

**HELPING ADULTS WITH ASPERGER'S SYNDROME  
ACQUIRE INTERPERSONAL UNDERSTANDING: THE  
BUBBLE DIALOGUE COMPUTER PROGRAM.**

by

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APPENDIX

## Abstract

The aim of this study was to assess if the experience of role-taking improved the interpersonal understanding of two young male adults with Asperger's syndrome. The research methodology involved the use of the computer program called 'Bubble Dialogue'<sup>1</sup> which presents the beginning of a dialogue between two on-screen protagonists. The participants and I progressed through six theory of mind inspired scenarios in which we continued the dialogues by assuming the characters' roles. The characters we played communicated through the text we typed into speech and thought bubbles above our characters' heads. The research aims were to improve the social understanding of adults with Asperger's syndrome and investigate and describe the nature of autistic thought and speech.

Before and after the Bubble Dialogue experience, the participants were tested with the Wisconsin Card Sort Test and the British Picture Vocabulary Scale. Additionally, their carers were interviewed using Frith, Happé and Siddons (1994) supplementary items for the Vineland Adaptive behavioural Scales to assess if the Bubble Dialogue experience improved the participants' understanding of mental states in their everyday lives.

Two male adolescents with Emotional and Behavioural Difficulties (EBD) also completed all six scenarios. Thirty three raters, who were blind to the identities of the four participants, rated their and my (the experimenter's) scripts along three dimensions: 1) emotionally charged to emotionally flat 2) polite to coarse and 3) pursuing a topic too little to pursuing a topic too much.

Analysis revealed that the one of the adults with Asperger's syndrome's scripts were rated significantly more emotionally flat and the characters he played were rated as pursuing a topic too little (relative to the characters I played) from the other three participants. And on the dimension polite to coarse, all the scripts were rated significantly different from each other apart from the two adolescents with EBD. These findings suggest that although both individuals with Asperger's syndrome had the same diagnosis, one of them expressed speech and thought which was rated more similar to the two adolescents with EBD, at least on dimensions 1 and 3.

The findings from the battery of tests pre and post the Bubble Dialogue suggest that after the experience of the program there was i) no detectable improvement in the autistic participants' interpersonal understanding ii) there was no increase in their in their overall cognitive function, but iii) there was improvement in their executive function. The implications of the results are discussed in relation to the theory of mind and executive function hypotheses of autism.

*Keywords* : Autism, Asperger's syndrome, Theory of Mind, Computer, Bubble Dialogue.

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## Chapter 1

### General background to Autism

For his trip to England, he dressed in his most comfortable suit. *One suit is plenty*, he counselled in his guidebooks, *if you take along some travel-size packets of spot remover*. (Macon knew every item that came in travel-size packets, from deodorant to shoe polish.). *The suit should be a medium gray. Gray not only hides the dirt; it's handy for sudden funerals and other formal occasions. At the same time, it isn't too sombre for everyday.*

(from *The Accidental Tourist* by Anne Tyler)

#### 1.1 History

It was in 1908 that an eminent psychiatrist, Eugen Bleuler, first used the term 'autistic' (from the Greek 'autos' meaning self). He used it to describe the social withdrawal seen in adults with Schizophrenia, their narrowing of relationships with people and the outside so extreme that it left only the person and their self. However it was not until the 1940's that descriptions, of the disorder now known as autism, were first published. Before then individuals with autism existed but were probably given different diagnostic or cultural labels depending on where and in what period of history they lived. For example, the more intellectually able may have been labelled as 'blessed fools' in Tsarist Russia or 'idiot savants'. Earlier this century, children

with autism may have received the label of 'Childhood Schizophrenia'. In today's applied diagnostic classifications, schizophrenia is a label usually given to adults and only rarely does schizophrenia have an onset before late childhood.

