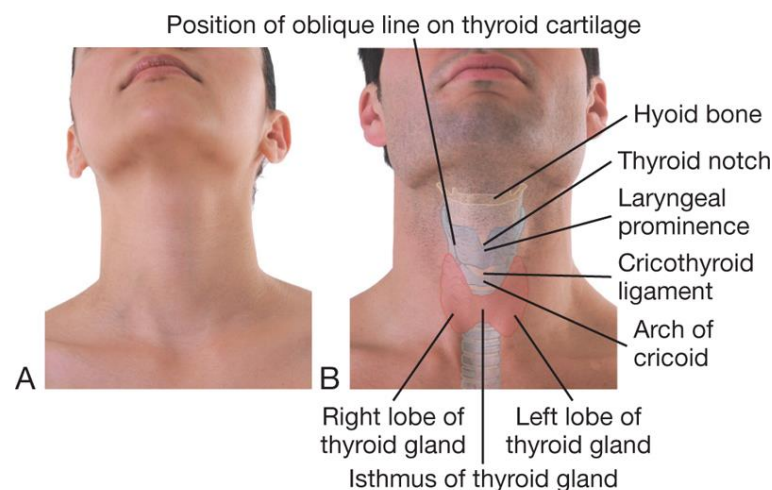
Drake et al: Gray's Basic Anatomy
Copyright © 2012 by Churchill Livingstone, an imprint of Elsevier Inc.

The larynx is made up of three paired cartilages and three larger single ones. One of the single cartilages, the epiglottis, has little purpose in speech but the other two are important to speech. (Behrman, 2013: 111). These cartilages, the cricoid and the thyroid, are capable of changing configuration or relationship to each other, through the action of connecting muscles (Fig. A4 and Fig. A5). The vocal folds are the parts of the larynx that vibrate to produce sound as air moves past. The folds are a pair of 'smoothly-rounded' bands of tissue (Zemlin, 1998: 101-102) continuous with a ligamentous area composed of elastin fibres (Behrman, 2013: 125).

Fig. A4 Cartilages of the larynx within the trachea and in relation to the hyoid bone
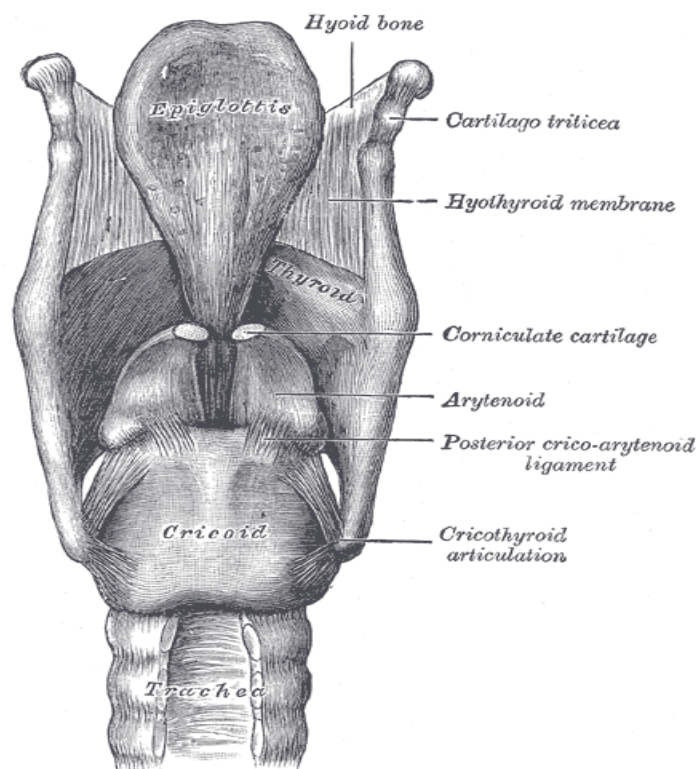
(Häggström, 2014)

The folds attach between the thyroid cartilage and the paired smaller cartilages, the arytenoid (Behrman, 2013: 124). The folds are spaced apart much of the time, including when we are not speaking, so that the outflow of air past the larynx is 'unimpeded' (Zemlin, 1998: 102).

Being constructed of cartilage gives the larynx some firmness, but pliability, of structure. This pliability and its flexibility of location within the airway, due to its muscular attachments to

the hyoid bone, enable the larynx to function in the highly mobile area of the neck and to meet the demands of voice and speech production.

The vocal folds are capable of protruding into the airstream to produce sound or for other non-speech purposes, such as preventing foreign bodies entering the lungs (Seikel, King and Drumright, 2010: 227).

Fig. A5 Muscles attaching to the hyoid bone
Many connect the hyoid and the cartilages of the larynx
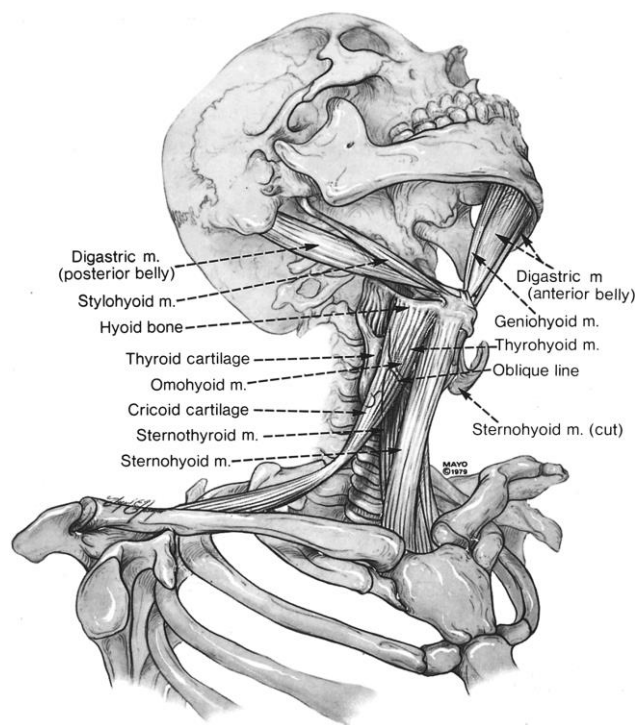
(Thibealt in Aronson and Bless, 2009: 362)

In speech, the folds may be lengthened or shortened, tensed or relaxed to produce and modulate sound (Zemlin, 1998: 102). Whilst sound production or phonation is dependent on movement of the cartilages within the larynx to change the positioning and shape of the vocal folds, it is also influenced by the elasticity of the folds' muscular structure.

A3.2.1 The mechanics of phonation

The low sound produced in phonation (A3) is not just a result of muscular activity causing movement of the laryngeal cartilages to which the folds attach and hence movement of the folds themselves, but also of the Bernoulli force. Daniel Bernoulli (1700-1792) was a Swiss scientist

who noted that when the movement of a fluid (and air comes into this category) accelerates to pass through a narrowed space, the pressure (in this case, air pressure) decreases.

The Bernouilli principle applies to movement in the airway at the larynx, (Zemlin, 1998: 146-147; Behrman, 2013: 135-136). To describe the cyclical process of phonation, it is assumed that the vocal folds are lightly touching or 'approximated' at the time that air is being expelled from the lungs (Zemlin, 1998: 148). Behrman describes the way the arytenoid cartilages 'rock inward', closing the space between the vocal folds known as the glottis (2013: 138-139). Because the airway is then closed, pressure builds up or increases below the folds until it is sufficient to force them apart with a small 'popping' sound. This is sometimes called 'the glottal tone' (Zemlin, 1998: 119). The folds may then draw together again as pressure beneath them decreases.

These events, the folds closing through decreased pressure and their enforced opening by the increase in pressure, are described as one vocal fold vibration. It occurs many times in a second: 125 vibrations per second in males and more frequently in females and children (Zemlin, 1998: 102). At the end of an act of phonation, when one finishes a sound, the vocal folds are moved apart completely through muscular activity.

Sound production by the larynx is classed as a non-biological function of that organ because voice is not of itself essential to maintaining life. The larynx only functions as a sound generator when it is not fulfilling the vital biological functions of protecting the respiratory tract in activities such as coughing and throat clearing (Behrman, 2013: 116). The process of speech demonstrates that humans have adapted well to use existing systems such as the larynx and airway for an additional purpose. Gray states: 'elaboration of laryngeal musculature and its neural control' and the integrated activity of respiratory and other muscles of the pharynx, palate, tongue and lips in 'the complex articulation of speech' provides humans with this 'unique ability' (1995: 1628).

A3.3 Articulatory and resonatory mechanisms in speech

Articulation of speech sounds (A3) makes them distinct and distinctive. This process, taking place in the upper tract, is sometimes referred to as resonation in voice science texts. Following production of the basic sound at the vocal folds (phonation), the sound is amended

by the so-called articulators of the mouth or throat, the tongue, and the lips. The nose or nasal pharynx (see Fig. A1) is also involved in amending some sounds.

Behrman describes three sound variations. The first is that produced by the interrupted flow of air at the larynx, 'driven by the lung pressure' and 'converted into a series of puffs' as the vowels (2013: 294). Secondly, consonants such as /f/ and /s/ are produced by the airflow 'becoming turbulent as it flows through a supraglottal constriction'; that is, one which is above the larynx (Behrman, 2013: 294). This produces a continuous noise. Thirdly, there is an effect which is a 'transient noise', driven by 'generation of pressures in the mouth' rather than by lung pressure; this sound can be produced in the supraglottal tract and is related to sounds such as 'the pop of a /p/ or the click of a /k/' (Behrman, 2013: 294).

The areas which account for amendment or articulation of sounds or phonemes can be used to describe the phonemes which we call consonants. To produce a particular sound or quality of sound, the vocal tract is altered by movements in the area of the oral or nasal cavity.

In the categorisation used by therapists and clinicians, the consonants may be bilabial (produced by movement at the lips), labiodental (produced by the lips and teeth), dental or 'lingual', palatal, alveolar (related to the ridge at the back of the palate), or velar ('produced with the back of the tongue against the soft palate', which is the back part of the roof of the mouth (Behrman, 2013: 295). The sounds /m/ and /n/ are produced by 'directing continuous airflow out through the nasal cavity', but they originate in different areas because /m/ is labial and /n/ is alveolar (Behrman, 2013: 295 & 326).

There is also the important variation in any sound or phoneme dependent on whether it is voiced (with a contribution from the vocal folds) or unvoiced (without vocal fold vibration) (A2). These aspects of articulation demonstrate the intricacies of producing single sounds which we then learn to combine in myriad ways in words and connected speech.

A4   Resonance

What is heard by a listener is influenced by the way in which sound waves interact with each other and surrounding surfaces. The resulting vibration of another medium beyond the sound source is a phenomenon called resonance. We can define resonance as the result of a force

'applied at a natural frequency', the 'frequency, or set of frequencies, at which the object vibrates most easily' (Behrman, 2013: 45).

The way that sound waves act to set in motion other media is important for the human voice. For example, there is an influence on the sound of the voice as it interacts with the tissues of the vocal tract. The short puffs of air originating in the vocal folds are combined in multiple bursts which then radiate energy or create resonance within the upper tract. Resonance is an identifiable and important aspect of voice quality (Zemlin, 1998: 175-176).

A4.1 Influences on voice quality

The quality of voice produced overall is subject to alterations in the internal dimensions of the tract (A3.3), the positioning of the larynx, and flexibility of the larynx during actions for phonation (A3.2.1). There are several observable effects within the area of the larynx which can be described, although it is noted (A5 and in the body of the thesis) that the whole of the organism and its configuration is relevant to voice production and voice quality; that is, the organism functions as a whole.

One consideration is that the larynx, due to muscular action, moves in relation to the hyoid bone and this affects the size of the cavity above the larynx which will, in turn, alter the resonating characteristics (Zemlin, 1998: 121). Secondly, both pitch and other characteristics, such as resonance, depend partly on 'the configuration of the vocal tract' (1998: 145). In this connection, resonances, sometimes called 'formant frequencies' are determined 'by the shape and length of the vocal tract' (1998: 298). Behrman, in common with some other voice science scientists, refers to the tract in terms of its 'resonating cavities' (2013: 236-7). A formant is 'a concentration of energy around a particular frequency in the acoustic wave'; formants affect our perception of vowels (Behrman, 2013: 222).

Thirdly, the extrinsic muscles of the larynx and those attaching it to the hyoid bone bring about alterations in the position of the larynx during phonation. These changes affect the production of high- and low-pitched sounds (Zemlin, 1998: 159).

Musculature throughout the upper body is associated with the activities of breathing, phonation, articulation and therefore voice quality. It is demonstrated in the body of the thesis

that voice can only work for the best within the integrated psychophysical use of the individual.

A5   Summary of the mechanics of speech and voice production

The process of speech and voice production involves three distinct but integrated systems: breath to power sound production, phonation as the occurrence of sound at the larynx, and articulation giving the sound differentiated form. In addition, resonance is an important aspect of voice, as it means that the sound produced at the larynx, and articulated within throat, mouth or nose, has some carrying power.

Resonance is dependent on the size (or any restriction on size) of the cavity of the vocal tract. The quality of resonance and other voice quality features such as pitch are also dependent on the mobility of the larynx within the tract and in relation to the hyoid bone to which it has muscular attachments.

Speech production is reliant on two key principles of moving air: Boyle's law which explains the underlying mechanics of respiration; and the Bernoulli force which partly explains generation of sound at the larynx. This production of sound is partially dependent on the elasticity of the vocal folds within the larynx and on muscular activity which is responsible for movement of cartilages to which the folds are attached.

All the organs involved in speech production have other biological functions: the structures of respiration to provide life-supporting oxygen for body cells; the larynx as a protective device to prevent foreign bodies entering and endangering the lungs; parts of the mouth as essential to the intake and mastication of food. These organs serve purposes of speech and voice only secondarily to these life-preserving functions and as such they function within the integration of the whole organism.

When functioning as part of the speech mechanisms, organs such as the lungs are well adapted to efficient speech production for the majority of individuals. Voice and speech production is shown to occur as an integrated process of the whole organism. Gray indicates that speech development is possible because of 'very high levels of integration between the nervous system and locomotor structures' (1995: 1628); that is, in conducting nerve impulses from the brain to the mobile organs related to speech and their related muscles. Likewise

Behrman states: speech and voice production is 'a complex neuromechanical activity' which is regulated by the neurologic system and the physical properties of the structures which govern it' (2013: 4).

The anatomical structure of the respiratory system, as part of the capability we have for speech, is described by Behrman (2013: 67-68). However, it is useful to bear in mind the nature of the organism and its integrated working: that there are evident links with other body systems such as the cardiovascular and the alimentary or digestive system. The cardiovascular system has the function of transporting materials around the body (Davies, Blakeley and Kidd, 2001*:* 494). Parts of the upper respiratory tract are shared with the alimentary system, or 'are anatomically closely related to it in organization and continuity' (Gray, 1995: 1631).

Such detail serves as a reminder that the whole organism is involved at all times. Describing the study of anatomy, Gray shows that it is not merely 'the separation of parts, the accurate description of bones, ligaments, muscles, vessels, nerves and so forth, but an attempt to grasp the totality of body structures' (1995: 2). This includes the nervous system, both central and peripheral divisions of it, which are vital to the organisation and control of all systems (1995: 902 and 909).

A5.1 Other factors important to an understanding of how the voice works

Voice should be understood within the psychophysical workings of the organism as a whole and this was identified by F.M. Alexander in his investigations which led him from his own voice problems to an enunciation of the concept of use (Alexander, 1985: 22), as explained in Chapter 1 of the thesis.

Alexander reported that his hoarseness occurred occasionally and then became more persistent, recurring 'at shorter and shorter intervals' and resulting in a condition which sometimes brought 'a complete loss of voice' (1985: 24). Assuming no underlying medical cause, people (such as classroom teachers who are the focus of my study) may think that any problem with their voice is due to the demands of a job where they have to speak a lot or speak loudly much of the time. There might be a tendency to look for cause of a problem within the activity itself, rather than thinking how it is approached (Door, 2003: 12-13). How someone goes about the act of speaking is a consideration and, in this respect, the thought

process is an integral part of someone's 'use' in activity. The speech process has to be viewed as a whole (A3).

The production of voice is not just to do with the area where the larynx is sited, but is about the whole of the human organism. This includes both the mechanisms and the way an individual thinks about the activity: the way s/he reacts to any stimulus in their environment. Misuse can result in problems such as vocal discomfort. As Alexander himself discovered, problems such as hoarseness can prevent what someone wishes to do, in his case reciting to public audiences. Conversely, an improvement in use in general means an improvement in voice quality is possible.

A5.2 Applying knowledge of integrated activity to breath and speech

If the concept of applying too much muscular effort and 'pulling out of shape' in misuse (1.8.2; 1.8.3) is accepted, it assists an understanding of learned activity and the idea that some learning may take place with misuse (Door, 2003: 25 and 26-27).

With reference to voice, the flexible larynx and vocal tract are subject to any misuse within the whole frame of the individual (A6.2). Where there is misuse, the pulling out of shape may mean the thorax is confined, held by muscles which may not need to be working or may need to work to a lesser extent for particular activities such as breathing and speech. Alexander talks of breathing as 'a psycho-physical act' and that breathlessness may result from misuse (2004: 129 and 127).

The best use of the breathing mechanisms is not 'natural', but as in most of our other activities, can be learned with misuse. Breathing occurs to meet demand in any activity (A3.1.6), including speech when breath is required to maintain phonation and to enable utterances of varying length, with varying intonation and loudness. Although voluntary control of breathing is possible (A3.1.4; A3.1.6), how his can be balanced with the involuntary may be impossible to know. For instance, no one can register the amount of breath required for a particular vocal task; the system operates according to demand (A3.1.4; A3.1.6). Good use enables the best functioning of all systems in the body, whereas misuse means we do not function for the best. Boulpaep and Boron refer to the 'function of the whole organism' with systems working 'hand in hand' with each other (2012: 3) and Alexander indicated a change in use brings an associated change in functioning (1985: 55).

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Prior to speaking there is no need to take a breath or to hold on to the breath during the course of speaking. If we are not doing the things associated with misuse, the outbreath (which can occur passively and without undue effort) will enable inhalation to follow according to demand for air (oxygen) (A3.1.6). The involuntary nature of much of the process of the breathing may mean intervention in the rhythm of breathing or anything associated with the breathing process is problematic. What has been described is a system that appears to work well in many circumstances without voluntary effort. For instance, Behrman shows that the system works such that there is inefficiency in 'taking a breath much deeper than is necessary to sustain phonation'; it is counterproductive because all that happens is the additional air is expelled almost instantly without providing more air for phonation (2013: 82-83). Without intervention, lung pressure is sufficient for effective phonation. Zemlin indicates similarly that 'inhalation to high lung volumes prior to speech is a very uneconomical practice' (1998: 92).

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INTERVIEW WITH SEAN, A PROFESSIONAL ACTOR AND VOICE TRAINER

Interviewer (L) is the author ALM.

Sean (S) is a professional actor who is leading the voice workshop offered to groups of teacher students at Keele University.

The initial interview took place, face-to-face at Sean's home (at his invitation), on 19th March 2010.

Transcript:

L   What would you say makes good voice quality?

S   It's pitch, it's good breath control, it's tone - it's resonance. It's all those things. The voice quality… You know the voice that isn't interesting – you don't listen. That's why I get them to tell a story. It's the whole way of talking that's important - it's like a narrative. If you're acting, it's the script, it's the role. So I think why not that way for teachers…. I say, think about it as a narrative what you say in the classroom.

        You need good resonance. The pitch needs variability. It's no good being monotone - so often, people are trapped in their own pitch. It's about confidence too - how you speak - it's about all of you …. as a person.

        I say to students as teachers it's their main tool. They can think about how to get variety into their voice. They can get more resonance. They can control breath. The breathing exercises are so important. You have to have enough breath for what you want to do with the voice. It's your tool of communication.

L   You've got a strong and melodic voice. Have you ever had any voice problems yourself?

S   It's good of you to say so. Thank you.

        The problem with my own voice, you know, is that it's so low. It's what I had to change. I had to learn to add colour as an actor - to get variety.

It's very low and just talking here in the kitchen - it's not the voice I'd use on stage. Here this morning I haven't warmed up - so it's low and if you tried to talk like this on stage you'd just rumble on. Down here like this [has lowered the pitch of his voice during this phrase].

I had to work with that - and to get some variety into it - to make it interesting. You can't hold an audience without that. It's about varying the pitch but it's also about the resonance and where it is, you know. I did have to get more colour into my voice.

L   Remind me about your own training then. Was it? – did you say RADA?

S   Yes, RADA and then five years at the RSC - and I was at the Globe, you know, for a while after that. You learn such a lot about taking on a role, developing a part - it made a huge difference to my voice.

        Cis Berry at the RSC, you know she had a big influence on me. She really helped a lot. She really teaches you how to get more in a part - with a piece - like Shakespeare. We did a lot of work with Cis and you find out how to get more from the text.

L   So - am I right that you're saying after your initial training it was work at the RSC – and that was all part of developing your voice?

S   Yes, you know you've explored all these things - but there's more to find out. You find out a lot in different roles. You'd be worried if you didn't keep on developing. That's what it's like in a profession…. like teachers. They should be looking to keep on changing and thinking - what's this about - how am I going to be doing it. It's like that in acting. So there's always more to do - it never stops. Each time I play another role I have to think what it's about - what about the voice.

L   So was that initial training still useful when it came to performing professionally?

S   Oh, tremendously, you know you've found out about things – pitch, tone, resonance, getting colour into the voice - variability - and then you come to work on that more on stage.

L   And did you have - dialect work? Singing?

S   Yes, dialect work was important. And preparing for different parts - You need a lot of work on that. We did a lot at the RSC and I kept working on that at the Globe. Each time a new role comes up you have to think about what it is about.

L   Coaching?

S   Yes, and you know I look at these teachers – these students – and I think - here am I with my years at RADA, that time at the RSC and the Globe – and I think - they have two hours.

        Some of them definitely need more than that. You can see that they have problems and….. I have begun …. Towards the end of the workshops I was running I thought - with a few individuals - if I don't say something they're going to have problems in the classroom. So I took one or two to one side in those last workshops to spend a few minutes or so. For instance with one AT *[Associate Teacher]* - it was breathing…. I talked to her about this. You need to have breathing and lean on the breath. Otherwise she was going to go away and her voice was never going to work in the classroom.

L   So you've run – was it workshops across the whole week? And what was your experience of working with those student teachers?

S   It was more than five workshops actually because in the end I worked with all the ATs across all the PG – postgraduate - subjects – English, history, science, maths, foreign languages The English students are the most positive you know. They can see it's useful…. they're keen to work. But you know one scientist said - what's the problem, they can hear me in the lab - they do what I say. And when I asked about why he was there, he said - because it's compulsory. So, you know, it's a real mix.

L   And what kind of questions crop up?

S   They're worried about losing their voice. They ask about that and about keeping control in the classroom. They talk about having a squeaky voice particularly first thing in the morning. That's why it's so important to warm up.

        Singing that's good for warming up.

And the Maths department have found …. They have come back to me wanting more sessions. They identified a particular problem with some of their students. It was about their presence in the classroom. They have to learn to let go you know - to free up. They don't have enough presence in the classroom and so it's hard to create interest - to keep attention.

L   Was this to do with voice as well?

S   Yes - to free up the voice and free up themselves - I say to them - you remember your teachers at school - and the most memorable - it's probably something to do with that teacher's voice as well as what they do. It's about committing. It's your commitment. And that's what Cis Berry was so good at. She knew how to get you committing to a role. Anyway there are some more sessions going on - at the university. They asked me back to give those students more time. I'm running sessions of another two hours - the presence workshops.

        That was something that science AT hadn't got. He was one of those people who don't give eye contact - so he does need to think about it, you know. I work on the Henry V piece the Prologue with them because it gives them chance to develop that committing. I'm getting them using the whole body. It's also about the delivery, how to make it interesting. That's what they have to do in the classroom.

L   Could you just re-cap for me? I think you said in the workshop …. You compared your biggest role on stage with the amount of time for teachers in the classroom. Have I got that right?

S   Yes, for instance, there was a part in a play last year and part way through I had a long speech. It was about twenty minutes of monologue - and in all I was on stage during the evening about one hour twenty minutes maximum. Even Hamlet wouldn't be more than that. Hamlet probably wouldn't be much more than one hour twenty on stage. I say to teachers - you are probably going to be talking much more than that - in a day. You will be talking all day, five days a week. So they have two hours preparation for it - where I had RADA and those years at the RSC and the Globe.

L   So what feedback have you had from workshops?

S   We're just beginning to get that now.

From tutors, it's positive. It's been very good - and ATs say that they had a problem - and they knew from what the mentor in school said - Your voice is too weak - you need to do something to project it - and the AT says to me -they've worked on it. Then there are no more comments in school in their feedback, so they think it's solved. Maybe it is.

L   And have you worked with teachers too – with qualified teachers?

S   No…. well, there has been some discussion now at the end of other workshops and sessions that we do together, like in Stoke - with teachers there you know - and they are very keen to have some voice help.

L   Those who've been teaching some time?

S   Oh, yes – some of them are senior teachers. They say - we never had anything like the sessions for students that you're doing now. I don't know - do all PGCE courses in the country have some training for students?

L   Well, not that I'm aware of… and my own place, it doesn't offer any training that I know of. So I think maybe this is ground breaking in a way - is it? It's why I asked about the link to come to your university workshops here.

S   It certainly seems to be necessary. Something all students could benefit from. All teachers too you know.

But you know you go into different situations - different classrooms and places. Actors, we go into different theatres, work on different stages - and you have to adapt you know. You have to think about it and what it needs. I think it's the same in teaching. How to get the resonance you need in those situations. One thing is warming up the voice - like singing in the car.

L   And just coming back to your own training, did you work on singing at RADA?

S   Oh, yes - but I'm not a singer. I can sing - but I wouldn't sing with students. I don't know about music to have them singing. It's a good way of warming up - so I say sing in the car on the way to school. But I wouldn't inflict my voice on them. It's not that I can't sing …. and one does have roles where there's singing. A few months ago I had a role and I had to sing a …. one song as part of it. You do it.

L   Is there anything else that you think might be useful to my work on voice quality and voice training?

S   Well, I never thought it would be the same – an actor and what a teacher does - but I have got them to look at pitching their voice - thinking about that. Working on tone, resonance, breathing. Breathing: that's so important - to have enough breath - to take the breath in - so that you're not short of breath - or tensing the shoulders. I don't know the science of it all. Someone explained it to me, but I don't remember …. I don't understand the science - I just know it works and what you can feel.

         And I am a bit of a fraud really. I've not got the experience in the classroom that they have. I think that you have to use the whole of your voice sometimes - raise the voice when necessary. I'm lucky when I work with the AT s - they are there and listening. You can address them as adults - as the adults that they are. I only have to say something and they are thinking about it. It's different in a classroom. But you can't talk to them like five year olds.

         But I have now been and taught in a classroom - Year 8. You can't talk to them like five year olds - because they're not.

         You can't talk to anyone like five year olds.

L   Unless they are five year olds.

S   Sure, but in secondary school you can't. But you might have to use a powerful voice to get their attention. I did have to use my voice above the chat and to reach the back of the room. It was different – and I had to think about the classroom space and how to say what I wanted to say to get things done.

         But you might have to use a powerful voice to get their attention.

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I've noticed teachers in the school changing the voice - the tone - to address someone with - I want you to - I want you to do…. I listened to one teacher. She changed her voice - perhaps without knowing it - so it was a tone that she knew would mean they did what she wanted. It was the way that she said that meant the lad stopped and did what she asked. It's in L---- High School and it's closing down. Year 8 have been doing pieces about their memories of the school and I've been there supporting the work getting them to explore what they remember and to think how to record that. They're writing and performing pieces about this - and the future. It is an interesting project - and they will be performing in the summer.

So at least now I know more about talking in the classroom. I know more of what it's about for the AT s. I've got that experience. I'm thinking about that in the next sessions I'm giving.

L   Well, thank you very much for giving me your time and letting me come into a workshop too. Can I just ask, whether I can contact you if I find that afterwards I'm not entirely clear about something.

S   Oh sure, you've got my number and my email.

L   Thank you.

Sean agreed to a short follow-up interview by telephone some weeks later, so that I could check my understanding of what he was saying. This was informative in clarifying detail about his own voice training, how he developed ideas for helping others (e.g. student teachers), and his thoughts on voice quality.

It was not possible to make an audio recording, but below are some main points:

Sean told me about how his voice work at RADA was broken down into various elements articulation, voice quality (Sean talked about getting a greater 'palette' and resonance), ideas for breath (contrasting 'easy' breathing with breath 'feeling odd').

He described the practical work sessions at RADA: that from the second term on there were performances and that all the time they were rehearsing, always applying what they learned.

Another aspect, he said, was having singing lessons there and he also talked about his experience of the Alexander Technique as 'physically supporting movement and voice'.

Sean gave more description of working with Cicely Berry (at the RSC) – that she would give you an 'MOT initially' and that she helped on voice as the season went on. Sean also remembered group activity on general voice work. People were taught a voice warm-up and how to keep the voice in good condition: to protect it as well as improve voice quality.

With student teachers, Sean talked of starting with the theoretical, thinking that strong voice will help them in class and in management positions.

We discussed ideas for loss of voice: Sean mentioned getting resonance off the throat, thinking about other areas like the shoulders, not speaking in the throat by making sure of a warm up. Sean suggested that if someone shouts, they need breath control, but it's better not to shout. He said that more control makes the voice stronger; 'in voice, you have to find variety'.

Resonance, said Sean, is about placing the voice somewhere other than the throat and he thought some people 'just have it'.

If a speaker sticks to one pitch they become boring; better if the voice is 'resonant and alive'.

APPENDIX C

INTERVIEW WITH CLAIRE, A NEWLY QUALIFIED TEACHER

Interviewer (L) is the author ALM.

Claire (C) is a newly qualified teacher (NQT).

The interview took place in her school on 21st June 2010.

Transcript:

L   This is Lesley and Claire talking on 21st June and I know the date because it's my son's birthday. He's a fair way away, but I sang to him loudly this morning! Do you want to give me an idea about what might interest you about teacher's voice?

C   Well my Masters, the first assignment I had to do was an audit and to identify strengths and weaknesses within our teaching practice. Throughout that, when I was on my GTP year *[Graduate Teacher Programme]* I actually couldn't attend the voice coaching session so I missed out on that actual independent session. But then a few members of staff around the school when they have observed my lessons have noticed that I am a loud speaker. I tend to be at one level in the class or louder if you're getting attention and it was suggested to me that I go and observe a few other members around the school that do it in the total opposite way to me because there are a lot of members who are the same but then there are other members of staff who are very, very quiet and for me to see how they would draw the children in using their voice, but put in a quieter manner.

L   So there are some people who find it difficult to be heard in the classroom, but that definitely wasn't your problem?

C   No it wasn't my problem but at the same time even the students would make comments like 'Miss you don't need to shout' and sometimes I think because you're constantly surrounded by noise you forget what level you're at and when you're having a normal conversation with somebody you stop hearing your own voice after a while. I was filmed in a lesson, so that I could pick up on my bad habits really, so that I could actually see what the children were seeing and then through that I thought this

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was something I could work on and try and change and then to see just by using different techniques that I may find out in literature or through that what other members of staff have seen.

L   Well it's a big field, isn't it?

C   Well yeah and also I think it's good. I always say to my students 'I'm learning all the time just as much as I stand there and teach you. It would be wrong of me if I didn't take on board what other people were telling me or what you sometimes comment on, so you're modelling really on their behaviour.

L   And do you know of people who have different kinds of voice problems?

C   Well obviously I haven't been in the profession that long but you can see different styles. Like, there's two members of staff that don't have behaviour problems but their voices are very, very quiet and there are other members of staff that again won't have many behaviour problems but like Steve across the road, he is a very, very loud speaker and, even when he is in the classroom, he isn't changing his tone of voice because of controlling the class; which is what I was picked up on because my lesson observations were coming out as good, so it wasn't as though I needed to use my voice to manage behaviour. It was just that I was finding it a problem to change it in the first place and its difficult because when you're used to doing something you've then got to make a conscious effort to then change and think 'I need to stop saying that' or 'right, come down five notches' and I'm still getting into the habit of trying to do it now.

L   And I mean you're talking about aspects of voice quality really, aren't you, in terms of, you know, what they call the amplitude, the loudness.

C   And pace and when you've got students in your class that might be of a lower ability they can't access all the information and the words I might speak out in one sentence.

L   Yeah, okay, so quite a number of different angles there really and how it occurred. And have you come across any people who have got problems in terms of their voices and using their voices such that they suffer. I mean there are a range of symptoms that get described as some of the research literature likes to call it, voice problems: to do

with hoarseness and as far as losing the voice really at the extreme. Have you come across that at all?

C   I haven't personally but then people could say I probably talk for England but I understand what you're saying from the point of view that sometimes people get too loud or too high a pitch and then all of a sudden their voice will go and they'll stop saying what they were trying to say in the first place. I have witnessed that before, with members of staff perhaps, that have got quite angry with a student and raised their voice to a certain level and their voice has disappeared on them!

L   Or, if you're in a very large space and the person who realises that their voice just doesn't reach the back of that space.

C   I mean I've had a few ATs. *[Associate Teachers]* There's been two ATs this year and they were both very different as well with their voices and one of them asked me about projecting my voice and I said I don't ever think about how I project my voice because I know I can always be heard in this room. But then I've never gone and stood at the front of the hall and tried to project my voice.

L   Or the playing fields? That's what games teachers have to do.

C   Yeah.

L   And you said you missed this training when you were a student.

C   I think it was just training on how you control your voice so when I said about thinking of tone or pitch, I think they were saying they try to train students to know really how you can actually change your own voice.

L   So, to vary it?

C   Yeah.

L   And do you know who was providing that?

C   I'm sure it was something to do with… well, I could ask one of the lead teachers and find out.

L   It would be interesting to know as many leads as I can get. And have you got any other voice use experience? Some people have drama or singing links, etc.

C   No, I haven't got any links from that respect, just teaching really.

L   And you did your work here originally?

C   Before I even worked here as a tutor, when I was at university doing my degree, I did two years voluntary two days a week at a behaviour unit in Newcastle and that was with Key Stage 3 people and there wasn't many people there, but they were either excluded or out of the school system for some reason and couldn't go back into mainstream. So those children were taken in there and we used to do outside activities and trips for those but I wouldn't be the only member of staff because I wasn't qualified anyway, but I suppose that's a different setting, but nothing else really.

L   So currently how many hours during an average day would you be in a classroom?

C   Well we start at 8.30am and finish at 3.15pm. We have break and dinner so I would say that's an hour and 15 minutes, so we have eight forty minute periods a day but on average I have one free because of NQT time and I have one to two periods that I wouldn't teach in a day.

L   So you do five or six forty minute periods with gaps for free periods and lunchtime.

C   It varies really from day to day. Like on my timetable today I will teach all morning until lunchtime and then I am free this afternoon but we don't have lunch until 1.05pm, so it's quite late compared to other secondary schools.

L   So you could be teaching for quite a long spell with lessons on the trot.

C   We have a 15 minute break but other than that…

L   I've just been interested recently when I got to interview an actor and he was comparing the length of time that teachers have to speak in a school day or over the course of the school week with the time he spends on stage as an actor and it is quite a lot of time for a teacher. I mean he spoke of having one role where he had got a 20 minute

monologue and of course we try not to have monologues in the classroom, don't we, but even so it wasn't anything like the length of time for this actor that teachers are speaking.

C   Yeah, I think as well when I first started and was interested in voice my tutor said 'I don't want you to pick something that you're criticising yourself about' and I said 'well *I'm* not really picking it, because it's been pulled up before'. Primarily, every time we communicate with each other in the day or even in the classroom, 9 times out of 10 it will be through auditory and the children will have to listen and as much as you vary your teaching style and methods, at some point during every lesson they have to listen even if it is just the name for the register or what the objectives of the day are. You might have them written up and they're there for them to read, but a lot of the time you will say them to the class as well. So I said 'well, how do we vary it and make our voice interesting to a child?' because they must get bored of it and listening to it in every lesson from when they come to my room and then go up to Maths and then English.

L   Was there something when you first went into a classroom? You would probably have to backwind to when you were first in there as tutor wouldn't you, what came to mind when you were first there and speaking in front of a class?

C   When I was a tutor I suppose we didn't have full classes as it was groups of ten to twelve so I suppose it was easier in some ways because you didn't have as many students but then you'd got to establish yourself because you knew and they all knew facing children isn't very easy! And then going for it: I don't know really. It was mainly through observing other members of staff as I saw how they did it; and you adapt what you've seen from someone else like bits of good practice and then you become your own.

L   So by the time you were an NQT you had seen lots of other people?

C   Yeah, I would say even that when I did my GTP, I was kind of 'thrown in' and 'there's your timetable and classes get on with it' which at the time is really, really

scary; but then I would say this year it has benefited me a lot more because I didn't come into my NQT year having a shock.

L   And if you were wanting to pick up things from seeing other teachers? Is there anything you can think of that's voice related where you thought 'oh I'd really like to do it like that'?

C   Yeah I would say in the way, I haven't observed the other members…well, I've seen the other members of staff but haven't done it formally for this yet, but Anna, one of the lead teachers: when, say, she is doing something behaviour management wise, she won't get louder, she will get quieter and quieter and she is getting angrier and angrier. The children will respond sometimes straight away, whereas I have seen alternative members of staff who get louder and then get ignored and then they get even louder and it still wouldn't have an effect. Especially I think working in this area and being a school where a lot of the children don't have a settled home life; constantly come from backgrounds where parents or family members are screaming at each other, they will respond better to a quieter voice because it's some sort of stability for them.

L   So how was that? Did you have a go at doing that yourself?

C   I did, and I do try!

L   And how was it!

C   It does work for some, and doesn't for others, and I think the only way I can come to some sort of conclusion of 'why' is because some children will respond to a louder voice because they might not have that loud noise when they get in their home. So for some it really works and for some it has the opposite effect, if you know what I mean. So, it's getting to know your class I suppose; but in other ways, I try not to use my voice as much. So if I'm setting a task; I'll say it, but then I'll provide a written task on the board, on the interactive whiteboard, for them to refer to during the lesson, so they haven't got to constantly put their hand up and say: 'Miss is this what I need to do?' Or if they didn't quite catch everything or missed something, it's there for them to then digest in a different way. We don't always hear every word someone speaks and I find that that's helped as well. But it is changing. I suppose it's so many things

that you could look into; and like my tutor has been saying to me 'well maybe you shouldn't be looking at voice, maybe you should be looking at teaching style' and I'll say 'well, it's teaching styles specifically about auditory learning because that is what I want to know about', about what the children want in a person's voice to keep them listening.

L   And this has started as something personal to you, that you then want to look at material and ideas on. And what do you think can be done in terms of training? Can you think of any specific things now that you are in the classroom as an NQT? What do you think could have been provided to help you when you were training?

C   Obviously the session I said about the course that I didn't get onto. I'd like to go to one of those in the future and that won't be until after September now because it's starting to close down for the summer. But, I think as well more trial and error. I think for my training (and this is probably personal for everyone, it's not going to be the same) because I did the route I did, it was very much you're teaching on the job and learning everything you're doing on the job and you don't really have time to experiment in the same way that you might do if you did a different type of training. I had to find a way where I got in and the kids knew where the line was and they would be in trouble if they crossed it, whereas everything else came afterwards. I think if I had done my training in another way I would have perhaps had more time during my training to experiment with different types of voice and auditory learning rather than 'right this is your class, I want you to get ten Cs by the end of the year'. Unfortunately it is data driven like that as well and you think 'right, loads of pressure; I've got to get it done' and you just find the best way to get it done in the short space of time as possible and it's not necessarily the most effective for the students which is conflicting really.

L   And if somebody comes in now, just starting teaching, and is even more fresh to it than you are, you've now got a whole range of experience, haven't you? But if somebody was coming in fresh to it, what kind of pointers would you give them?

C   I'd say it's a lot easier to find and be able to point things out to other people, which is why I said I would be recorded. It's easy for someone to come into my class and

observe me and say 'you're speaking too fast; your voice is at one level. You're getting higher and not lower'. By recording it I can watch it and see it for myself. I think that that is a very good thing for them to do as well because sometimes you do think 'oh, you're finding fault with everything I do'. Instead of someone else finding it you can find it for yourself.

L   So you think it's about learning about how you are doing something.

C   Yeah, which is why I have said, when I have done all my literature research and my own changes and spoken to the students again and speaking to you, I would then get re-filmed and watch it back to see if I have actually consciously done it. I'm trying to do it consciously at the minute, but eventually I'm hoping it will become subconscious and I will change. It might not be everything and happen overnight; but some parts.

L   So from that first recording you talked about, was it video presumably?

C   It was a video.

L   So from that were there things that you then worked on?

C   Yeah, I would say, I mean perhaps words that I would say that are part of my accent but it's not necessarily the best role model to have for the students, so I found that I said 'like' so much that it's cringe worthy at times! And most of the students in the room don't pick up on it because they're from the exact same area and I don't think there's anything wrong with having an accent because everybody does have one. But I found I say it all the time and the students must notice that, because I noticed it in myself.

L   And of course it's possible to have an accent still, it's fine, but to have eliminated some of the repetitive phrases that could become a barrier to people who are listening.

C   And I think because if you're constantly saying something, then you switch off, don't you? Like I would if I was sat in their shoes. They're bound to be a cause because they've got a concentration span that's less than mine!

L   Yeah, I think we can take attention span for granted! If I ask you a question about this massive area of voice quality, what would you say makes good voice quality?

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C   'Clear', I would say, definitely clear, I would say, in a classroom of children. You have got to be 'not loud' but got to be heard, so not necessarily have to shout but it's pointless if you're stood at the front and your voice is that quiet that the kids sat at the back can't hear. Or, that if they're having a conversation underneath you, then it's muffling out your voice even to the ones at the front.

L   So loud enough?

C   I would say, to a certain degree as well, the language that you use and I am conscious that the language I use in my lessons is too high up for the children to register with and even now, because I write in an academic style, and when you speak to adults or your colleagues you speak to people in that way.

L   You were saying about, I guess, the complexity of the language that you use.

C   So even I found it difficult sometimes to change the words or sometimes I have been stood at the front, thinking for 30 seconds 'I need another word to explain the word that's already in my head to simplify it down for the students', so I think that's also key. And pace; speaking too quickly for example, so obviously if you speak too quickly then the students aren't going to access the information you're speaking about and they're not going to hear everything you're saying either.