Autism was almost simultaneously described by Leo Kanner in the United States of America, in 1943, and by Hans Asperger in Austria in 1944. Kanner and Asperger both believed this disorder was present from birth. They saw children who seemed unable to form normal emotional relationships with others, but unlike Bleuler's schizophrenic adults, the children's disturbance had an early onset.

Kanner called the condition 'early infantile autism' (which is perhaps a misleading term because it implies that autism does not continue into adulthood). Asperger described a more broadly defined condition which he called 'autistic psychopathy'.

There is a great deal of overlap between both Kanner's and Asperger's descriptions of autism and some differences. Nowadays, the consensus seems to be that Kanner and Asperger described the same condition but their experience was with individuals at different developmental stages. For example, a child with a Kanner-type diagnosis may develop into an Asperger-type adolescent.

## **1.2 Kanner's cardinal features**

Kanner and Eisenberg (1956) selected five features they believed were characteristic of all the children Kanner saw. To this day, these features form the basis of the diagnostic criteria for autism. The disorder was not accepted into official diagnosis until the publication of DSM-III in 1980 (The third edition of the Diagnostic and Statistic Manual of the American Psychiatric Association. Currently, the most up-to-date version is DSM-IV).

Kanner's own words appear in quotation marks, together with examples from my own clinical experiences.

1. Extreme autistic aloneness: "There is, from the start, an extreme autistic aloneness that, wherever possible, disregards, ignores, shuts out anything that comes to the child from outside". The parents of these children described them as "self-sufficient", "like in a shell", "acting as if people weren't there", "happiest when alone". Kanner said the children neither sought nor seemed to want social contact and displayed this from an early age by not opening their arms out when being picked up and not moulding themselves to the body of the person holding them.

2. "An anxiously obsessive desire for the preservation of sameness": Kanner stated that these children became distressed by even minor changes in routine; e.g., taking a different route to school. He said they showed obsessive ritualistic behaviours in their everyday routines, such as taking their clothes off or putting them on in a particular

sequence and became extremely challenging if the routine was not precisely adhered to. They engaged in repetitive activities; e.g., one young man I know likes to listen to the same music album over and over again.

3. Limitations in the variety of spontaneous activity: These children showed a "fascination for objects" which they "handled with skill in fine motor movements"; e.g., spinning objects and completing sometimes complex jigsaw puzzles. However, they did not show much in the way of spontaneous activity. Instead they displayed repetitive verbalisation (e.g., asking one question over and over again), repetitive movements (e.g., stereotyped body rocking and hand flapping) and a narrow range of interests (e.g., wanting to listen to music by only one group all the time).

4. The "kind of language that does not seem intended to serve interpersonal communication"/ immediate or delayed echolalia: Some children repeated or echoed, with remarkable fidelity, what they had heard another person say either immediately (immediate echolalia) or sometime after (delayed echolalia).

For example:

Parent:       What would you like for dinner?

Child:        What would you like for dinner?

Additionally the children reversed pronouns, using 'You' to refer to themselves and 'I' to refer to the other person. Hence when they said "You want some biscuits?"

They in fact meant that they wanted some biscuits.

Some children Kanner saw showed irregularities in the pitch and intonation of their spoken language and some were neologistic; i.e., not using words and phrases in their usual meaning. These idiosyncratic words or phrases were often associated with a past incident. For example, another young man known to me will still call birthday cards "jelly" because as a child he made an association between birthday cards and party food.

Children with some language comprehension, were over literal in their interpretations and failed to understand the underlying meaning of utterances. For example, a young woman with autism known to me becomes very distressed whenever she is told that she is going swimming. Until someone says to her "You are going swimming and you are coming back".

5. Good cognitive potentialities: Despite having severe learning disabilities, Kanner believed that the children had islets of superior ability. He believed they could utilise their excellent rote memories in a practical and applied way, if only they would, instead of memorising isolated and essentially meaningless pieces of information; e.g., bus timetables, weather forecasts. Kanner believed the children were being uncooperative rather than being unable to use their abilities.