L   But is there a problem sometimes if you speak too slowly?

C   Well, yeah, you send them to sleep! And time, I find time constraints. I mean we only have forty minute lessons and sometimes we have a double period, but in forty minutes if you've only got a single lesson and you've got a lot to get through, then you haven't got the time to stand at the front and speak really slowly to make sure everyone is keeping up, so I suppose it's the right balance.

L   Yes, it's about making those judgements at the time and according to the situation. They told us teaching was complex but…

C   There's so many things to think about and as soon as you think you've conquered one thing there's something else.

INTERVIEW WITH DEBBIE, A STUDENT TEACHER WHO HAS PREVIOUSLY TRAINED AS AN ACTOR

Interviewer (L) is the author ALM.

Debbie (D) is the actor now training as a teacher.

This interview took place on 14th August 2013 at Debbie's home (at her invitation); she had completed a final teaching practice and was about to take up her first post.

Transcript:

L   I wondered if you'd remind me about your drama degree and the drama training that you did.

D   My degree is in acting – it's a BA honours in acting - and then as part of that degree you learn obviously the art and the craft of acting. You have voice lessons to train your voice, dance, movement, singing lessons, Alexander Technique which is all to do with your posture which all fits in with the voice. And then other bits and bobs.

L   And where was that?

D   Manchester

L   Yes, I thought it was. It sounds as though it's quite akin to the courses that are offered round the country by various places. I've come across some of the work that's done at Central – Central School - for instance, in London.

D   Yes.

L   Was there anything particular about that course that made you want to go for that one?

D   I knew two people that'd been to that drama school, so because they'd been there - and like they taught me youth theatre when I was little - I'd just become accustomed to their ways of doing things and their style of theatre, and I knew that Arden did a lot of that sort of style.

L And you mentioned the Alexander Technique there; perhaps we can come back to that a bit later on. So, in terms of voice, when you were doing this degree course, what do you think you found out about your voice at that point?

D I got told that I'd got a very young sounding voice which doesn't carry very far when you're on stage. So I had to do a lot of work to make it lower in tone and to make it sound older. They said that would just come with age as well, but that's the trouble with having young actors, you have young sounding voices. So, there were just lots of exercises that they gave me to make it sound older – to make it carry further. And it's more cast-able if you've got more of an older-sounding voice.

L There are more parts? More people for those roles?

D Yes, and the other thing was to lose my Birmingham accent.

L Is that a problem then?

D You're just not very cast-able again with a Birmingham accent because nothing on TV is set in Birmingham; not many of the theatre productions ever require a midlands accent. So it's either a southern accent or a northern accent that they're looking for. If there are two actors at an audition and one of them's got a southern accent and one's got a midlands accent, they'll just naturally go with the one who's got a southern accent. That sort of thing they say.

L So did they actually tell you that … that you'd do better to lose your accent?

D Yes – yes.

L And you said about needing to make your voice sound lower – at a lower pitch– how did you go about that?

D Again it's doing different voice exercises and doing them on a daily basis. It's things like gentle humming – and then extending that humming, if you let your mouth fall open and make it into like an 'aaaaah' sound [*demonstrates*]; and taking deep breaths - big breaths in. Doing that for as long as you can; doing it at different pitches. It just kind of loosens the vocal cords, and it gives you more of a range then. And then

you've just got to focus on using- they say 'talking into your chest', so you feel for the vibrations when you're talking; if you can feel the vibrations in your chest and on your collar bone, that's where you should be pitching your voice.

L   Yes, and you mentioned singing as part of the course. Was that helpful?

D   Yes, it was actually because I am not a singer at all, but you are taught. It's all 99.9% confidence. When I was there, my range extended and I could hit notes that were higher and lower than I would ever hit before the training that the school provided. And again it's just about exercises. It's just repetition; doing these voice exercises over and over on a daily basis.

L   And do you think that had anything to do with changes to your speaking voice?

D   Mm. I think while I was at drama school I did lose my Birmingham accent but since I've moved back I've got it back again now, because everyone used to say my accent had changed whilst I was there. And my voice has got lower than it was, but I still don't think it's aged. I think I've got quite a young-sounding voice; I don't think it's aged yet.

L   Oh, right, well I don't think you've got a young sounding voice. I would have said it sounds okay to me.

D   Does it? Maybe it has then. Maybe it just sounds like that to me. [*Laughs*].

L   And we hear ourselves differently. It's not the way it sounds to everyone else.

     So that was really about you and your voice when you were on stage, preparing for a part. What did you find out about it when it came to doing teacher training?

D   I got told not to – I got told to start with that if you use your voice to manage behaviour, you'll start to lose your voice so you need to come up with good techniques. And to start with, because I think I just completely forgot all about voice work and drama school training and everything, I did use my voice. I used to have to shout to get the children's attention, and I did find to start with I was losing my voice.

But then the more I thought about how actors use their voice – instead of shouting, it's more about projection and things like that – and looking about pitching it in different places – I found I didn't lose my voice anymore. So if I needed to be loud, I'd think about projecting. Low in register so it would be a really deep sound – projecting, but think about going really deep down in my register, so it would be a really deep sound. Instead of shouting where often it's almost falsetto.

L   Yes, yes. What did they teach you then about projecting the voice?

D   Again it's about – it's all about feeling the vibrations – kind of pushing your voice down. So you'll do lots of humming exercises so you can start to understand where the sounds being made. So if you'd hum a high sound, you'd feel vibrations in the top of your head. Then as you change the pitch of the humming and the vibrations slowly move down, so then when you're humming, you feel the vibrations in your chest, shoulders and then sometimes, like, on your back as well, because you do it kneeling down on the floor. Then that's where you need to be getting your voice placed, 'cos the lower it is, the more it travels - the vibrations –

L   It carries?

D   Yes, yes. That's why men are louder than women.

L   And did they use the word, resonance, at all?

D   Yes, because they were saying – like the sound from your voice will travel through all the different things in the theatre so they made us do these exercises for 'ah'. We'd lie on the floor, put our mouths to the floor and make an 'ah' sound and then someone else would put their ear to the floor and they could be able to hear it at the other side of the room, and that sound would have travelled through the floor and it only travelled if it was a really low sound. So the boys found it easy, but the girls struggled with it.

L   It reminds me of acoustics - in the whispering gallery at St Paul's Cathedral – do you know about it? You're supposed to be able to talk into the wall at one side, and it would be heard all the way round the other side.

D   Really!

L   So when you thought about it: what you had learned for acting and being on stage was actually, it sounds as though it was helpful, was it?

D   Yes, I think it was just - soon as the HT said to me you need to use your voice - the pitch of your voice more, because I'd had my acting training, I knew exactly what she meant. I knew how I needed to be using my voice. I didn't find – I didn't have to do much research into it; I thought, 'oh yes, it's obvious'.

L   Whereas for some people, they might not have that idea.

D   No. Some people, it's hard as well, because they have used their voice in a certain way for so long they can't get out of it. There's a lady I do drama with and she has a really high voice, and she talks in a high voice. She talks in that kind of falsetto voice all the time. I mean, she just can't change out of it now, so she really struggles with being heard in some of the plays we do, because she's got such a high voice.

L   Mm. So that sound isn't carrying? Have you ever - in stage work and then coming into teaching – have you ever had any problems with your voice? I mean, other than not using it to control behaviour? Is there anything else?

D   The only problem that I've had is - when I get stressed, I get really sore throats. I suffered with my throat and my ears from being a child. So if at any point I am stressed or run down, it affects my throat straight away and that's when my voice starts to go croaky and I'll start to lose my voice a little bit.

L   You said you had laryngitis – or you said it was that - the other week?

D   Tonsilitis.

L   So did you say you had to go to the doctors?

D   Yes, I went to the doctors. I had all my glands swollen up, and it was agony. I had all white blobs all over my tonsils, so my sister said that sounds like it. I went down the doctors and she was useless, and they just said there's nothing wrong. And I was just –

like - I've got tonsillitis. So my sister took me up to the minor injuries at the hospital. They took one look and they said that's tonsillitis and gave me some antibiotics. I knew I had; I was in agony. It goes right up to your ear. I was just tired; I was asleep all the time. When I was asleep was the only time it didn't hurt.

L   Yes. And have you any idea how that came on? What might have led to it?

D   I don't know really. I just do get sore throats a lot from being a child. I've had problems with my ears and stuff as a child. So that's what happens: whenever I get poorly, I get a sore throat and ear ache.

L   Yes. So in the year you've already been in school, or before that in your work on the stage, were there any times you had to be absent because of your voice problems - something to do with your voice?

D   I've never - I've never had time off with it, but there was a week – I think it was when I first started teaching when I lost my voice. There was a week – and I just had no voice whatsoever. I couldn't speak at all; I just had to make signs. It taught me so much about managing behaviour and how I didn't need to use my voice to manage behaviour. Because I didn't have it, I couldn't use it; I had to make signs; and I learned all these other techniques and it taught me a lot about behaviour management.

L   So then you found you could get attention without necessarily using your voice?

D   Yes, yes – exactly.

L   So have you needed any other treatment, like the antibiotics the other week? Have you resorted to anything else in terms of the sore throats?

D   No, I just have throat sweets; it's just always the pain. I don't normally lose my voice and I don't normally have swollen glands or anything; it's normally just the pain.

L   Does it feel dry then?

D   No. I'm not sure really – it's just one of those - it hurts when you swallow.

L   I was really struck by the number of voice problems that various teachers have described to me. I did carry out one survey by questionnaire and there were so many people – teachers or student teachers – a really high percentage of people who reported some kind of voice problem. Some had been teachers for a long, long time.

D   I can't imagine another job though where you have to talk as much and use your voice as much as a teacher, especially at a loud volume. Call centre staff - have to use their voice all the time, but it's very quiet, isn't it?

L   So, in terms of being in the class, how long in a day would you say you were using your voice?

D   Let me see. So, a day is 9 'til 12, three hours, and then to half three. I'd say six hours – and I don't shut up anyway! *[both laugh]* I'll talk all lunchtime and all through break.

L   And plus, it's not that in primary school - it's not as though you get much time out of the classroom. So that's four and a half days a week – well, I suppose four days a week, if you take NQT release time into account.

D   Yes, but then when I'm rehearsing for a play which I normally am at some point, I'll rehearse every Tuesday and every Thursday, seven 'til ten. I run a youth theatre and that's five 'til eight on a Friday. So that's again, using my voice with children; and we'll be rehearsing all day Sunday.

L   So it's a lot, even in comparison with any other class teachers, isn't it? When you went on to the GTP course, was there anything about voice that was offered to you?

D   I think – not particularly about training your voice or anything, but just, like tips and reminders not to use your voice as a behaviour management technique. There wasn't any kind of solutions or 'if you manage your voice in this kind of way, if you look after your voice you won't keep using it'; it was just 'don't use your voice so much'.

L   And nothing like you'd had on your acting course, for instance?

D   No. No.

L Do you think it would be useful if there were something?

D Yes, really, really useful because you just learn to look after your voice, like a singer, they have to do vocal warm up every single day. As an actor at drama school we had to do vocal warm ups and voice work every single day, and as it happened when I was at drama school for three years, I never had any problems - a sore throat or anything. Even now when I have suffered with sore throats, when I've gone to drama and done voice warm ups, it has eased off. The time that I did lose my voice was actually when we were performing a play as well. By doing an hour-long voice warm up before the show, I managed to get my voice back a bit for the show.

L So if you were going to say anything to trainee teachers in terms of preparation for being in school, might this be one of them? Anything else you think they might benefit from knowing?

D I think, things like – I mean, a lot of teachers are quiet and I'm quite loud and I can't hear people a lot of the time; and I'm a bit deaf as well, so I know I talk really loud and I think I always have done *[laughs]*. A lot of the teachers are quite quiet and the children can't necessarily hear them – hear what they're saying. When it comes to things like class assemblies as well, and you're trying to explain to the children how to make their voice resonate so they can be heard, I know how to - kind of – explain it to them and what to do. I'll say, stand up straight…..

L Yes. So you'd say ….

D Yes, and how to make them louder. Other teachers, in my experience, haven't known how to explain to the children how to make their voices be heard.

L Yes, so you'd say to the children, stand up….?

D Stand up straight - for a start you know all the children can make the loud sounds anyway because they make them on the playground.

L Exactly!

D   So then as soon as they're in a class assembly, for some reason they talk really quietly. So it's just about – if you know they can make the sound - it's just about encouraging them to have the confidence to make the sounds really. But then I talk about speaking right to the back – and then it's just: 'I can't hear you, I can't hear you. I can't hear you, you need to be louder'. And then I get them to shout, so it's making that sound so they know how loud they need to be; but then 'go back to talking now but it needs to be as loud as that'. And talking about when you're breathing in and out, if you're breathing really gently, you're going to make a really quiet, soft sound; if it's a loud, sharp breath out, then they stand a chance that's going to be louder. And just doing some vocal warm ups, some exercises with them, really. I think they think they're doing something a bit 'drama-ery' or a bit professional, and they're quite up for it.

L   Yes, I'm sure. In a way you're talking about some of the things the teachers themselves might want to know, I guess, if they haven't had the background you have.

D   Yes, and I think, you learn a lot at drama school as well about how to make your voice interesting – so like pace, pitch, and – erm… how to put expression into things and things like that. So when I'm reading things or talking to children in the classroom, I try to incorporate that so they don't switch off when I'm talking to them. Make it interesting and especially when you're reading them a story, and things like that, it will get them to start using expression.

L   So, can you remember back to what were the challenges when you first spoke in front of a class? I suppose you've been doing it for quite a while if you've done the youth theatre as well.

D   *[Hesitation].*

L   Or – when you first spoke in front of an audience on stage, what you might have been thinking about?

D   I don't know – it's a difficult one really - because I've never been nervous - I've always been quite confident. And it wasn't about being louder; it's more a confidence thing. It wasn't about not being heard – the thing I really had to focus on when I was younger was diction. Because if the theatre is really bad acoustically. Using the

mouth… We're really lazy in the Birmingham accent about forming sounds – so, it's learning that received pronunciation so that when I'm on stage, I am always talking RP and forming sounds properly. I would never speak in a Birmingham accent on stage.

L   So you did mention the AT; I wondered what things you came across at your drama school.

D   Well, you learn all about your back, how your spine works, and posture, and the best position for the spine to be in and obviously that affects everything you do including voice work. We did all kinds of exercises - learning how to lengthen the spine, exercises to do to lengthen the spine. We learned how to do everything you do on a daily basis but constantly thinking about lengthening the spine. Keeping that fluid, keeping the finger spaces between …. We learned about the fluid in between

Keeping that fluid, because as the day goes on you get shorter. We learned how to do everything you do in a day - to sit, stand, walk, how to switch on a light, and lying down. And we learned semi-supine. That's the best position – semi supine – lying down on your back with knees up.

L   Did you have your head supported?

D   Yes, we'd do it in pairs so you have your head cupped on someone's hand so they could move it around a little bit and make sure it's loose– or on a book – the bible, they say.

L   That's about the right thickness? So when it comes to using the lying down, what do you think it's about?

D   I think to loosen up your vocal cords, your head and neck need to be in the right position and I think you only really know about that when it comes to singing. When I was singing I put my head down…. that was squishing my vocal cords. I could only hit the lower notes by putting my head up and I could only hit the higher notes by putting my head down slightly, so doing the opposite really.

L   So did they give you an idea of how you would know?

D   You just sort of know…. Feet shoulder width apart…. We used to have to - so your shoulders need to hang loosely …. So imagine a golden thread going up to the ceiling and as if you're suspended by that – everything just hanging – think of your arms and shoulders as a coat hanger – just let every… let all the tension out. It's like meditation just focusing constantly on your breathing – and everything just should hang.

L   And the structure of your course – the Alexander Technique – was that just about singing?

D   No, we had an hour and a half lesson every week of AT – and then the way… it came into our voice lessons…..

L   So was there a specialist teacher for that?

D   Yes, MH – and she's really high up in the AT. So she was specially trained for that. It was about the most boring lesson ever. But you can see the benefit.

L   So she wasn't in the voice team?

D   No, she was purely the AT. She used to go round the drama schools. She used to go round and some people used to have private Alexander treatment lessons; sometimes it's for medical reasons and things like that.

L   So after all that, I wonder what you would say makes good voice quality.

D   I think – I think it's a lot to do with the pitch – and how - not how low you can speak, but when you listen to people like Judi Dench, they have an acting voice – and they - it's not their normal talking voice, it's much lower down. It's speaking into the chest and it just resonates into their chest and it's so clear and crisp. So, thinking about using a lower pitch – for a woman obviously speaking lower. And then I think it's about diction. And I think in teaching - and it's all phonics – children spell by what it sounds like in their local accent. Spelling, important for spelling properly

L   Yes, you can have a phoneme that sounds quite different depending where you are in the country.

D   Yes.

L   So is there anything else you think it might be useful for me to be looking at – for consideration in terms of voice quality or training?

D   I think just along the routes of – think of singing – how a singer looks after their voice.

And I don't know if this is any use? It's the things you eat and things you drink that affect your voice. I was playing the role of Nancy in Oliver and, because I didn't train my voice properly when I was younger in youth theatre, I lost my voice and I was eating ice cream all the time. And it wasn't until my drama teacher told me; I didn't know dairy products are just the worst thing for voice. When I get a sore throat now, the head of our drama group – I'm there with my throat lozenges – and she gets so mad at me; she just says the best thing is humming; she recommends gentle humming and it does work. If you just hum gently and make sure it is your lips vibrating, not your nose or anywhere else. It will just slowly lower the pitch.

L   Thank you so much for your time – I didn't ask you how long you'd got, I just talked and asked things. I hope that was okay. *Both laugh*

D   No, it's fine.

L   And I wondered if I go away and there's anything I'm not clear about, can I contact you? Sometimes it's when you listen to a recording, you think: I haven't quite got the hang of that.

D   Yes, that's fine. Have you got things on what sort of voice exercises?

L   Well I've read …

D   Do you know? What sort of thing do they tell you to do? What do you think goes into a voice warm up? Do you want to know what goes into a vocal warm up?

L   Is that something you could just tell me about quite simply?

D   Yes, we start out with gentle humming – so it starts off 'mmm' and develops into an 'ah' so 'mmmmmmmmmmm aaaah'. Then we start to get our mouths working. Then we

do lots of little exercises - …. Ee; mene; ma-mene, pa-mene…. Kind of like little tongue twisters but get your mouth working at all angles.

And then there are lots of little things we do - things on diction. Lots of – a mixture of songs we do. Do you know 'wade in the water' the slave song? S*ings* – 'wade in the water, wade in the water, wade in the water, children, wade in the water'.

L   So, Gospel style? There's quite a range of pitch in a song like that.

D   Yes, and you can just feel the range of your voice. There are lots of little songs we do – about three quarters of an hour before a show if we can. The last show I did, I had to warm my voice up loads. The last play that I did I was a puppeteer so I was behind a hood and I just had to make sure I was super loud. I just knew that if I didn't do lots of warm up… after a while you don't think about it….

L   So there is a lot of physical theatre now.

D   Yes, and the stage show, *The Tempest* that we're doing in Edinburgh – that's diction, diction, diction

L   Where are you going to be performing?

D   First year we went up it was a church made into a theatre, second year it was the Royal College of Surgeons that was made into a theatre. This year it's a theatre….*[Both laugh]*.

[We chat about Edinburgh and her other stage work].

APPENDIX E

SURVEY: EXAMPLE OF QUESTIONNAIRE

As a professional whose voice is essential to the role of teaching, you can help add to knowledge about teacher's voice by answering the following brief questions. Many are *Yes/No* answers that you can circle, or simple tick boxes. Please remember that all of your responses are important. The average time for completion is 7 minutes.

Thank you for giving your time. If you would like to hear more about this survey which is part of a PhD study into support for teachers and students, you can contact me via email at the University……

Lesley Mycroft, March 2008.

1. (a) Have you ever had training for using your voice as a teacher?

Yes/No

If yes, please give details (duration, kind of training, whether during initial training, in what way it was helpful) –

………………………………………………………………………………………

…………………………………………………………………………………….

(b) Have you had other voice-related training or experience? For example: singing, drama.

Yes/No

Detail (duration, kind of training and how it has helped your voice)

…………………………………………………………………………………….

…………………………………………………………………………………….

2. Have you ever needed to be absent from work because of a voice-related problem?

Yes/No

Rarely ☐   Occasionally ☐   Once a term ☐   More frequently ☐

3. Have you ever experienced any problem in using your voice as a teacher, no matter how minor?   *Yes/No/Only Slight*

Please tick as many of the following as apply to you - regarding any point in your adult (working or social) life - even if you have not experienced them recently.

A. Dry throat   ☐

B. Tightness in the throat   ☐

C. Throat discomfort or sore throat without virus   ☐

D. Clearing the throat before speaking   ☐

E. Hoarseness   ☐

F. Discomfort or pain when speaking   ☐

G. Frequent coughing   ☐

H. Frequent colds   ☐

I. Difficulty with being heard   ☐

J. Shortage of breath in the middle of speaking   ☐

K. Vocal fatigue as the day goes on   ☐

L. Other – please specify ……………………………………   ☐

4. Would you say any of these signs were evident:

[Where you tick an answer box, please indicate beside it which of the above it is linked with – A, B, C, etc]

Before you began teaching?   ☐ ………………….