In his first paper on autism, Kanner wrote about additional features which included:

Odd responses to sensory stimuli: These children may show oversensitivity and become disturbed when exposed to crowd noises, vacuum cleaners, flashing or bright lights, etc. They may additionally show incredible tolerance to what the rest of us would consider severe pain. Some children may also show strong preferences for certain kinds of clothing materials, especially for items worn nearest the skin.

Destructiveness, aggression and outbursts: Frustration often related to their compulsion to maintain sameness, or frustration from their desperation to be understood, probably lead these children to destroy objects and injure themselves and others.

Unusual eating habits and problems with feeding: Kanner noticed that some children with autism were extremely selective about what they ate. While others ate almost anything and everything, including non-edible items.

Highly intelligent families: Kanner stated that the parents of the children he looked at were highly intellectual. This was probably due to an unrepresentative sample from referral bias. However other researchers have recently looked to see if an extension of the autistic phenotype exists in the families of individuals with autism. Bailey et al. (1995) stated that, in several studies, the first-degree relatives of individuals with autism, had an elevated rate of cognitive and social abnormalities. Baron-Cohen and

Hammer (in press) found that the parents of children with autism did better than controls on tests which individuals with autism are usually good at; e.g., visuo-spatial tasks such as the embedded figures and block design tests.

### **1.3 What causes autism?**

There does not seem to be one single cause of autism, though there are a number of risk factors associated with the disorder. There is strong evidence, from twin and family studies, suggesting that genetics plays a role in determining who is autistic. Exactly what the mechanism of inheritance is remains unknown.

Twin studies show that monozygotic (identical) twins have a higher concordance rate for autism than dizygotic (fraternal) twins, 36% and 0% respectively (Folstein and Rutter, 1977). The rate rises to 82% and 10% when the phenotype was extended to look at concordance rates for autistic symptoms (Bailey et al., 1995). According to Bailey et al. (1995), the difference in concordance rates between MZ and DZ twins suggests that autism is a complex genetic trait which involves more than one genetic locus.

Folstein and Rutter (1979) state that siblings of an individual with autism are at greater risk of the syndrome than the general population. Nevertheless only 2-3% of the siblings actually exhibited autism in their study and only 3% in Bolten et al.'s (1994) family history study.

In Bolten et al.'s (1994) study this figure rose to 6% of siblings, when the phenotype was extended to include more broadly defined pervasive developmental disorders (PDD) and Asperger's syndrome.

(Davison and Neale (1994) state that in part to clarify the distinction between autism and Schizophrenia DSM III introduced, and DSM IV retained, the term Pervasive Developmental Disorders. In DSM IV, autism is one of several PDD; the others being Rett's disorder, Child Disintegrative disorder and Asperger's syndrome).

The figure rose to 20% of siblings when their broadest definition of *lesser variant* autism (e.g. reading difficulties that just occurred in childhood, or social impairments that first emerged in adolescence/adult life) was included. In contrast 0%, 0% and 3% exhibited autism, PDD/Asperger's syndrome, or *lesser variant* autism respectively in the control group (siblings of individuals with Down's syndrome).

#### **1.4 How common is Autism?**

The recorded incidence of autism depends heavily on how it is defined and diagnosed (Happé, 1994). Autism is a relatively rare disorder with epidemiological studies suggesting a prevalence of between 2 and 10 per 10 000 births. These studies also show a higher ratio of males to females, with approximately 5 boys to every 2 girl; this ratio increases to as high as 15:1 (Newson, Dawson and Everard, 1984) as one moves along the autistic spectrum to include the more able individuals.



Skuse et al. (1997) looked at girls with Turner's syndrome and uses evidence from his study to suggest an account of why males are more vulnerable to developmental disorders, such as autism.

Turner's syndrome is a genetic disorder which affects girls only. It is a disorder which results from part or all of one X chromosome being deleted. (All 'normal' females have two X chromosomes, one inherited from each parent). About 70% of females with Turner's syndrome inherit their single X from their mother; the remaining 30% inherit it from their father.

Skuse et al. (1997) found evidence that these two groups with Turner's syndrome differ in their social behaviour. The ones who inherited their X chromosome from their mother had significantly more social difficulties than those who inherited their X chromosome from their father. This suggests that social ability is located on the father's X chromosome.

All 'normal' girls inherit one X chromosome from their mother and another from their father. Whereas all 'normal' males have an X and a Y chromosome, but crucially they inherit one X chromosome and this can only be inherited from their mother. Therefore, Skuse et al. (1997) argue, boys are at greater risk of socially debilitating genetic disorders and this is perhaps why there is higher ratio of males to females who are diagnosed as autistic.

## **1.5 Does Autism really exist?**

Unlike Down's syndrome, William's syndrome or Turner's syndrome which are all diagnosed at a biological or genetic level, autism is defined at the behavioural level; to date there are no genetic markers, or brain structure abnormalities that have been identified as the cause or site of autism. There is, however, evidence of a strong genetic component in autism (see section 1.4).

A true syndrome must be composed of a constellation of co-existing symptoms that do not occur by chance. The difficulty with diagnosing at a behavioural level is that behaviours may come together purely by chance.

Wing and Gould (1979) undertook a comprehensive study to see if behavioural features of autism appear as a systematic pattern of symptoms which occur together. Their epidemiological study found that children with autism had deficits in i) *socialisation*, ii) *communication* and iii) *imagination* and that these problems had a tendency to occur together. These are the triad of impairments and are the core parts of the diagnostic criteria for autism in DSM III-R (The Diagnostic and Statistical Manual of the American Psychiatric Association).

Since autism is a developmental disorder, Wing's triad of impairments may express themselves in different ways at different points along the individual's development.

i. Wing and Gould (1979) defined problems in socialization as an inability to engage in two-way interactions. They described three types of behaviour which capture this quality of social impairment: aloof, passive or odd. A toddler with autism might show aloofness by rejecting affectionate physical contact with others. The child might be passive by unquestioningly doing whatever s/he is told, even if it gets them into trouble. Walking up to a perfect stranger and showing them a series of photographs, as a social introduction, is an example of odd behaviour.

ii. Problems of communication might be shown in the same individual, at different times, too. For example, as a three year old the child may not produce any spoken language but as a teenager they may talk incessantly about one topic; e.g., the years in which certain pop songs charted.

iii. A child with autism might show an underlying impairment in imagination by lining up toy cars rather than pretending to drive them and involve them in crashes with appropriate sound effects. A teenager with autism might show no interest in fiction, in films, in novels or in TV dramas, preferring to read road maps or bus timetables.

That is why, when making a diagnosis, clinicians usually chart the individual's developmental history because a 'snapshot' of that individual might not show impairments of socialization, communication and imagination.

## **1.6 Autistic Continuum or Spectrum**

Since autism is a developmental disorder, the clinical picture of an individual varies according to which stage of their development is looked at, in combination with their age and their intellectual ability. Wing (1988) introduced the concept of an autistic continuum, capturing the idea of a range of problems from highly able individuals who have only the slightest social impairments to those who have multiple problems of which social impairments are only one. The continuum overlaps with learning disabilities (Shea and Mesibov, 1985) and shades into normality.

## **1.7 Asperger's (or Asperger) syndrome**

Asperger or Asperger's syndrome is a diagnostic label given to individuals with autism who are at the higher functioning end of the autistic spectrum. Asperger himself did not lay down specific criteria for diagnosis of his syndrome. Rather it was Lorna Wing (1981) who first used the term Asperger's syndrome to describe the very able individuals who did not fit Kanner's description of a socially passive, aloof, silent person with autism. Individuals with Asperger's syndrome are now thought to be a sub group of people lying along the autistic continuum.