When you began your training and first worked in school?   ☐ ………………….

When you first became employed as a full time teacher?   ☐ ………………….

At the start of a school week?   ☐ ………………….

At the start of every term?   ☐ ………………….

Every day (when teaching)?   ☐ ………………….

At the end of the day (when teaching)?   ☐ ………………….

All the time?   ☐ ………………….

5. Have you needed any medical help for problems related to voice?

Yes/No

Any detail you are willing to share …………………………………………………………

6. Have you ever been referred for Ear/Nose/Throat checks?

Yes/No

Detail ……………………………………………………………………………….

7. (a) Have you ever seen a speech & language therapist?

Yes/No

Reason …………………………………………………………………………

Treatment/Suggestions …………………………………………………………

(b) Did this help resolve your problem?

Yes/No

Detail …………………………………………………………………………..

…………………………………………………………………………….

8. Do you know anyone who has left teaching because of voice problems?

Yes/No

Detail – *if you are aware* - what was their problem, what help they had, how long the problem persisted   ……………………………………………………………………

…………………………………………………………………………………..

9. Have you ever considered giving up teaching because of a voice problem?

Yes/No

What help have you sought? …………………………………………………………

What (if anything) helped?   …………………………………………………………

Did the problem go away?   …………………………………………………..

10. If you were offered voice training now or in the future, would you be interested to undertake this as part of your training/continuing professional development?

Yes/No

Comments ……………………………………………………………………

Any other points or comments you would like to make (for instance, what would you say to a beginner teacher?)

……………………………………………………………………………………………

……………………………………………………………………………………………

About YOU:

I am *Male* ☐   Female ☐

I am in the age range -   under 25 ☐   26-30 ☐   31-40 ☐   41-60 ☐   60+ ☐

I have been teaching:

less than a year ☐   1-5 years ☐   6-10 years ☐

11-15 years ☐   16-20 years ☐   21+ years ☐

Please give the Local Authority of your school   ……………………………….

I am a trainee teacher   ☐

I expect to qualify ………………….. (date)

If you would be interested in taking part further in this project, please give other contact
details below – they will of course remain confidential.
Name
Email address
And/or Telephone contact

Thank you for participating in this survey.

TEACHER'S VOICE
2008 Survey of Teachers and Student Teachers.

Dear Headteacher,

I enclose details of this project on the teacher's speaking voice. Currently, I would like to ascertain how schools and the professional skills of teachers can best be supported, so that teachers make the most effective use of their voices.   The study is being undertaken as part of PhD work which is supported by the University of Birmingham as well as the University of Wolverhampton, where I work in teacher education.

Your help for this initial survey to be conducted in your school (as one of several in the Midlands area) would be much appreciated. If you are willing to do this, please distribute the accompanying notes, questionnaires and envelopes to all teaching members of staff and agree a suitable central point in school for their return. For instance, they could be collected in the school office if that is convenient. Please could all small envelopes be returned to me at the University via our trainee who is currently working in your school?

If you wish to contact me, you can use the email address or telephone me on xxx xxxxxxx.

I do hope you and your staff will be able to assist.
Many thanks,

Lesley Mycroft
Senior Lecturer

This Project
Clear use of the voice is essential to the professional role of any teacher. Although there are several studies which report on the factors affecting this, they have mainly been conducted in other European countries, the United States, or Australia. There has been little investigation in the UK and so my project will use this survey to verify the situation for teachers in primary schools here.
I am already considering how teachers (and student teachers) might be supported to use their voices effectively and the research will continue with a trial of approaches which may be beneficial.

How you can help
As an individual teacher you can help add to knowledge about teacher's voice by completing the enclosed questionnaire. It has been designed for speed and ease of answering and all responses will remain anonymous, as will the name of your school. Whatever your experience in this aspect of teaching, your responses are valuable to providing a broad picture of the situation across professionals of all ages, roles, responsibilities, and length of service.

Filling in the Questionnaire and returning it
The average time for completion is 6 minutes. Many questions have simple tick boxes for your answer; or there are *Yes/No* answers for you to circle. Arrangements for return: to ensure confidentiality, there is an addressed envelope provided so that you can 'post' your response in a pre-stamped envelope in the school office (unless your school suggests an alternative location). I would be grateful for responses to reach me as soon as possible, so completion within a couple of days would be appreciated. Thank you, in advance, for supporting this work.

Further information
If you would like to hear more about this survey which is part of a PhD study into support for teachers and students, you can contact me via email at the University of Wolverhampton: I work at the University as a Senior Lecturer in Initial Teacher Education and have students who are linked with many schools during their training in primary and early primary teaching. This study is also being supported by the School of Humanities at the University of Birmingham.

Thank you for your participation in this survey.

Lesley Mycroft

June 2008

N = 12

Participant	1	2	3	4	5	6	7	8	9	10	11	12
Age of participant	26-30	41-60	26-30	41-60	41-60	41-60	26-30	41-60	41-60	41-60	41-60	41-60
Length of time in teaching (years)	6-10	31+	1-5	1-5	16-20	31+	6-10	11–15	31+	<1	16-20	21-30
Number of hours teaching per week	>20	>20	>20	>20	>20	>20	>20	<20*	>20	<5	>20	>20
Category of problem:												
None						✓				✓		✓
Tonsillitis		✓									✓	
Laryngitis		✓	✓	✓			Chest	✓	Dysphonia			
General sore throat	✓		✓	✓	✓							
Loss of voice	✓		✓	✓				✓			✓	
Voice strain												

* spends half time in 1-to-1 teaching

Participant	1	2	3	4	5	6	7	8	9	10	11	12
Severity of problem:												
Slight			✓									✓
Minor	✓	✓			✓	✓	✓			✓	✓	
Major				✓				✓	✓			
Specific problems:												
Dry throat	✓	✓		✓	✓		✓	✓	✓	✓	✓	
Tight throat	✓	✓						✓	✓			
Sore throat	✓		✓	✓	✓		✓	✓	✓**			
Clearing the throat	✓			✓	✓				✓	✓		
Hoarseness	✓		✓	✓					✓	✓		✓
Inaudibility								✓	✓			
Shortage of breath		✓							✓			
Vocal fatigue		✓	✓	✓	✓			✓	✓			

**discomfort or pain when speaking

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APPENDIX H
SURVEY: SUGGESTIONS GIVEN BY PARTICIPANTS
FOR OTHERS STARTING IN TEACHING

TEACHERS said:

- Don't raise your voice / avoid excessive shouting / not to strain the voice shouting

- Try not to screech as this would strain the voice

- Try not to get into the habit of shouting or raising your voice to be heard. Use other methods - whispering works well

- Don't need to shout – there are other strategies to use – and these were not discussed 40 years ago

- Please look after your voice – hardly ever shout – use quiet voice majority of time

- Use silence for class discipline – not shouting

- I advise student teachers to find different ways of using their voice so it's not being strained or over used

- Modulation very important

- Being able to use good intonation and project your voice is a vital part of teaching. You use it every day. The ability to project your voice rather than shouting is essential in teaching – some people don't seem to be able to do this - it would be useful for trainees to be taught / learn how to project your voice and not use it stridently or it may become damaged

- Use your voice within a comfortable range. Don't shout and clearly project your voice – this doesn't involve speaking loudly or raising your voice.

- Keep your voice <u>low</u> but audible

- Don't shout – learn to raise your voice without straining it

- Do not shout. Learn activities to get attention / find strategies to save your voice (ring a bell, bang a drum, use a talking book) / systems in classroom i.e. hand signals to minimise use of voice.

- Listen and wait for silence and pause after giving a command

- Try to use other management strategies i.e. clapping to gain attention

- Learn how to use your voice effectively / learn to control your voice – use it carefully

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- Learn to use your voice by reading stories out loud (with lots of expression)
- Drink enough fluid during the day / plenty of water / always have water by the side of you – 10 individuals refer to this
- Get your college to fund training / voice training could be useful / training essential for new teachers / I think voice training should be part of the training / take any training advice given
- Get voice production training – speak from the diaphragm, never shout, talk less (own training during ITE + choirs)
- Attend professional development for speech and drama
- I think warming up the voice may help, but I usually forget to do this
- If one has a voice problem, (i.e. sore throat, loss of voice), do not come back to work too soon – your voice is one of your teaching tools
- Your voice is a teacher's essential tool – look after it
- Look after your voice – it's a tool of the trade
- Would point beginner teacher to website that gives information about care of voice
- Try to avoid stress
- Remember to rest you voice, have time to relax and encourage the children to speak more
- Rest your voice as much as possible – take up any training offered
- I have also found having a sound system in my classroom this year extremely helpful
- It would be worth getting some advice
- Speech therapy – exercises and breathing – lubrication and what to avoid
- There is not a specific time period – when my voice suffers it is intermittent
- Because of my drama training, it is fine – but big issue for others

STUDENT TEACHERS

Undergraduates said:

- Tone is important plus clear voice with clear dialect not always loudness
- Vary the volume
- Speak from stomach not throat
- Try not to shout
- Don't always use your voice, using your hands or often 'the look' is enough
- Voice training re using voice to control situations
- Be aware of catching bugs and if you stress your throat you can cause permanent damage
- Drinking water (mentioned by three students as being helpful)

Postgraduates said:

- Learn to vary tone of voice / change of tone – projecting voice
- Don't go in full pelt – your voice will strain – build up the sound level
- If voice is a problem purchase a head set with microphone
- Non-verbal techniques are also important
- Voice training would be extremely beneficial for many student teachers who need to adjust to speaking and addressing large groups
- I think training for voice projection and variations of intonation would be really useful for teachers

APPENDIX J

SURVEY: A SUMMARY OF RESPONSES
FROM SECONDARY POSTGRADUATE TEACHERS

N = 16

Participant	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Gender	M	F	F	M	M	F	F	F	F	F	M	F	F	F	F	F
Age	41-60	41-60	<26	31-40	26-30	26-30	<26	31-40	31-40	41-60	<26	41-60	<26	<26	<26	41-60
Specialist subject	ICT	ICT	ICT	Sci	MFL	MFL	MFL	MF	MFL	MFL	MFL	MFL	MFL	MFL	MFL	MFL
Hrs of teaching per wk	16-20	10-15	16-20	10-15	16-20	10-15	10-15	10-15	16-20	10-15	10-15	16-20	10-15	10-15	10-15	10-15
Voice training	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y¹
Whether helpful	N	Y	Y	Y	Y	Y	Y	Y	Y	Not sure	N	Y	N	Y	Y	Y
Further training wanted	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Maybe	Y
Voice-related absence	N	N	N	N	N	N	N	N	N	Rare	Rare	N	Rare	N	N	N
Other problems - slight/minor/major	Mi	NoR	S	S	S	Mi	Mi	NoR	S	Mi	S	S	S	S	NA	Mi
What problem(s)?*	A	NoR	CK	ACD	D	AB	DI	CK	G	AE	AK	NoR	CDL	AD	NA	E
Worked in schools previously	NoR	11-15	<1	N	<1	N	1-5	<1	1-5	<1	<1	<1	1-5	<1	1-5	1-5

N – No   Y – Yes   NoR = No response   ¹ – day

*KEY TO PROBLEMS:

A – dry throat	B – tightness in throat	D – clearing throat before speaking
E – hoarseness	F – discomfort or pain when speaking	H – frequent colds
I – difficulty being heard	J – shortage of breath in middle of speaking	L – other
	C – throat discomfort	
	G – frequent coughing	
	K – vocal fatigue as day goes on	

LABORATORY EXPLORATION: CONSENT FORM

FOR LABORATORY WORK AT MMU

Work took place in the week 25th July 2010

AGREEMENT TO PARTICIPATE

This laboratory is set up and maintained by the Institute for Biomedical Research into Human Movement and Health at MMU.

As a participant you will be asked to have small markers attached by means of sticky tape to various parts of the body. The idea is to be able to track postural set up and movements by means of these markers and cameras which are in place around the lab. Standing on a force plate platform also generates information about the balance of the participant. Voice recordings by means of a microphone headset will be made during the course of the investigation.

All data will be stored but only for study purposes and no confidential details of name or contact information will be kept. All references in studies resulting from this investigation will be anonymous other than acknowledgements that you agree to.

I agree to take part as outlined above.

I **would/would not** like my name to appear in any possible acknowledgements.

Signed

Print Name

Date

LABORATORY EXPLORATION: INFORMATION SHEET FOR PARTICIPANTS

Investigation at Institute for Biomedical Research into Human Movement and Health

Faculty of Science and Engineering, Manchester Metropolitan University

Week beginning 26th July 2010.

Investigators: Ian Loram, Rose Whyman, Lesley Mycroft

Project Title: **The Teacher's Voice**

You have been asked to take part in a research project described below. The researcher will explain the project to you in detail. You should feel free to ask questions. If you have more questions later, Lesley Mycroft will discuss them with you.

Description of the project

You have been asked to take part in the study that aims to explore speaking in relation to certain procedures in standing.

Investigation

There are several different experiments that will be done as part of this study.

In all cases, reflective markers will be in place on your arms, legs, back and head. Surface EMG electrodes and sensors to measure skin conductance will also be used if you agree to this.

The equipment will need to be calibrated for the recording of data and we will tell you when and how this is taking place, including asking you to lie down towards the end of the session.

The actual experimental procedures are to record you speaking a sentence when standing on a force plate that is also taking measurements of your balance. Some of the time you will stand in your usual way and some of the time we will explain to you a new procedure to use as set up for standing.

When we ask you some questions at the end about your subjective experience during the investigation, it will be useful to record what you say.

Photos or videos may be recorded during the experiments, which will only be shown in public with your consent.

Risks or discomfort

There are no foreseeable risks to taking part in this study. Mild skin irritation may occur due to the EMG electrodes, reflective markers, ultrasound straps or load cell straps.

If you are performing the experiment that requires you to stand on the footplate, you might experience some fatigue in your leg muscles, although there will be adequate intervals between tests.

Benefits of this study

Although there may be no direct benefit to you for taking part in this study, the researcher may learn more about use of voice and balanced posture and may subsequently apply this knowledge to help teachers prepare for their work as professional voice users.

Confidentiality

Your participation in this study is confidential. None of the information will identify you by name. All records will be kept anonymously on a password-protected computer.

Voluntary participation and withdrawal

Participation in research is voluntary. You have the right to refuse to be in this study. If you decide to be in the study and change your mind, you have the right to drop out at any time.

Questions, Rights and Complaints

If you have any questions about this research project, please contact

The Registrar, Manchester Metropolitan University, All Saints Building, Oxford Road, Manchester, M15 6BH.

If you have any questions or concerns about your rights as a research participant in this study, please direct them to the University Secretary and Clerk to the Board of Governors, Tel:

LABORATORY EXPLORATION: EXPLANATION TO PARTICIPANTS

MMU, July 2010

Brief introduction to each subject to explain the purpose of the experiment:

The equipment in this lab has movement detectors which record detail from small markers attached with sticky tape in various places like legs, head and neck. The idea is to be able to track postural set up and movements by means of these markers and other sensors. We'll also use a microphone for recordings of your voice because we want to analyse what happens when someone is speaking. We'll ask you to speak and some of the time to stand on this particular platform, called a force plate, which also registers information.

I've got a sentence for you to speak during the experiment and we'd like you to memorise it. It's not too long. You'll be asked to say the same sentence several times.

The other procedure during the different trials is to do with standing. Some voice training is based on the Alexander Technique and there are simple adjustments to postural configuration which are according to the principles of the AT. We'd like you to use these today but I'll talk you through it at the time.

Thanks for taking part. Have you got any questions at this point?

Answer any of *their* questions briefly?

SENTENCE *(in the laboratory exploration it was presented in sentence, not verse, form)*:

O! for a Muse of fire, that would ascend
The brightest heaven of invention;
A kingdom for a stage, princes to act
And monarchs to behold the swelling scene.

(Taken from the Prologue to *The Life of King Henry the Fifth*, William Shakespeare)

LABORATORY EXPLORATION: INSTRUCTIONS FOR THE AT PROCEDURE

Script for laboratory investigation, MMU July 2010

Detail given before the procedures begin

The equipment in this lab has movement detectors which record detail from small markers attached with sticky tape in various places like legs, head and neck. The idea is to be able to track postural set up and movements by means of these markers. We'll also use a microphone for recordings of your voice because we want to analyse what happens when someone is speaking. We'll ask you to speak and some of the time to stand on this particular platform, called a force plate, which also registers information.

I've got a sentence for you to speak during the experiment and we'd like you to memorise it. It's not too long. You'll be asked to say the same sentence several times.

The other procedure during the different trials is to do with standing. Some voice training is based on the Alexander Technique and there are simple adjustments to postural configuration which are according to the principles of the AT. We'd like you to use these today but I'll talk you through it at the time.

Thanks for taking part. Have you got any questions at this point?

Answer any of their questions briefly.

SENTENCE *(we explained its origin to participants):*

O, for a muse of fire that would ascend the brightest heaven of invention; a kingdom for a stage, princes to act and monarchs to behold the swelling scene.

Taken from the Prologue to '*The Life of King Henry the Fifth*' by William Shakespeare

Start of laboratory procedures

For the first recording we want you to stand as you normally do and then say the sentence when Ian asks you to.

In explanations of the laboratory exploration, (e.g. in Chapter 6), we called this 'habitual stance'

[Participant is asked to step forward on to the force plate, is directed to speak and all recordings begin at this point]

The adjusted stance as the intervention in this exploration

Before the second recording, we're going to think about your set up in standing and we will ask you to follow a procedure which is according to the principles of the Alexander Technique.

First, we could look at improving the situation of the feet and legs so that you have a stable base. This means with feet not too close together (but not too far apart either). A space of four to six inches between your heels gives more stability side to side. We can increase (decrease) the base by taking this template which measures six inches (15 centimetres) along one side and adjusting the feet to that distance between the heels (so that the foot is more or less under the shoulder on each side). An angle of 45° between the feet also increases stability (that means 22½° either side).

[Participant adjusts distance between heels according to the paper template which is folded to demonstrate six inches and an angle of 45°. The researcher asks permission to put a hand on and demonstrates to the participant that they have more stability because it is not as easy to send her/him out of balance as it would be with a narrow standing base]

This set up will put you in with a chance of freeing up the legs but we'll come back to that some more in a moment.

Now let's think about the poise of the head. Most people are pulling the head back. We can check this by using the fist to indicate the distance between the top of the sternum (here) and

the chin. If you can fit the fist in and there is a gap, just allow the chin to fall so that it rests on the fist with the head poised.

It's a good idea to think about the knees as you want them to be free to point out over the toes, instead of our tendency to brace them.

[The researcher indicates this direction with their own hands pointing in the required direction]

Finally, if standing for a while it is a good idea to increase the stability from front to back by increasing the base in that direction. So, take a small step forward with one foot or the other – about a couple of inches - following the line of the template.

[Participant follows instructions for adopting this adjusted stance which in the explanation of the laboratory exploration, (e.g. in Chapter 6), we called 'MA stance']

We're going to ask you to read again in a moment – maintaining this posture. So, you are thinking about the stable base, knees free and pointing in the direction of the toes, and poising the head.

[Repeat of reading]

References for the procedure for MA stance are taken from Door (2003): widening the base (2003: 97-98); the fore and aft stance (2003: 102-103); freeing the legs and associated joints (2003: 98-99); the poise of the head (2003: 96). In addition, the 'fist' test is described (Door, 2003: 63-64).

The follow-up interview

Which answer most closely applies to speaking during the two procedures? A, speaking was more effortful in procedure 1; B, it was more effortful in procedure 2; C, you can't distinguish between them.

APPENDIX P

LABORATORY EXPLORATION: PLACEMENT OF VICON MARKERS

Placement of infra-red markers for VICON recordings

Placement	Number of markers
(designated mainly by site on skeletal frame)	
Malleoli (ankles)	4
1st and 5th Metatarsals (toes)	6
Calcaneus	2
Condyles of femur	2
Condyles of tibia	2
Tibial tuberosity	2
Tibial marker	2
Anterior superior iliac crest of innominate bone	2
Iliac crest either side of spine	2
Sacrum	
Upper leg markers	2
Vertebrae – C7, T10, T3, T7, L3	5
Sternal notch	1
Manubrium	1
Zygomatic bones	4
Ridge of Trapezius	2

APPENDIX Q

LABORATORY EXPLORATION: PLACEMENT OF EMG MARKERS

EMG recordings (placing of sensors) – list of muscles being monitored

1	**LEFT**	Tibialis anterior
2		Soleus
3		Gastrocnemius medialis
4	**RIGHT**	Tibialis anterior
5		Soleus
6		Gastrocnemius medialis
7	**LEFT**	Vastus medialis
8		Vastus lateralis
9	**RIGHT**	Vastus medialis
10		Vastus lateralis
11	**LEFT**	Semimembranosus
12	**RIGHT**	Semimembranosus
13	**LEFT**	Trapezius
14	**RIGHT**	Trapezius

APPENDIX R

LABORATORY EXPLORATION: ALEXANDER TECHNIQUE EXPLANATION

Script for explanation of Alexander Technique given to participants when they had finished in the laboratory exploration, MMU July 2010

In any activity we have to engage the whole of our psychophysical mechanism. Whether that is standing or walking, for instance, sitting at the computer or lying down, we have to be in some physical configuration or another; we exist in and occupy space. I know that seems obvious. The overall shape and the relationship of one part to another is not random but is directed by our brain usually following a pattern which the brain associates with the particular activity.