Wing (1991) states there is a debate about whether people with Asperger's syndrome are different or the same as higher-functioning individuals with autism, whether sub groups of autism truly exist and what theoretical use any distinction provides.

Schopler (1985) argued that "until an empirically based distinction from higher-level autism can be demonstrated (p. 359)", the term Asperger's syndrome should not be used. However, Wing (1991) stated that there is a lot to be said for equating high-functioning Kanner's autism and Asperger's syndrome and Happé (1994) suggested that the Asperger's syndrome label has been of clinical if not theoretical value.

Studies trying to discriminate between individuals with Asperger's syndrome and high-functioning autism have provided mixed results. Volkmar, Paul and Cohen (1985) argue that practical distinction between children with Asperger's syndrome and high-functioning children with autism is problematic. Whereas Ozonoff et al. (1991b) found that individuals with a diagnosis of higher-functioning autism performed poorly on Theory of Mind tasks and verbal memory compared with individuals with Asperger's syndrome and so argued for a distinction between the two labels.

According to Wing (1991) the Asperger's syndrome label is a signpost to service provision and help for families whose autistic child is of normal intelligence but whose condition has remained undiagnosed until adolescence or adulthood.

Additionally, the label has facilitated thinking about a clinical population for whom there has not been much service provision until recently and has facilitated thinking about autism as a disorder which persists into adulthood.

## **1.8 Is Asperger's syndrome a mild form of Autism?**

Asperger's syndrome is thought of as a mild form of autism because the individual has autism, but without a severe associated learning disability.

This may be misleading if 'mild' implies 'less of a problem'. According to Wing (1991), individuals with Asperger's syndrome are susceptible to mental illness. The very fact that individuals with Asperger's syndrome shade so closely into 'normality' is often the very source of their problems and they can suffer mental illness or maladjustment as a consequence.

Individuals with Asperger's syndrome may feel that they are 'different' from others and feel they just cannot comprehend, never mind engage in, the subtleties of relationships. Temple Grandin, an American academic with Asperger's syndrome, has spoken and written about her experiences. She states in Sachs (1995) that she had never dated anyone, finding "such interactions completely baffling and too complex to deal with" because "she was never sure what was being said, or implied, or asked, or expected" (p. 272). Such feelings of social separation and isolation may be the starting point for mental illness.

Furthermore, individuals with Asperger's syndrome have a disability that is essentially 'hidden'. If someone uses a wheel chair then it is fairly obvious that they have a disability and probably unable to do some things. Hence, the general public and services providers are accommodating, tolerant and make allowances for them. However, if one looks 'normal' and mostly acts 'normal', then 'unusual' behaviours

may be completely misinterpreted and possibly be perceived as psychotic or threatening. An individual with Asperger's syndrome may find their well intended actions entirely misinterpreted.

### **1.9 How common is Asperger's syndrome?**

Interestingly the ratio of male to females increases when the higher functioning end (Asperger's syndrome end) of the autistic spectrum is looked at; the ratio ranging from 5:1 (Lord, Schopler and Revicki 1984) to as high as 15:1 (Newson et al., 1984). A number of ideas have been put forward why there is a general difference in male to female ratio with autism (see section 1.4) and why this difference increases when higher functioning populations are looked at.

Different aetiologies in autism provide a possible reason for the increase in the ratio of males to females as we progress towards the higher end of the autistic continuum. At the lower end of the continuum, autism may result from general brain injury or abnormality (e.g., foetal brain haemorrhaging). However, at the higher end of the continuum autism may be a more specific disorder resulting from the inactivation of the genes for social understanding.

Therefore any general brain damage resulting in autism, has a more-or-less equal chance to occur in boys or girls. However, a more specific genetic cause of autism, without a corresponding learning disability, is more likely to occur in males and that may be why the ratio of boys to girls increases as we move towards the higher

functioning end of the autistic continuum.

## **1.10 Summary**

Autism is currently considered a neurodevelopmental disorder with a large genetic component. There are many contemporary theories of autism elucidating the diverse range of cognitive, motor and sensory deficits which are seen across the autistic spectrum. The theories I detail in the next chapter not only describe autism, but seek to explain why such a diverse and seemingly disparate range characteristics are seen in this enigmatic condition.



## Chapter 2

### The “Theory of Mind” hypothesis of Autism

“I do not object to people looking at their watches when I am speaking. But I strongly object when they start shaking them to make certain they are still going.”

(Lord William Norman Birkett)

#### 2.1 Understanding other minds.

Imagine a world where it was possible to read other people’s thoughts as if they were prose from a novel. What kind of world would it be? There would be no more secrets, no more lies and no more surprise birthday parties either. Would it be worth even talking to each other, if we knew what people were thinking?

Of course we cannot literally read each other’s minds, but what we can do is sometimes infer other people’s mental states from their behaviour and from their informational history.

The first researchers to scientifically investigate the understanding of other minds were Premack and Woodruff (1978). In their seminal study, they looked to see if a chimpanzee, Sarah, was sensitive to the mental state of a man in a video, struggling with a variety of problems. Premack and Woodruff (1978) coined the term “theory of mind” which they described as the ability to impute mental states to oneself and to

others, and it was their work which sparked a whole wave of research into the understanding of other minds in apes, children and individuals with autism.

Theory of mind is perhaps a misleading term because it is not the same as a scientific theory. Rather, having a theory of mind provides the individual with the ability to predict mental states from external events. This ability is also known as mentalizing or mindreading.

The following case illustrates what happens when someone is impaired in reading minds.

M. is a young adult with Asperger's syndrome who lives in residential care. He was in mainstream education until fourteen years old, but found it increasingly difficult to cope. He was diagnosed with autism at the relatively late age of sixteen and was given the specific label Asperger's syndrome.

One of M.'s behaviours is to try and get carers into trouble by breaking objects and blaming it on the carer who is with him. Curiously, M. still destroys things while a second carer is in the same room and yet continues to blame it on the first carer. It is as if M. does not realise that seeing leads to knowing and that the second carer is an independent witness to the event.

From the above example, one consequence of M.'s mindblindness is that he cannot effectively deceive others. His difficulties extend to not thanking people for birthday and Christmas presents and staring at anyone who has just hurt themselves.

On one level it looks as though M. is just an ungrateful and tactless person. However, if M. suffers from mindblindness then his behaviours can be interpreted very differently. That is he may not be able to mentalize, and therefore not realise how disgruntled the present giver might feel at not being thanked, or how embarrassed the injured person might feel when stared at.

The theory of mind hypothesis of autism explains deficits in communication, imagination and socialisation as an underlying cognitive problem. The theory of mind hypothesis of autism states that Wing's triad of impairments (see Chapter 1.5) are secondary to the failure to develop a theory of mind and not primary deficits (Klin et al., 1992).

M.'s story is an example of mindreading in everyday life, but how do we test for mindblindness in a scientific and controlled way?

## **2.2 The false belief paradigm.**

The underlying cognitive problem with individuals with autism could be identified in its most specific form as a failure to grasp the substantive quality of a simple factual belief. But how do you test someone's belief? One difficulty in testing beliefs is that beliefs and reality are usually congruent with one another. For example, if you believe that your car is parked outside your house and you look out of a front window, then you fully expect to see your car. Even when you are not looking at your car, you still believe that it is there.

A car thief might steal your vehicle as you watch television, but your belief remains that it is parked outside. In this case you have a false belief about the location of your car, where reality and your mental state become incongruous with one another.

## **2.3 Metarepresentation and understanding mental states: the role of pretence.**

Imagine that a four year old picks up a banana and starts to use it like a telephone. The child passes the banana to his/her mother and says, "It's for you mummy". Both the child and the parent are aware that in reality the banana is a fruit, but that in those moments it represents a telephone and there is no confusion about the banana's identities.