The question we are exploring here is whether the pattern directed by the brain in standing and speaking, that is the way that is usual or habitual for you, is the best it could be. We first learn to stand as very young children and to find solutions to the problem of gaining stability in standing. No-one teaches us the best way, as a rule, so by the time we reach adulthood we may not be achieving best balance in upright posture and, if this is the case, we will be stiffening to achieve it.

Studies in electromyography show that only three muscles need to work for us to remain standing – iliopsoas, which attaches the femur to the spine and pelvis, and the calf muscles intermittently. Standing for humans, if we can get it right, is really a balancing act. If we are not standing in best balance, using the minimum amount of effort, then the excess effort will distort our structure – we will be stiffening and pulling ourselves out of shape.

If we can get an improvement in the way we are standing, we should get also an improvement in your voice – and being able to use your voice efficiently is essential for teachers.

The quality of the voice is not just determined by what is going on with the vocal mechanism, the diaphragm, lungs, voice box [larynx], etcetera, but by the configuration you are in as a whole. The posture you are in, the shape you make up in space, when you make a sound will determine the quality of the sound that you make in speaking.

So what we did in Procedure 2 to guide you into a standing position according to the principles of the Alexander Technique, based on anatomical and physiological principles, required less effort.

We indicated at this point that we were willing to answer questions or to provide further information on the Alexander Technique if they wanted.

LABORATORY EXPLORATION VOICE ANALYSES USING MATLAB

(9 pages of results)

Notes to the graphs:

In the bar graphs, the four-coloured columns represent results for each numbered participant,

according to the four instances or trials

(results in habitual stance, dark blue; its repetition, light blue;

results in MA stance, yellow; its repetition, burgundy);

Column 12 is always the 'mean of means', the results for all participants combined.

On any line graphs, the blue line represents results for MA stance;

the green line represents results for habitual stance.

In the ANOVAs, any result where there is a statistically significant difference between

habitual and MA stance is highlighted in yellow

APPENDIX S

LABORATORY EXPLORATION VOICE ANALYSES USING MATLAB

S-1a Whole trial mean frequency, bar graph

Whole Trial mean frequency (Hz)
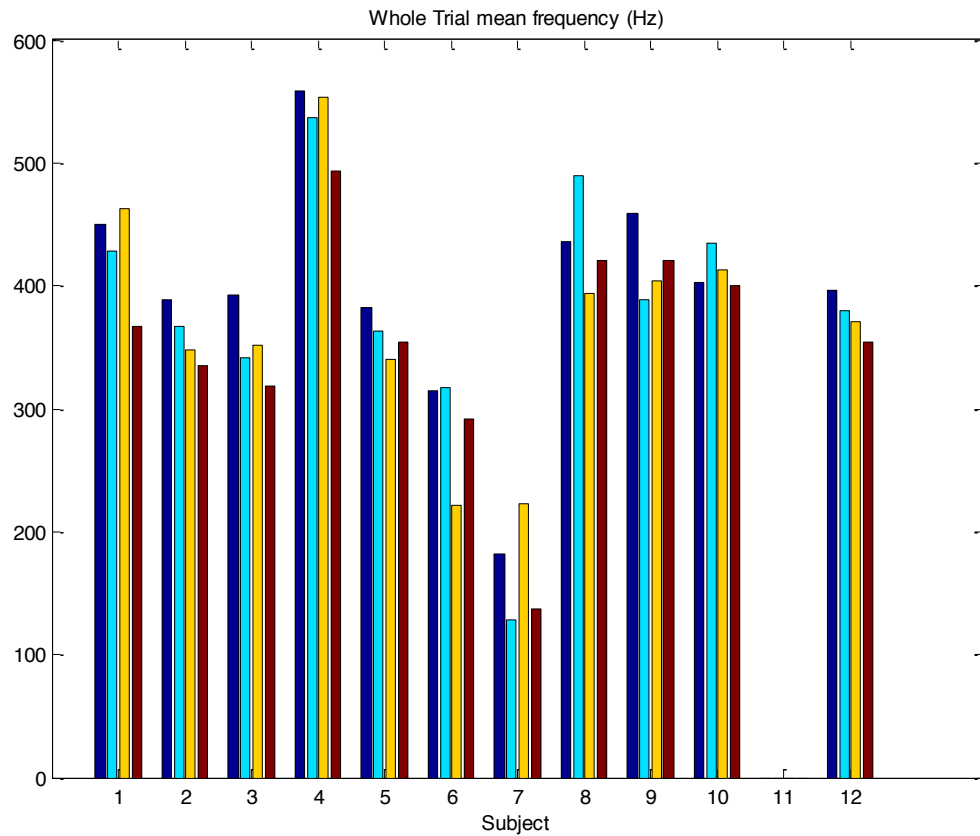
S-1b Whole trial mean frequency, ANOVA

Analysis of Variance

Source	Sum Sq.	d,f,	Mean Sq.	F	Prob>F
MA	6554.4	1	6554.41	7.67	0.0098
Rep	2931.8	1	2931.83	3.43	0.0745
Subject	348866.7	9	38762.96	45.37	0
Error	23920.5	28	854.3		
Total	382273.5	39			

Constrained (Type III) Sum of Squares

APPENDIX S cont.

S-2a Mean frequency, bar graph
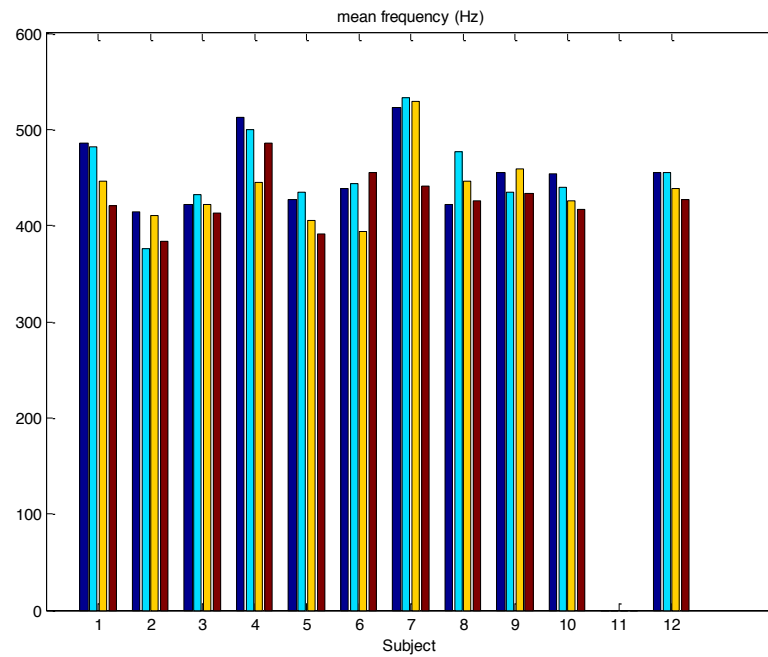
mean frequency (Hz)

S-2b Mean frequency, ANOVA

```
Source          Sum Sq.         d.f.    Mean Sq.        F       Prob>F
-----------------------------------------------------------------
MA              103593.3        1       103593.3        5.64    0.0178
Rep             6694.6          1       6694.6          0.36    0.5461
Subject         783356.2        9       87039.6         4.74    0
Error           14466601.1      788     18358.6
Total           15360245.1      799

                Constrained (Type III) Sum of Squares
```
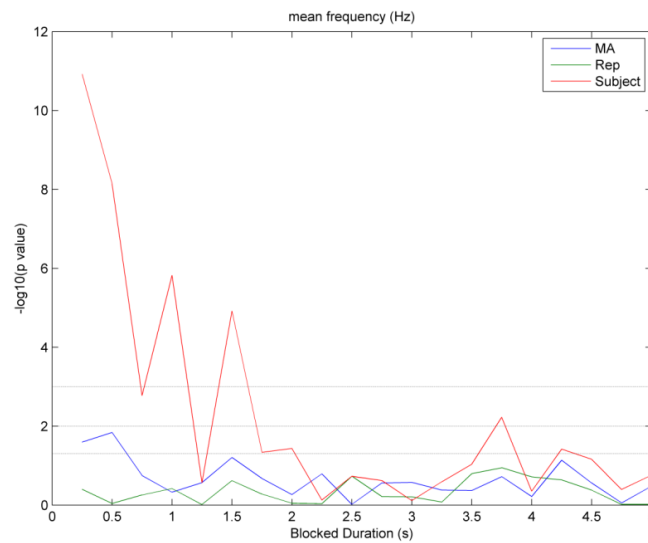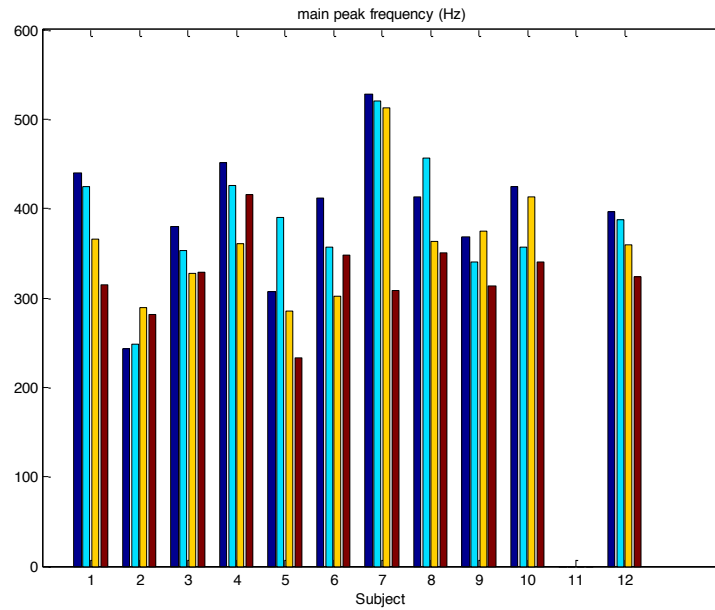
S-2c Mean frequency: 'significance of quantities' from start of speaking

mean frequency (Hz)

S-3a Mean frequency of main peak, bar graph

main peak frequency (Hz)

S-3b Mean frequency of main peak, ANOVA

```
Source          Sum Sq.        d,f,      Mean Sq.        F        Prob>F
----------------------------------------------------------------------
MA               512072         1        512072        10.85      0.001
Rep              103968         1        103968         2.2       0.1381
Subject         2304313.7       9        256034.9       5.43      0
Error          37182442.8      788        47185.8
Total          40102796.5      799

             Constrained (Type III) Sum of Squares
```
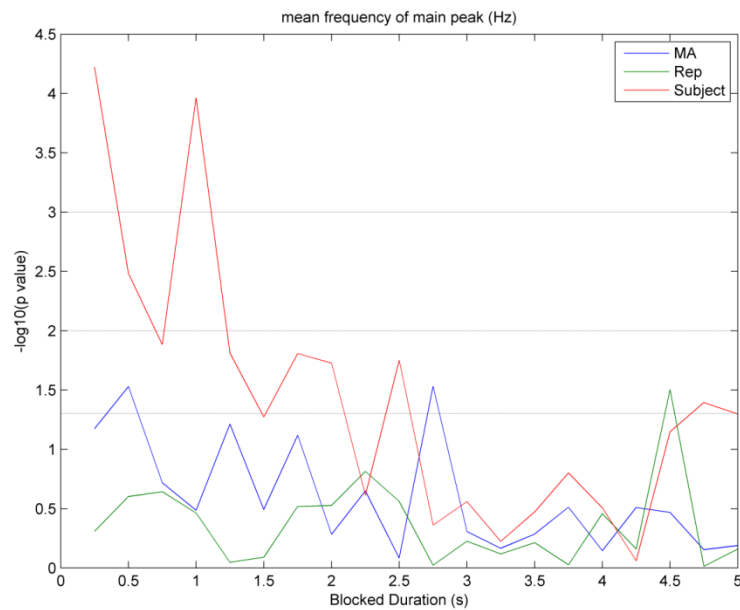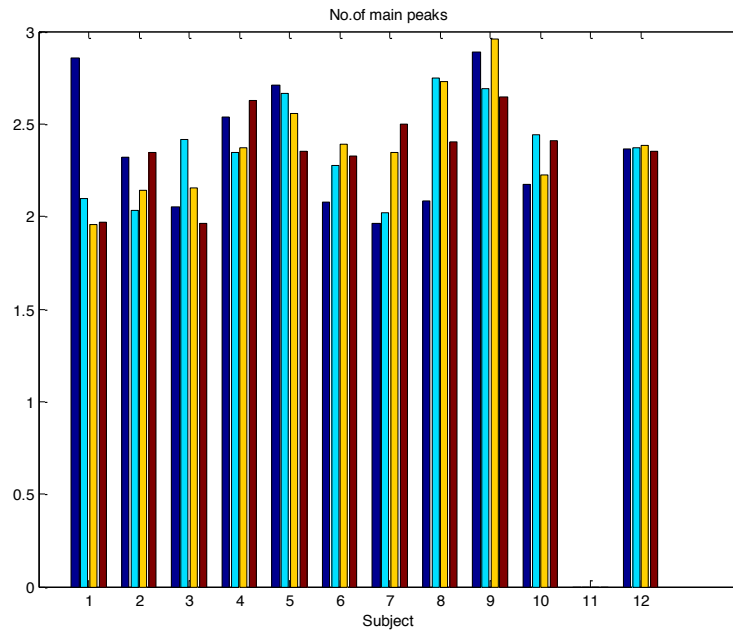
S-3c Mean frequency of main peak: 'significance of quantities' from start of speaking

mean frequency of main peak (Hz)

S-4a Number of main peaks, bar graph

No.of main peaks

S-4b number of main peaks, ANOVA

```
Source        Sum Sq.        d.f.    Mean Sq.         F       Prob>F
-------------------------------------------------------------------
MA                  0           1     0.00003          0       0.9958
Rep             0.022           1     0.02209       0.02       0.8913
Subject         30.69           9     3.40996       2.89       0.0023
Error          930.697        788     1.18109
Total          961.409        799

                Constrained (Type III) Sum of Squares
```
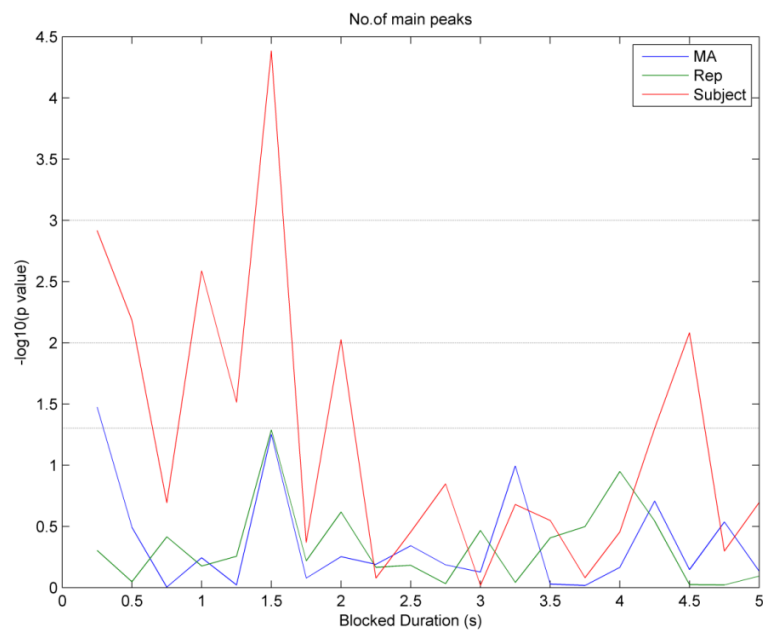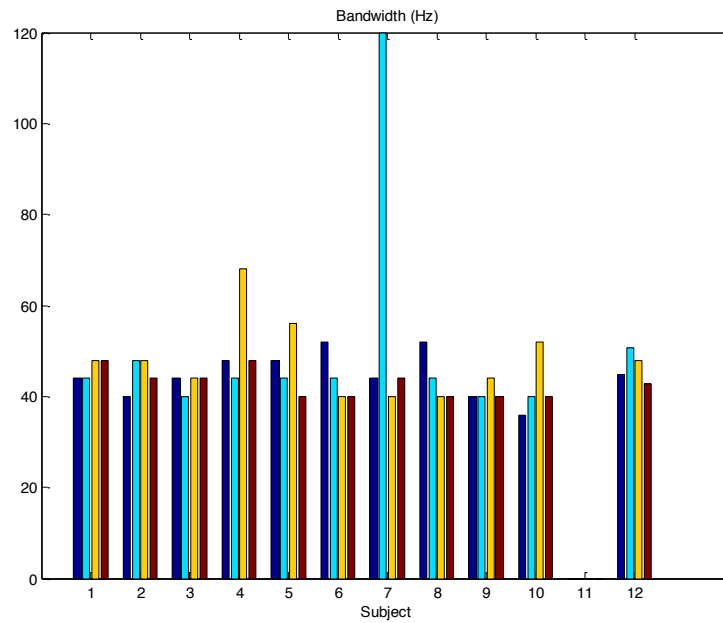
S-4c Number of main peaks: 'significance of quantities' from start of speaking
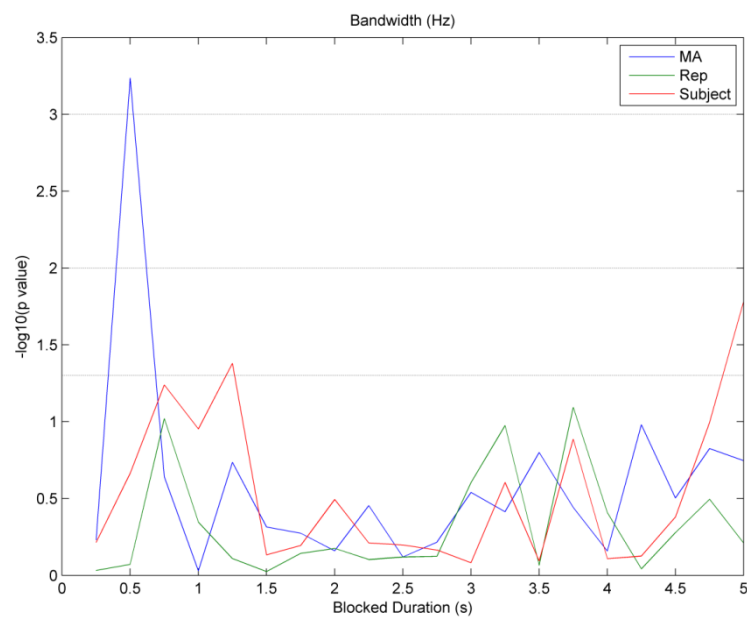

No.of main peaks

S-5a Bandwidth, bar graph

Bandwidth (Hz)

S-5b. Bandwidth, ANOVA

Source	Sum Sq.	d.f.	Mean Sq.	F	Prob>F
MA	92.5	1	92.48	0.15	0.7015
Rep	50	1	50	0.08	0.7781
Subject	5596.9	9	621.876	0.99	0.4478
Error	495676.3	788	629.031		
Total	501415.7	799			

Constrained (Type III) Sum of Squares

S-5c Bandwidth: 'significance of quantities' from start of speaking

Bandwidth (Hz)

APPENDIX S cont.