Leslie (1991) argues for a distinction between *primary representations* (in the above example, a banana) and *metarepresentations* (in the above case, a telephone).

Primary representations store literal information about the real world. Whereas, metarepresentations allow for the construction of hypothetical events, such as descriptions of thoughts, dreams and pretend objects.

Leslie (1991) argues that in the banana telephone example there is *decoupled* representation because the primary representation is copied and the normal links to the outside world are suspended, i.e., the banana is no longer a fruit because it has become a telecommunications device.

An example of a primary representation is that *Mum has a banana*. While a metarepresentation derived from this (i.e., a decoupled copy of it), might have the form *Mum pretends (or believes) the banana to be a telephone*.

Leslie (1991) postulates a computational-cognitive view of why individuals with autism fail to attribute mental states to others. Leslie (1991) states that in autism there is damage to the capacity for metarepresentation because the decoupling device does not function. Leslie (1991) argues that this is the fundamental reason why individuals with autism cannot engage in pretend play and have deficits with other metarepresentational concepts like beliefs, desires etc.

## **2.4 The Unexpected transfer task.**

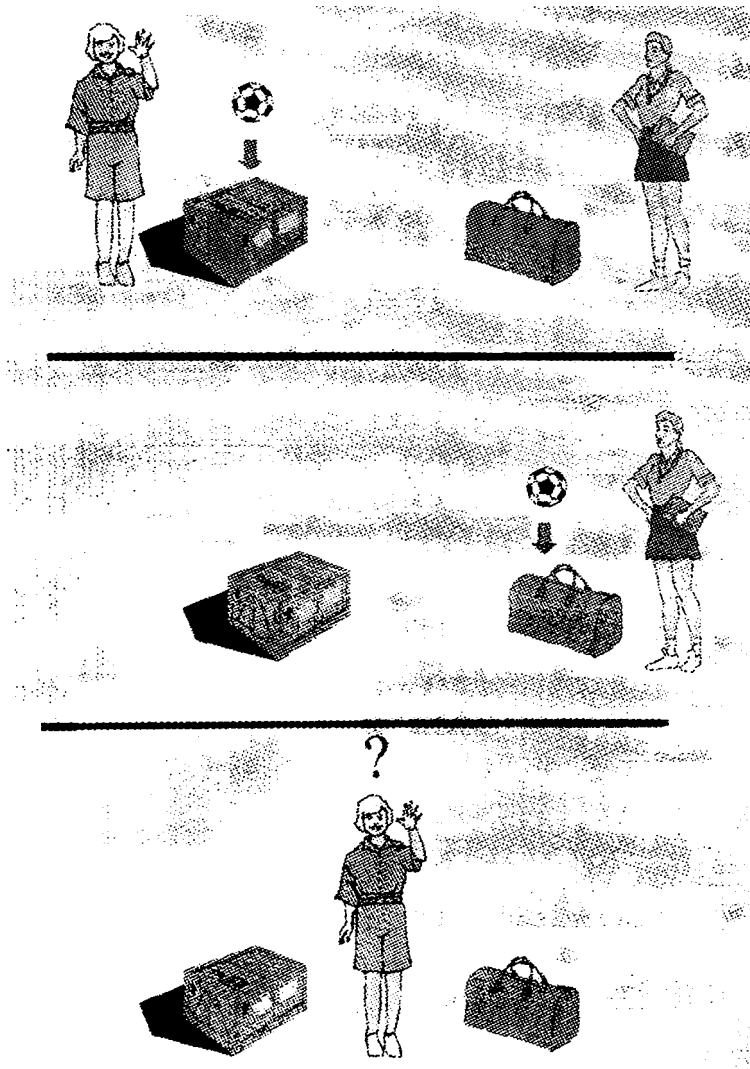
At about the age of four, typically developing children show an ability to infer the representational states of themselves and others. Children can display this ability by passing a number of theory of mind tasks; e.g., a false belief task. The unexpected transfer task was originally devised by Wimmer and Perner (1983). Baron-Cohen, Leslie and Frith (1985) used Wimmer and Perner's design in their 'Sally-Anne' experiment in which they tested children with autism and children with Down's syndrome, as well as typically developing children.