S-6a Mean peak frequency, bar graph

main peak frequency (Hz)
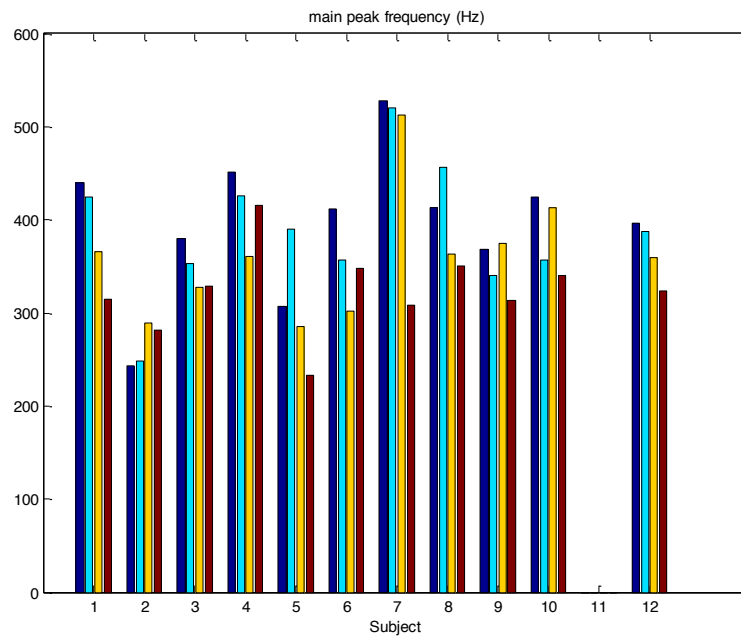
S-6b Mean peak frequency, ANOVA

```
Source          Sum Sq.        d.f.    Mean Sq.        F       Prob>F
------------------------------------------------------------------
MA              512072          1      512072         10.85    0.001
Rep             103968          1      103968          2.2     0.1381
Subject         2304313.7       9      256034.9        5.43    0
Error           37182442.8    788       47185.8
Total           40102796.5    799

         Constrained (Type III) Sum of Squares
```
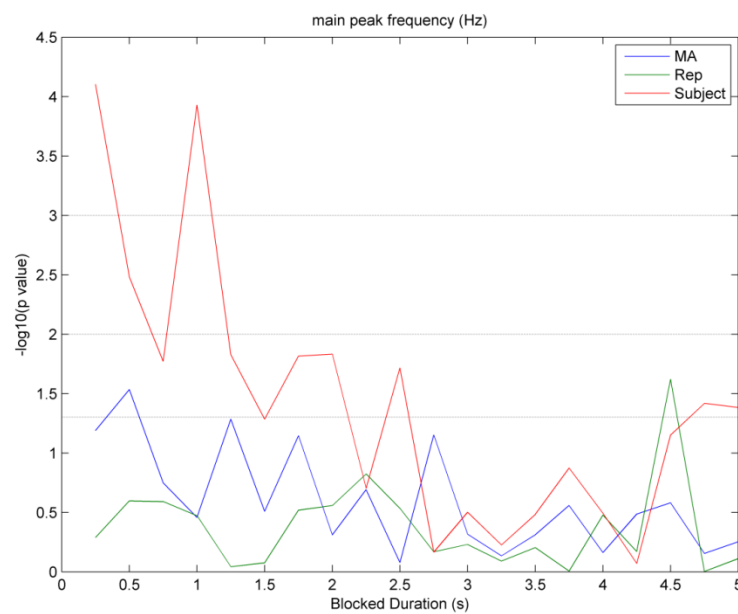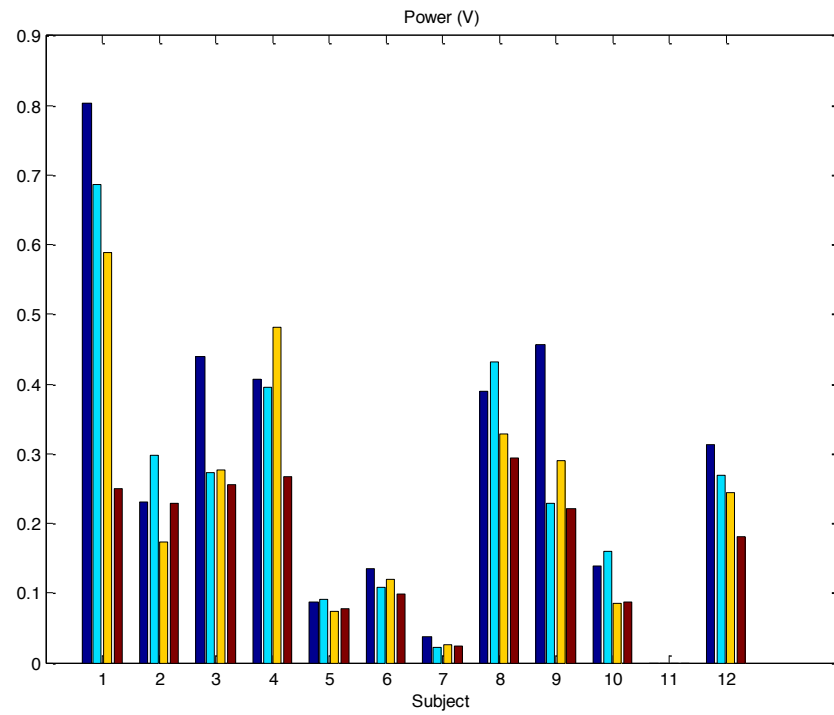
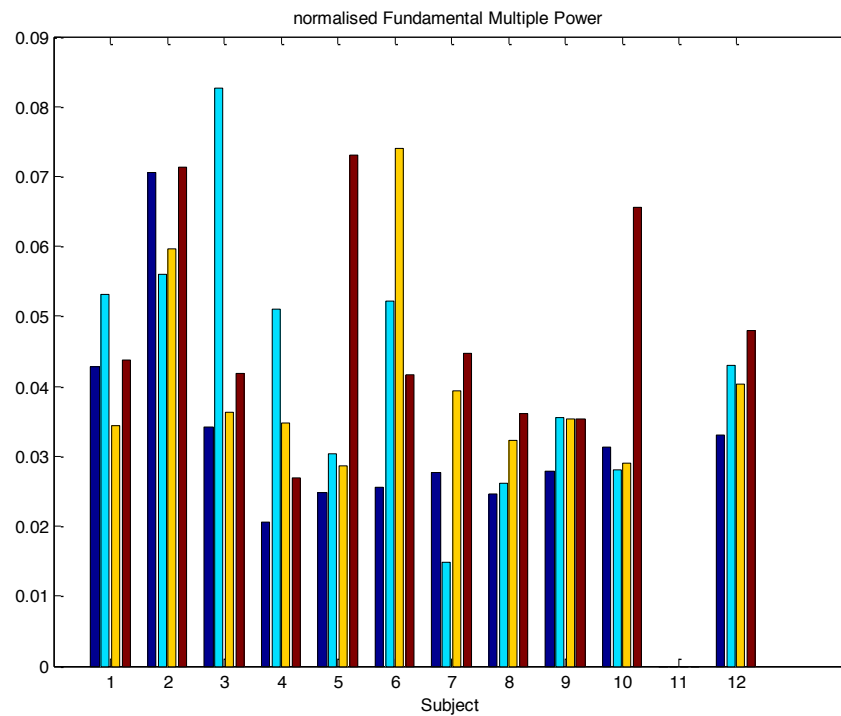## S-6c Mean peak frequency: 'significance of quantities' from start of speaking

main peak frequency (Hz)

S-7a Power, bar graph

Power (V)

S-8a. Normalised fundamental multiple power, bar graph

normalised Fundamental Multiple Power

S-8b Normalised fundamental multiple power, ANOVA

```
Source        Sum Sq.      d.f.     Mean Sq.       F        Prob>F
------------------------------------------------------------------
MA            0.00004        1      0.00004       0.08      0.783
Rep           0.00035        1      0.00035       0.66      0.4184
Subject       0.07602        9      0.00845      15.68      0
Error         0.42434      788      0.00054
Total         0.50075      799
                 Constrained (Type III) Sum of Squares
```

S-8c 'significance of quantities' from start of speaking
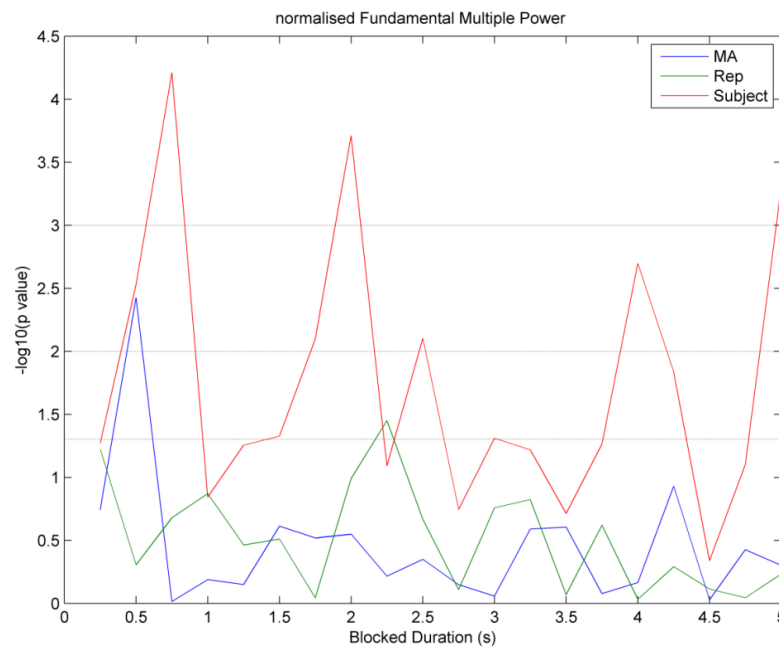
S-8d Total harmonic power: 'significance of quantities' from start of speaking
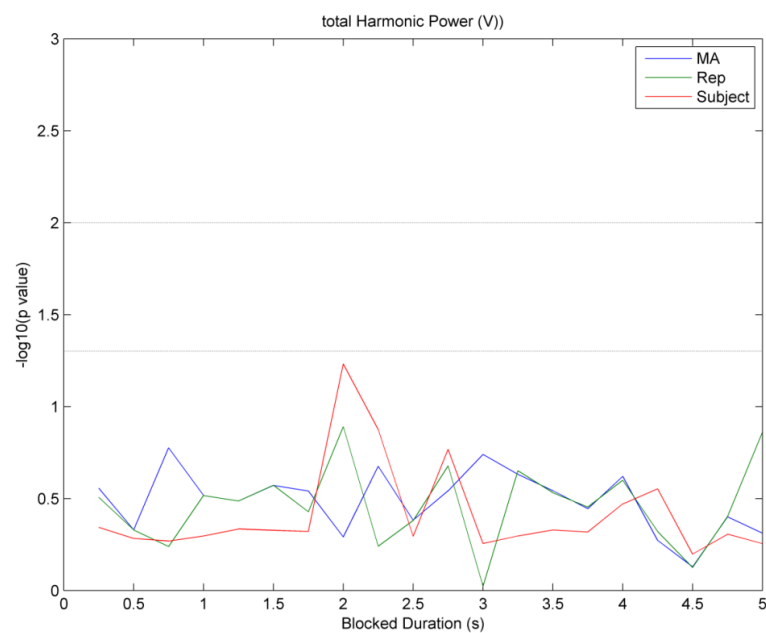
S-9a Speech duration measured in seconds
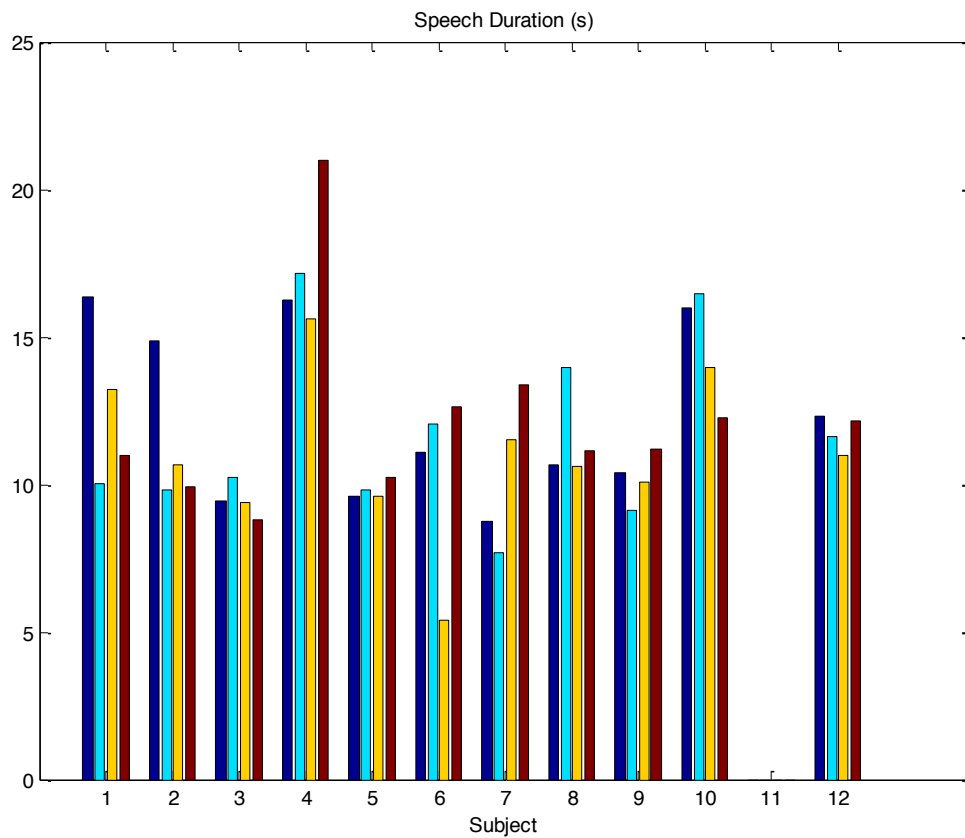
Speech Duration (s)

S-9b Speech duration, ANOVA

```
Source          Sum Sq.        d,f,    Mean Sq.      F        Prob>F
--------------------------------------------------------------------
MA              1.687          1       1.6867        0.36     0.554
Rep             0.456          1       0.4564        0.1      0.7576
Subject         232.501        9       25.8335       5.5      0.0002
Error           131.615        28      4.7005
Total           366.259        39

             Constrained (Type III) Sum of Squares
```

APPENDIX T

LABORATORY EXPLORATION: PRAAT REPORTS ON VOICE QUALITY & SPSS

(5 pages of results)

APPENDIX T

LABORATORY EXPLORATION: VOICE ANALYSES USING PRAAT / SPSS

Two Examples of Praat Reports

(1)

Participant 8 for the short extracted sound (0 to 0.5 seconds)
(a)   Trial 14 is recorded in habitual stance; (b) Trial 16 with adjusted (MA) stance

```
-- Voice report for P8_Trial_14_Hab (values in bold are those extracted for analysis)
Date: Thu Jun 04 20:41:55 2015
Time range of SELECTION
   From 0 to 0.500000 seconds (duration: 0.500000 seconds)
Pitch:
   Median pitch: 151.089 Hz
   Mean pitch: 148.805 Hz
   Standard deviation: 6.984 Hz
   Minimum pitch: 124.876 Hz
   Maximum pitch: 155.899 Hz
Pulses:
   Number of pulses: 47
   Number of periods: 45
   Mean period: 6.720614E-3 seconds
   Standard deviation of period: 0.331556E-3 seconds
Voicing:
   Fraction of locally unvoiced frames: 35.616%   (52 / 146)
   Number of voice breaks: 1
   Degree of voice breaks: 22.832%   (0.114161 seconds / 0.500000
seconds)
Jitter:
   Jitter (local): 1.291%
   Jitter (local, absolute): 86.752E-6 seconds
   Jitter (rap): 0.471%
   Jitter (ppq5): 0.354%
   Jitter (ddp): 1.413%
Shimmer:
   Shimmer (local): 9.014%
   Shimmer (local, dB): 0.742 dB
   Shimmer (apq3): 2.421%
   Shimmer (apq5): 4.668%
   Shimmer (apq11): 13.269%
   Shimmer (dda): 7.263%
Harmonicity of the voiced parts only:
   Mean autocorrelation: 0.926248
   Mean noise-to-harmonics ratio: 0.114124
   Mean harmonics-to-noise ratio: 15.449 dB
```

```
-- Voice report for P8_Trial_16_PMA
Date: Fri Jun 05 13:31:34 2015
Time range of SELECTION
   From 0 to 0.500000 seconds (duration: 0.500000 seconds)
Pitch:
   Median pitch: 134.698 Hz
   Mean pitch: 139.440 Hz
   Standard deviation: 55.076 Hz
   Minimum pitch: 108.767 Hz
   Maximum pitch: 473.524 Hz
Pulses:
   Number of pulses: 34
   Number of periods: 33
   Mean period: 7.656047E-3 seconds
   Standard deviation of period: 0.439442E-3 seconds
Voicing:
   Fraction of locally unvoiced frames: 44.521%   (65 / 146)
   Number of voice breaks: 0
   Degree of voice breaks: 0   (0 seconds / 0.500000 seconds)
Jitter:
   Jitter (local): 2.124%
   Jitter (local, absolute): 162.602E-6 seconds
   Jitter (rap): 0.950%
   Jitter (ppq5): 0.489%
   Jitter (ddp): 2.851%
Shimmer:
   Shimmer (local): 8.486%
   Shimmer (local, dB): 0.836 dB
   Shimmer (apq3): 1.196%
   Shimmer (apq5): 2.637%
   Shimmer (apq11): 11.344%
   Shimmer (dda): 3.588%
Harmonicity of the voiced parts only:
   Mean autocorrelation: 0.932260
   Mean noise-to-harmonics ratio: 0.090220
   Mean harmonics-to-noise ratio: 15.611 dB
```

Three Examples of Univariate Analysis of Variance

(1)

Shimmer dB for extract 0 to 0.5 seconds

Between-Subjects Factors

		Value Label	N
MA	0	Habitual	20
	1	MA	24
Rep	1	first instance	20
	2	second and subsequent instances	24

Tests of Between-Subjects Effects

Dependent Variable: Shimmer Db

Source		Type III Sum of Squares	Df	Mean Square	F	Sig.
Intercept	Hypothesis	22.379	1	22.379	179.235	.017
	Error	.182	1.459	.125		
MA	Hypothesis	.100	1	.100	12281.000	**.006**
	Error	8.178E-006	1	8.178E-006		
Rep	Hypothesis	.024	1	.024	2987.250	.012
	Error	8.178E-006	1	8.178E-006		
MA * Rep	Hypothesis	8.178E-006	1	8.178E-006	.000	.985
	Error	.973	40	.024		

(2)

Shimmer dB for extract 0.25 to 0.5 seconds

Between-Subjects Factors

		Value Label	N
MA	0	Habitual	20
	1	MA	24
Rep	1	First instance	20
	2	second or subsequent instance	24

Tests of Between-Subjects Effects

Dependent Variable: Shimmer Db

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	Hypothesis	24.874	1	24.874	262.130	.035
	Error	.099	1.041	.095		
MA	Hypothesis	.093	1	.093	239.201	.041
	Error	.000	1	.000		
Rep	Hypothesis	.002	1	.002	5.982	.247
	Error	.000	1	.000		
MA * Rep	Hypothesis	.000	1	.000	.006	.941
	Error	2.809	40	.070		

(3)

Jitter % for whole sentence recording

Between-Subjects Factors

		Value Label	N
MA	0	habitual	20
	1	MA	24
Repetition	1	first instance	20
	2	second or subsequent instance	24

Tests of Between-Subjects Effects

Dependent Variable: Jitter

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	Hypothesis	162.222	1	162.222	1490.262	.010
	Error	.126	1.159	.109		
MA	Hypothesis	.101	1	.101	370.016	.033
	Error	.000	1	.000		
Repetition	Hypothesis	.008	1	.008	30.721	.114
	Error	.000	1	.000		
MA * Repetition	Hypothesis	.000	1	.000	.004	.952
	Error	2.991	40	.075		

APPENDIX U

LABORATORY EXPLORATION: RESULTS FROM MOTION ANALYSES
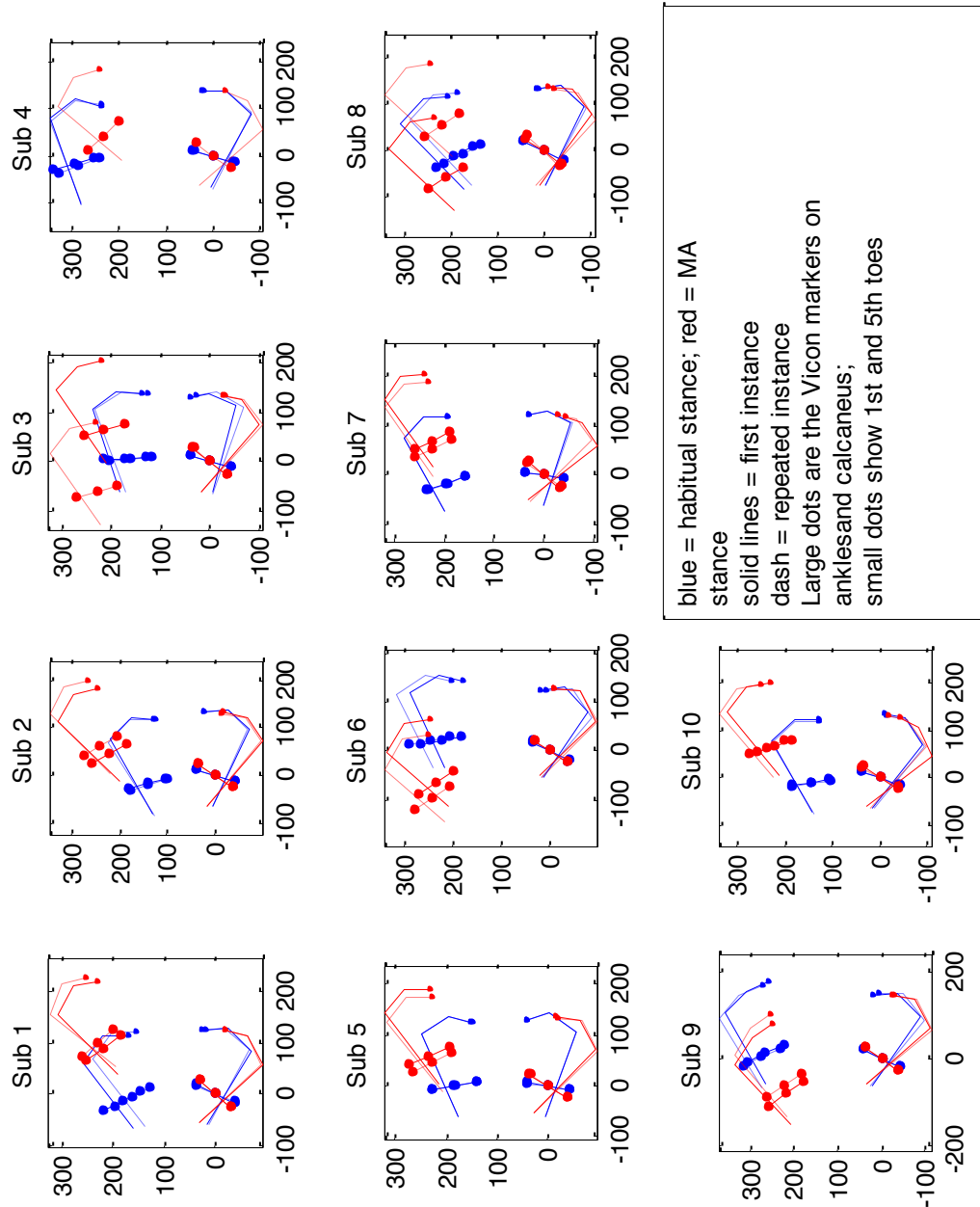
(7 pages of results)

Note: the red or blue dots show the Vicon markers
in either habitual (blue) or MA (red) stance.

The lines on each diagram should not be viewed as corresponding
with any anatomical features.
They are imaginary vector lines added in Matlab to enable accurate measurement
of postural configuration.
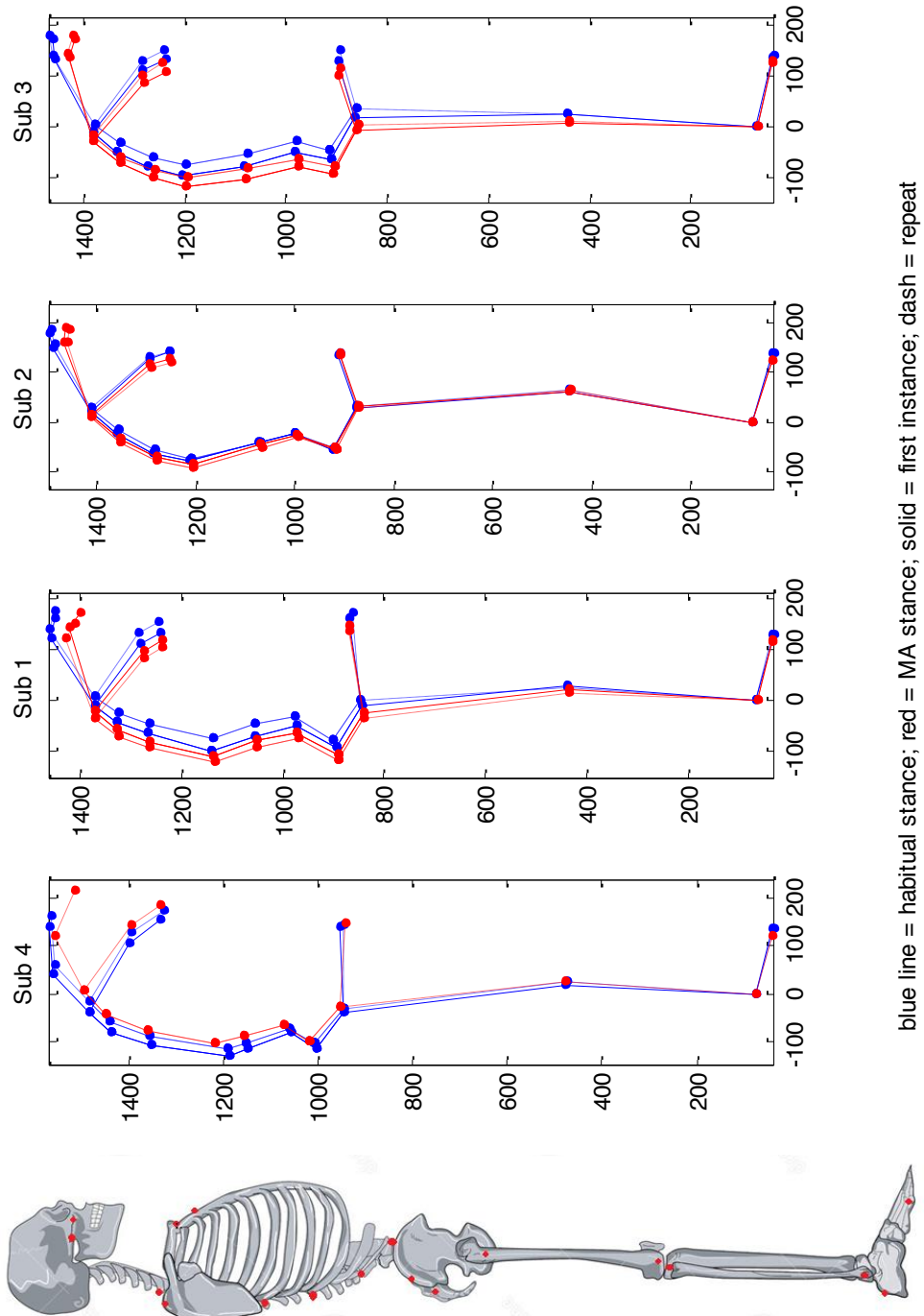
LABORATORY EXPLORATION: RESULTS FROM MOTION ANALYSES

Motion analysis: MA U-1 placement of feet
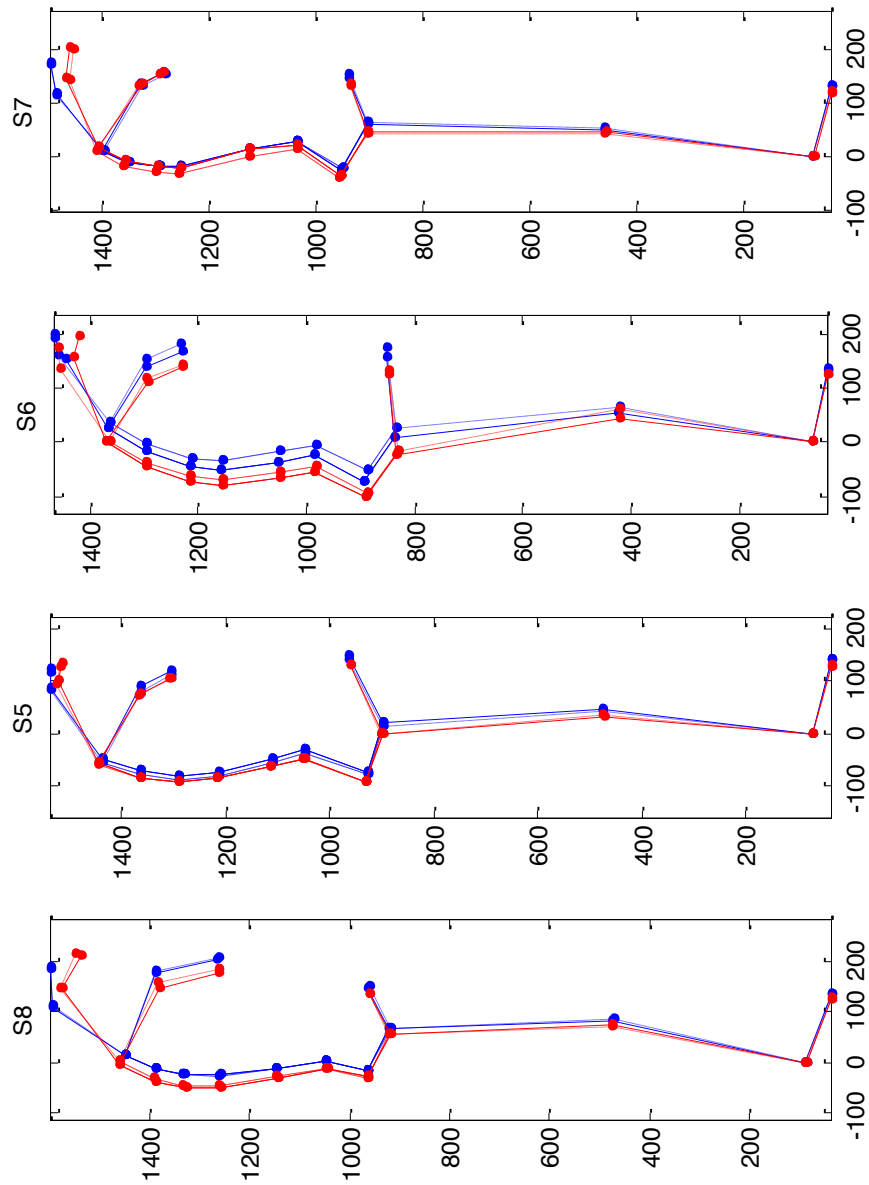### (record at point of starting to speak)

blue = habitual stance; red = MA stance
solid lines = first instance
dash = repeated instance
Large dots are the Vicon markers on ankles and calcaneus;
small dots show 1st and 5th toes

Motion analysis: MA U-2 whole body view
(record at start of speaking)

The four diagrams (Sub 4, Sub 1, Sub 2, Sub 3) show respective participants and the Vicon markers (attached in locations listed in Appendix P). This is similarly shown on the following page for S8, S5, S6, S7 and finally for S9 and S10. The illustration at the foot of this page shows the approximate locations on a model skeleton to make clear that the zygomatic (cheek) bones do not mark the top of the skull and that markers do not delineate the feet in contact with the floor because the markers were located on the malleoli (ankles) above ground level.
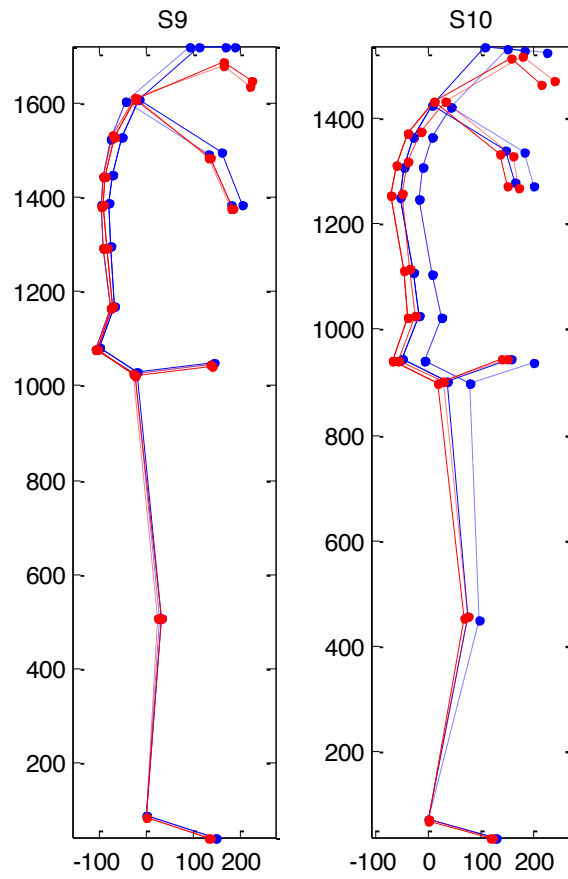

blue line = habitual stance; red = MA stance; solid = first instance; dash = repeat

blue line = habitual stance; red = MA stance; solid = first instance; dash = repeat
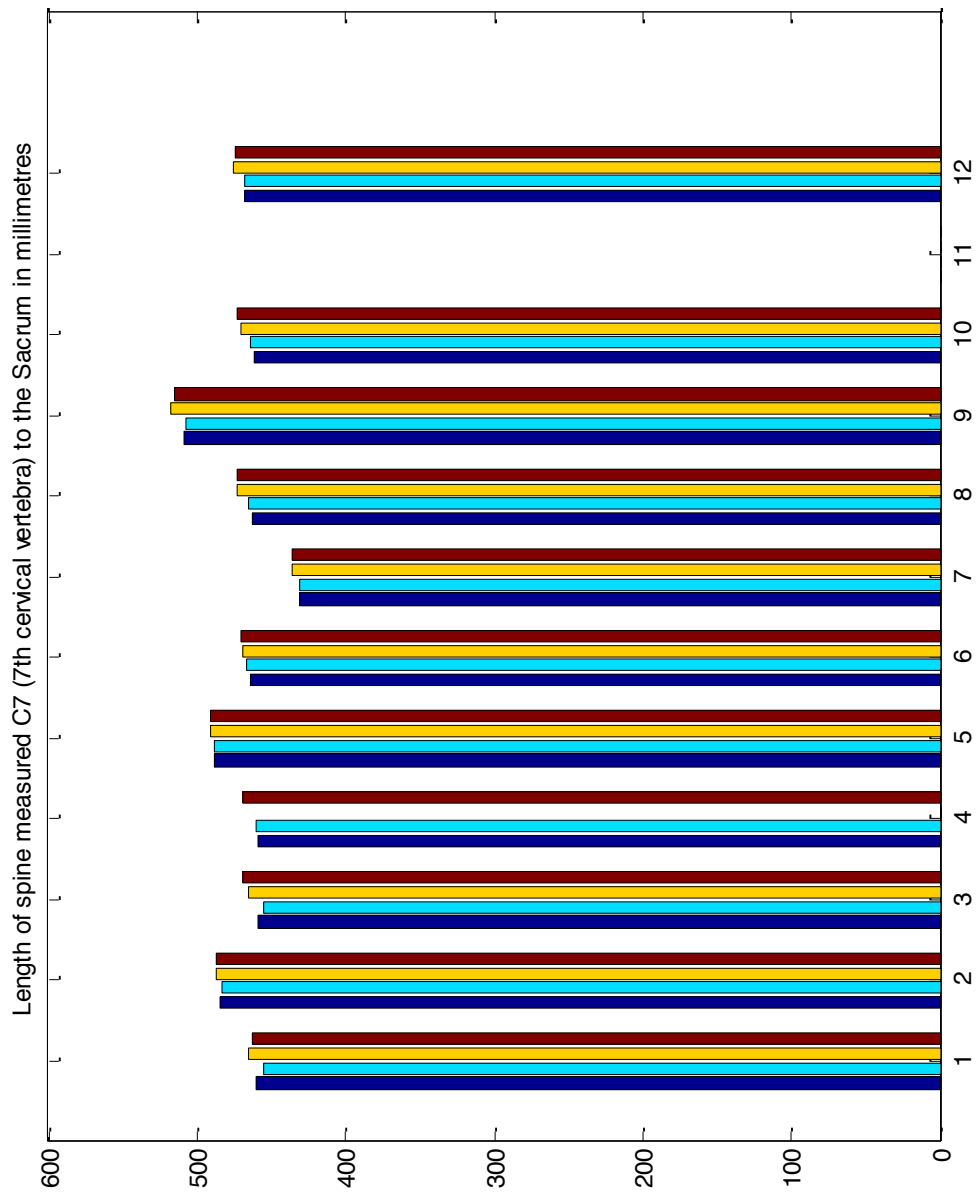
Motion analysis: MA U-2 whole body view, continued

blue line = habitual stance; red = MA stance; solid = first instance; dash = repeat

Motion analysis: MA U-3 length of back, C7 to sacrum
(key - dark blue = habitual stance; light blue = repeat of habitual; yellow = MA; burgundy =
repeat of MA)

MA U-3a Bar graph

Motion analysis: MA U-3 length of the back, ANOVA

Length: C7 to Sacrum
NOTE: there is a statistically significant difference for MA stance (p = 0), but Repetition shows no statistically significant difference (p = 0.8038)

Analysis of Variance

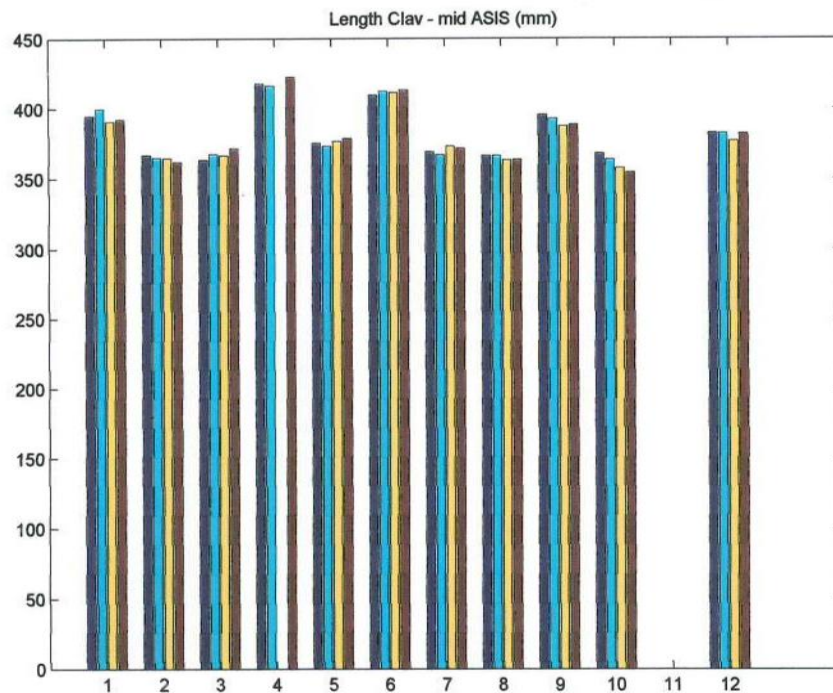| Source	Sum Sq.	d.f.	Mean Sq.	F	Prob>F
MA	443.3	1	443.26	96.31	0
Rep	0.3	1	0.29	0.06	0.8038
Subject	15674.6	9	1741.62	378.42	0
Error	124.3	27	4.6		
Total	16298.7	38			

Constrained (Type III) sums of squares.

Motion analysis: MA U-4 anterior chest measurement
Distance from clavicle to a point on the pelvis (the anterior superior iliac spine, ASIS)
measured in mms.

MA U-3a Bar graph
(key - dark blue = habitual stance; light blue = repeat of habitual; ochre = MA; burgundy = repeat of MA)

Length Clav - mid ASIS (mm)

MA-U4b ANOVA

Length: Clavicle to ASIS
NOTE: there is a no statistically significant difference for MA stance or for repetition

```
                    Analysis of Variance
Source       Sum Sq.      d.f.    Mean Sq.      F       Prob>F
--------------------------------------------------------------
MA             12.1        1        12.12       1.1      0.3044
Rep             1          1         0.96       0.09     0.7707
Subject     14177.9        9      1575.92     142.44     0
Error         298.6       27        11.06
Total       14619.1       38

          Constrained (Type III) Sum of Squares
```

APPENDIX V

LABORATORY EXPLORATION: EMG RESULTS

(4 pages of results)

Mean values across all muscles as recorded in all four trials (2 X habitual; 2 X MA)
Green titles show results which were statistically significant,
red titles indicate results being close to statistical significance

Key to abbreviations for muscles:

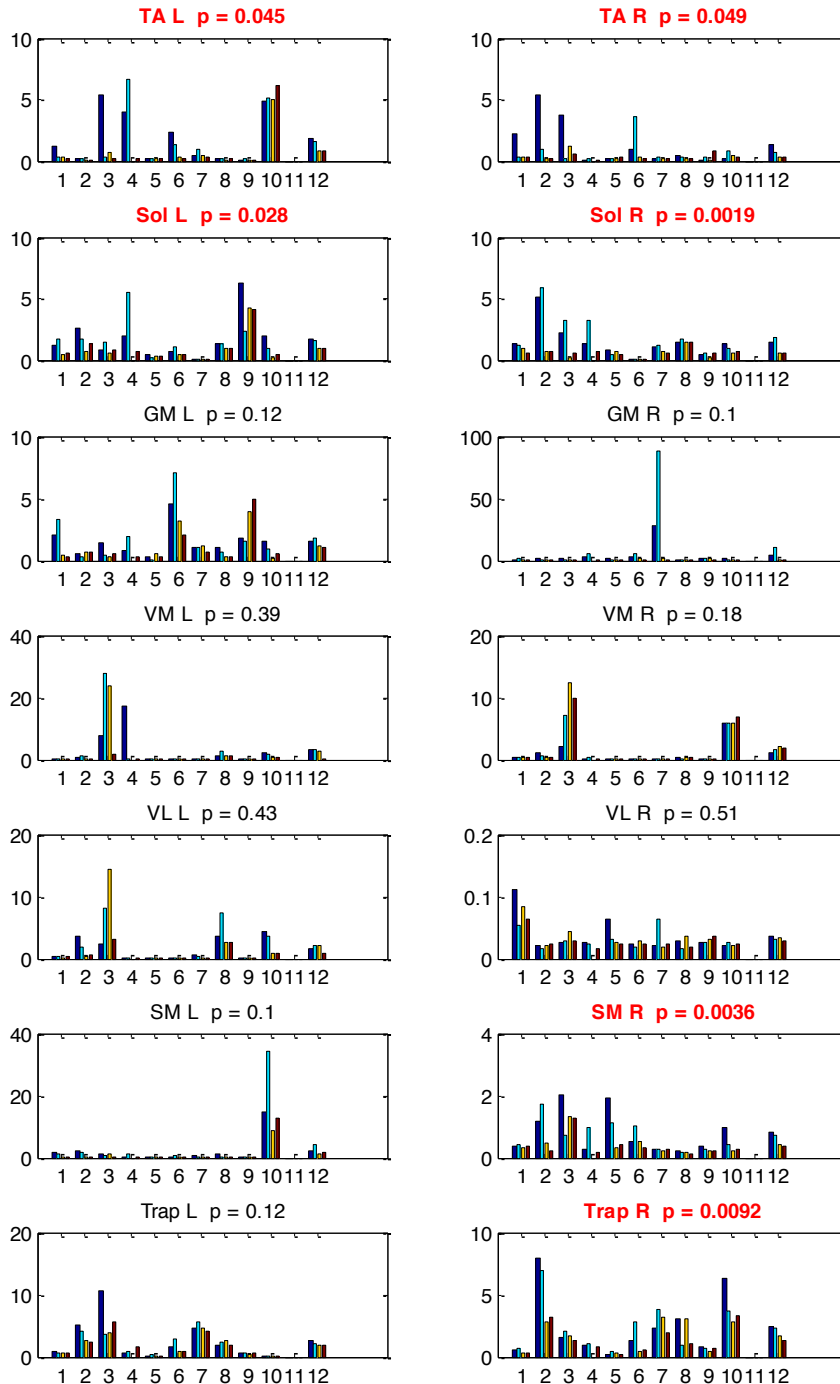|	
TA	tibialis anterior
Sol	soleus
GM/Gas med	gastrocnemius medialis
VM/Vas M	vastus medialis
VL/Vas L	vastus lateralis
SM/Semi Memb	semimembranosus
Trap	trapezius

LABORATORY EXPLORATION: EMG RESULTS

EMG V-1 Mean values across all four trials
Titles in red indicate statistically significant results; titles in green indicate those results which are close to statistically significance
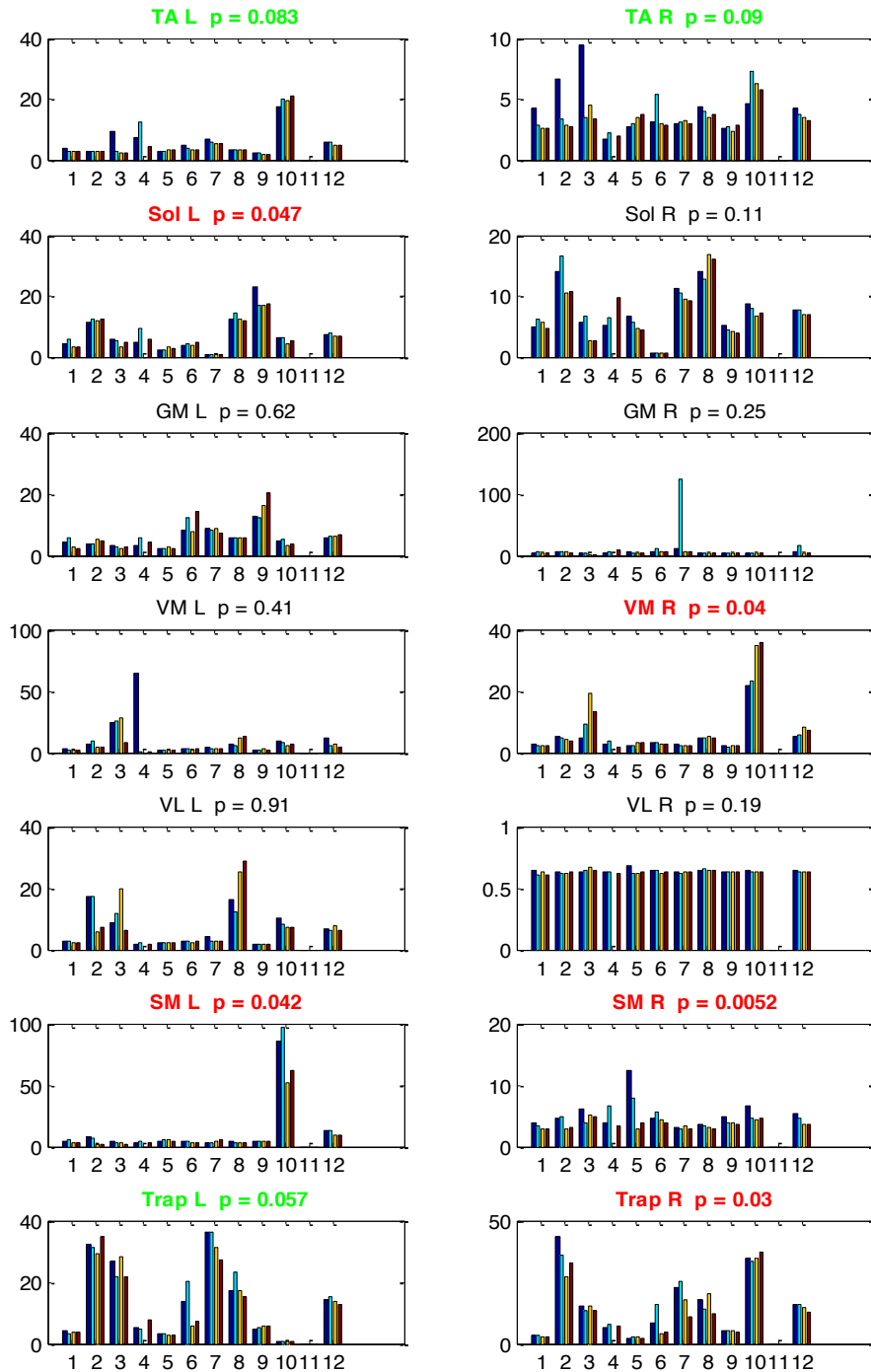
SUMMARY OF RESULTS:
Five muscles show results with a statistically significant difference between habitual and MA stance (red title); the results for three other muscles are close to statistical significance (green)

EMG V-2 Standard deviations across all muscles being recorded
Titles in red indicate statistically significant results; titles in green indicate those results
**which are close to statistically significance**

SUMMARY OF RESULTS: Six muscles show results with a statistically significant difference between habitual and MA stance (red title)

EMG V-3 Times series for EMG of muscles on the left
Blue represents results in habitual stance; green represents MA stance

TA	tibialis anterior
Sol	soleus
GM/Gas med	gastrocnemius medialis
VM/Vas M	vastus medialis
VL/Vas L	vastus lateralis
SM/Semi Memb	semimembranosus
Trap	trapezius

Left EMG

time from speaking (s)
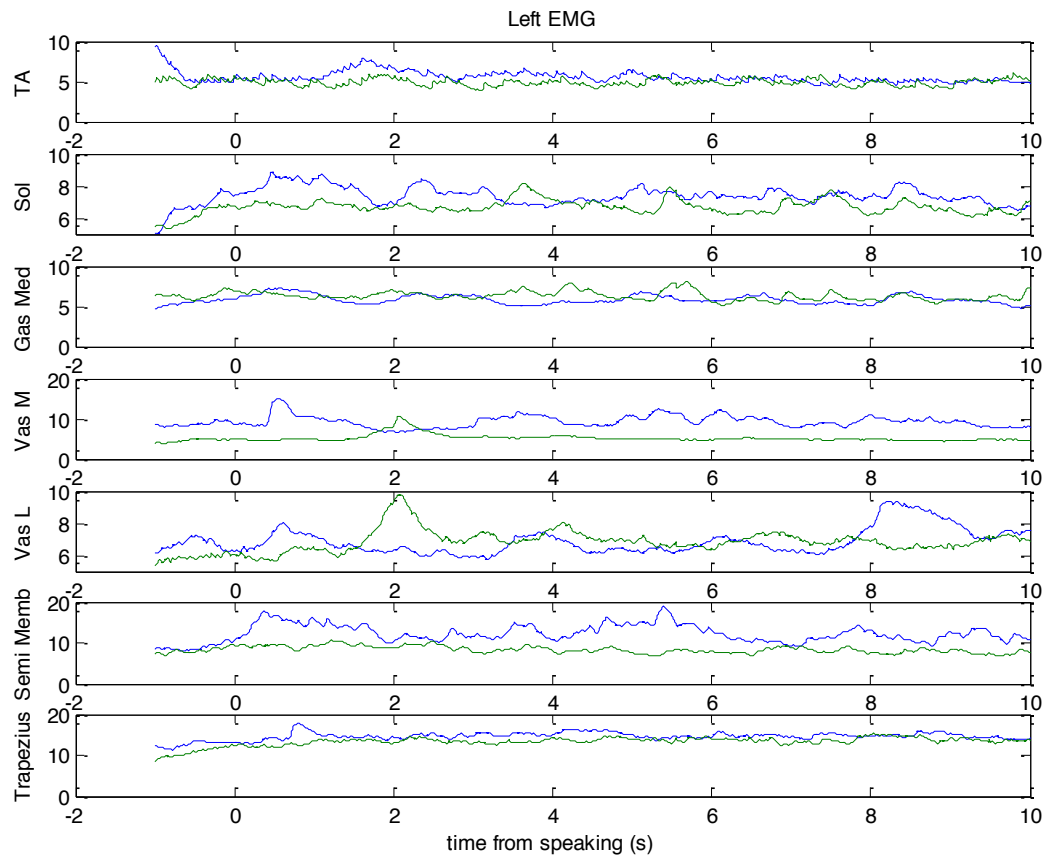
EMG V-4 Times series for EMG of muscles on the right
Blue represents results in habitual stance; green represents MA stance

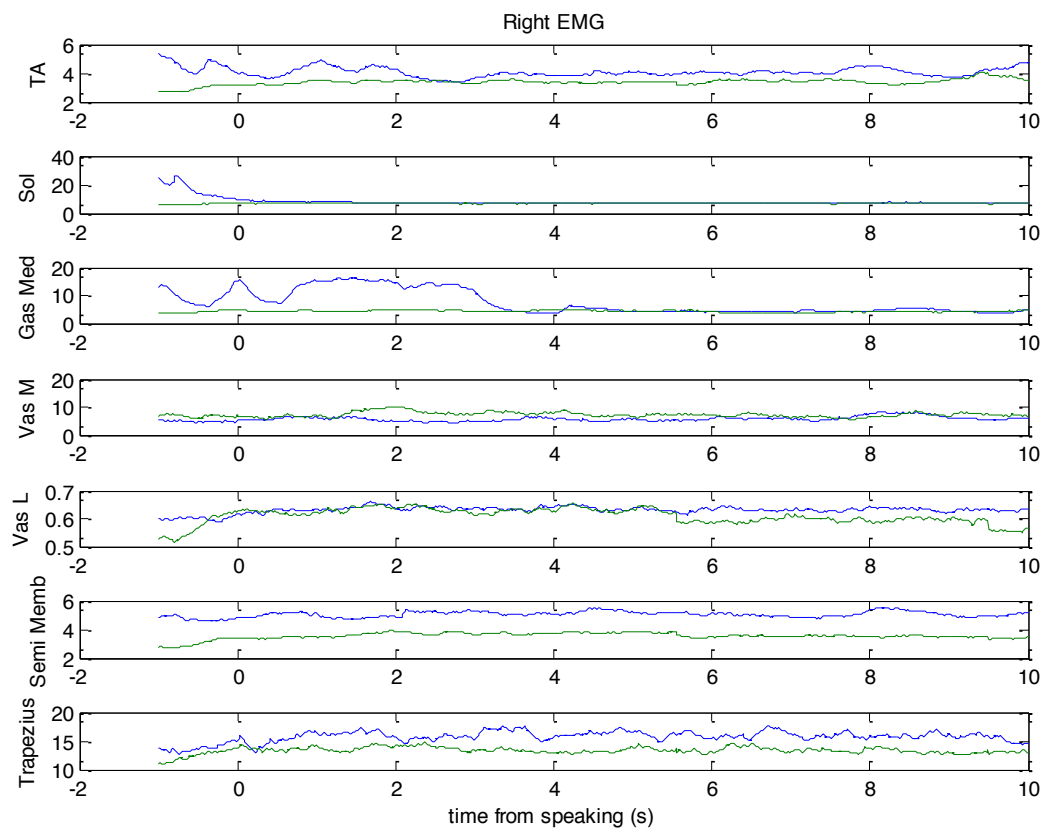| TA	tibialis anterior
Sol	soleus
GM/Gas med	gastrocnemius medialis
VM/Vas M	vastus medialis
VL/Vas L	vastus lateralis
SM/Semi Memb	semimembranosus
Trap	trapezius

Right EMG

APPENDIX W

LABORATORY EXPLORATION: ANALYSES OF SKIN CONDUCTANCE (EDA)

Means for skin conductance across all participants
(Statistically significant result in ANOVA is highlighted)

EDA W-1a, bar graph

Dark blue = habitual stance; light blue = repetition
yellow = MA stance; burgundy = repetition

Skin conductance (V)
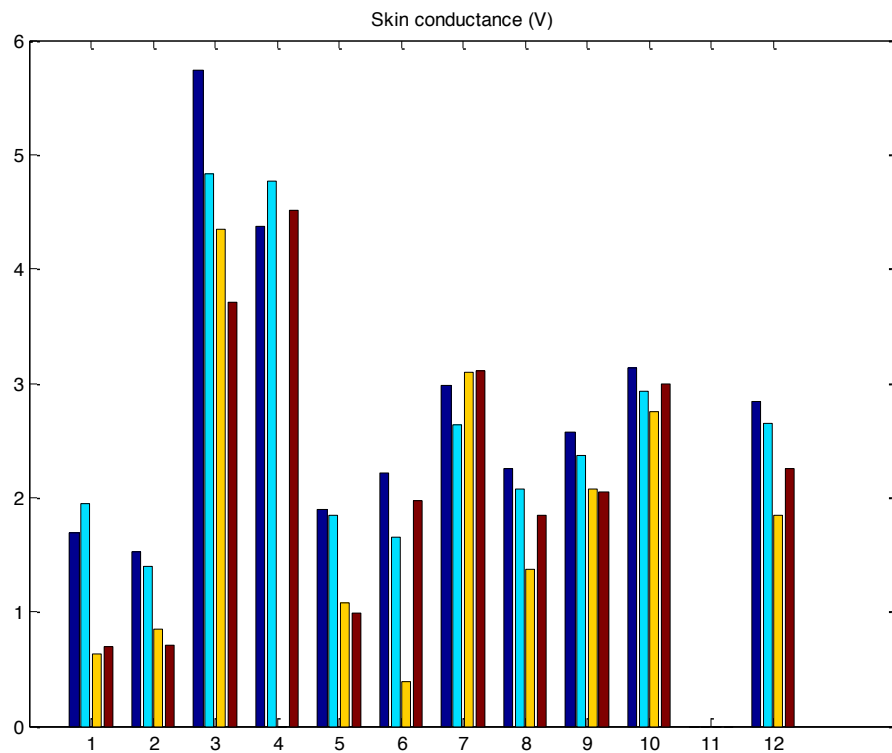
EDA W-1b, ANOVA

Analysis of Variance

Source	Sum Sq.	d.f.	Mean Sq.	F	Prob>F
MA	3.1918	1	3.19179	19.34	0.0002
Rep	0.0002	1	0.0002	0	0.9722
Subject	54.7548	9	6.08387	36.87	0
Error	4.4556	27	0.16502		
Total	63.8256	38			

Constrained (Type III) Sum of Squares

APPENDIX X

LABORATORY EXPLORATION: FORCE PLATE MEASUREMENTS
AND OTHER MEASURES

TIME SERIES: changes over time for centre of pressure recorded through the force plate
Blue trace is that recorded in habitual stance; green trace is that recorded when in MA stance
a. (yCOP); b. breath; c. sound; d. skin conductance
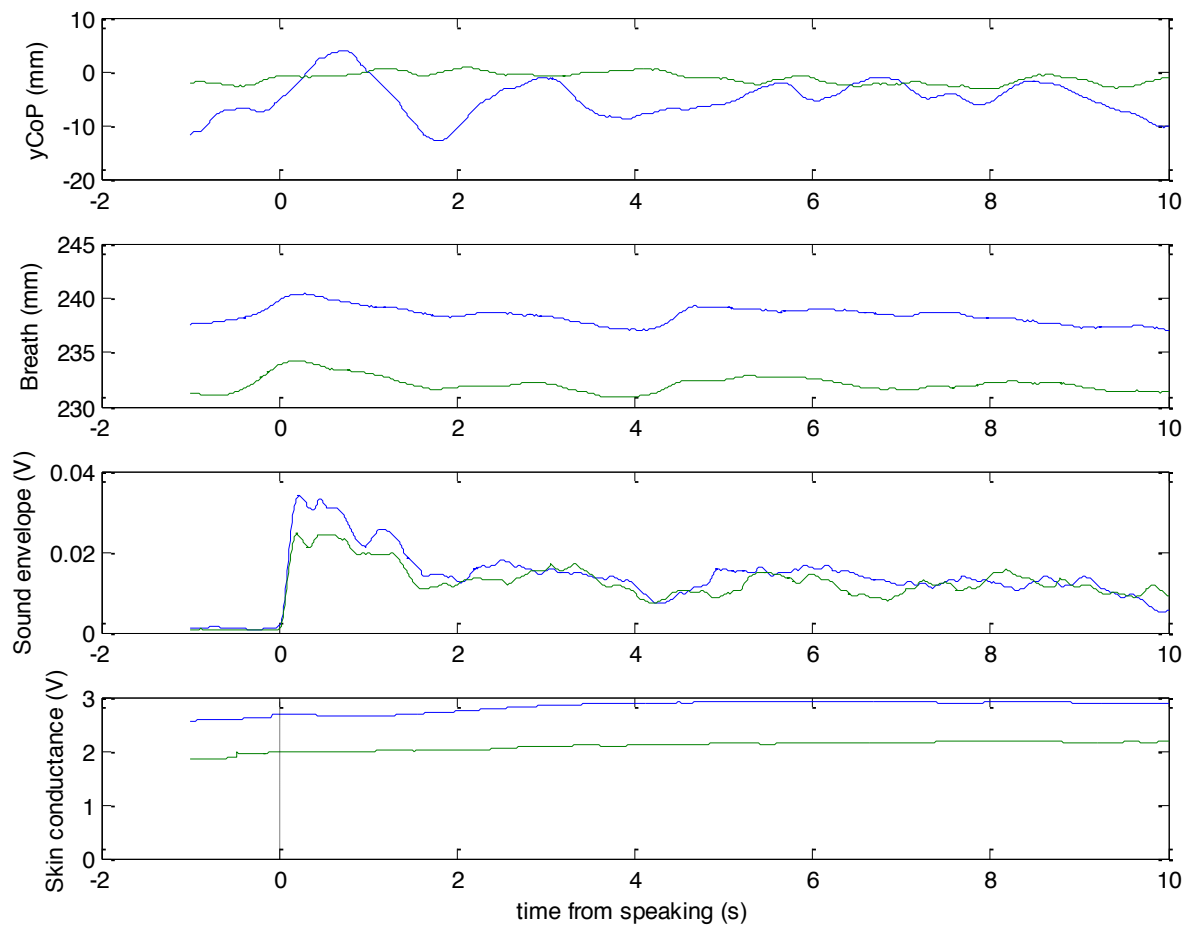
LABORATORY EXPLORATION: THE QUALITATIVE MEASURE OF
PARTICIPANTS' PERCEPTIONS OF THEIR OWN VOICE

Question 1 This is a mini questionnaire really, but because you're not in a set-up where you can see anything written down I am going to read it out to you and I can repeat if you need me to. We would like you to tell us about your subjective experience of the effort you applied in speaking during the two procedures. So we're thinking about the usual standing position, so there's the one where you were standing on the force plate in your normal set-up and there was the one where we looked at the set-up in standing and adjusted it. So I'm going to give you three answers - which answer most closely applies to what went on in those two procedures. So a) there was more effort in procedure 1 [habitual stance], or b) you thought there was more effort in procedure 2 [MA stance], or c) you can't distinguish between them?

Question 2 Did you notice anything about your voice during the experiments?

1	2	3	4	5	6	7	8	9*	10*
c	a	B	b	c	b	b	b	b (1 was free-er)	b (2 free-er)
No difference except voice louder in trials of repeated phrase	Softer and more relaxed in effort and volume in 2	Tried to keep it the same each time but sometimes there was more emphasis on different words.	I think my voice changed a lot at times but I think that was because I was thinking about what I was saying, but other than that, no, not really.	It may have been slightly deeper when I was standing (in procedure 2)	Yes I think in the second procedure I think my voice was less steady probably because I was concentrating more; that's what I felt anyway	Didn't notice anything	Didn't to be honest	I perceived that I spoke deeper whilst I was looking down compared to looking up.	It was perhaps a little bit shaky because I was worried about getting my lines. I was a little bit calmer in the second one.

*additional question: In either procedure did your voice seem freer? P9 said procedure 1; P10. It felt freer in procedure 2

Transcript of response from one student teacher

Lesley:	So it seemed a good idea to ask these questions verbally because although it's like a little questionnaire, K, you're not in a place where you can look at it and read it so I'm just recording what we each say.
K:	Okay that's fine.
Lesley:	So firstly it's to ask you to tell us about your subjective experience of the effort you applied in speaking during the two procedures, so there were the usual standing position like the one where you were standing and speaking and the one where we looked at the new balanced standing position and then you were speaking. So which answer mostly applies: a) that there was more effort in speaking in procedure 1, b) there was more effort in speaking in procedure 2, or c) you can't distinguish between them?
K:	I'm going to be really annoying now; which…
Lesley:	a) More effort in procedure 1.
K:	Which was procedure 1?
Lesley:	Standing and speaking.
K:	And procedure 2 was where we moved my feet, the one where I was looking down?
Lesley:	Yes.
K:	Oh there was more effort in procedure 2.
Lesley:	Okay and in either procedure did your voice seem freer?
K:	It felt freer in procedure 2.
Lesley:	And did you notice anything else in your voice during the experiment?
K:	Only that it was perhaps a little bit shaky because I was worried about getting my lines, right.
Lesley:	So was that the case all the time?
K:	Probably, probably more in the first one and I was a little bit calmer in the second one.

Lesley: Okay do you want to say anything more about that?

K: It felt like I was speaking lower in the second on; I don't know whether that makes any difference.

Lesley: So, lower as in a different tone?

K: Yeah.

Lesley: Okay thank you.

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