Two dolls were used, Sally and Anne, to act out the scenario (see Figure 1, p.23, by kind permission of Peter Mitchell. Taken from lecture notes). Sally has a box and Anne has a bag. Sally has a ball which she puts into her box. Sally then goes out. Anne then takes out Sally's ball and puts it into her bag while Sally is away. Then Sally comes back and wants her ball. The test question is asked, "Where will Sally look for her ball?"

The correct answer is of course "the box". This answer is correct because Anne has taken out the ball unbeknownst to Sally (who has not seen the transfer) and Sally still believes that the ball is where it was last. It was argued that to answer the test question correctly, participants need to represent Sally's mental state in their own minds by making a representation of a representation (or metarepresentation). The crucial point is that someone's knowledge depends on their own informational access. In this example seeing leads to knowing; without having seen the transfer, in this

experiment. Sally is unlikely to know the new location of the ball. Sally could have been told about the new location, but that would require informational access of a different kind.

Figure 1.



Baron-Cohen et al. (1985) ingenuously asked children a location-based test question, i.e., "Where will Sally look for her ball?". Therefore, children's beliefs were tested without them having to understand any mentalistic vocabulary. For instance, the kind of understanding that would be required to answer a test question like, "Where do you believe Sally will look for her ball?".

Furthermore, Wimmer and Perner (1983) found that children who failed the false belief task did not fail due to poor recollection/memory of the sequence of events in the unexpected transfer task. Wimmer and Perner (1983) found a developmental trend showing that typically developing children between the ages of 4 and 6 years passed the false belief task, but younger children failed. Nevertheless, the children who failed to answer the test question correctly still managed to answer the memory test question correctly, i.e., "Where did Anne put the ball?".

In their experiment, Baron-Cohen et al. (1985) discovered that the children with autism, who had a relatively high verbal mental age (as measure by the British Picture Vocabulary Scale, or BPVS), performed poorly when compared to verbal age matched typically developing children and verbal aged matched children with Down's syndrome.

Baron-Cohen et al. (1985) found that the vast majority of the children with autism (16 out of 20) incorrectly judged that Sally would look for the ball in its new location (the bag). It was as if the children with autism did not take into account Sally's belief



which, although false, arose from her state of ignorance.

Baron-Cohen et al.'s (1985) verbal mental age controls cleverly ruled out i). immaturity in verbal intelligence and ii). any language comprehension deficit as competing explanations for the autistic children's failure. Furthermore, the inclusion of the Down's syndrome control group suggests that having a learning disability per se can not explain failure on the task.

DeGelder (1987) criticised Baron-Cohen et al.'s (1985) study on different grounds. DeGelder (1987) stated that children with autism are known to have deficits in their pretend play and their imagination and that the unexpected transfer task relies too heavily on the children's ability to make-believe. DeGelder (1987) argued that children with autism might view the dolls as inanimate and not capable of having beliefs etc. Therefore, the children might resort to a default test question interpretation and ask themselves where they themselves would look for the ball, i.e., the ball's current location.

Though another experiment helped refute DeGelder's criticism, by utilising the deceptive box procedure.

## **2.5 The deceptive box paradigm**

Perner, Frith, Leslie and Leekam (1989) investigated autistic children's understanding of their own and another person's mental state using the deceptive box paradigm.

First devised by Perner, Leekam and Wimmer (1987), children are presented with a Smarties tube and asked what they think is inside. (Smarties are small, many coloured, oval-shaped, well-known European confectioneries. A US equivalent is M&Ms. Smarties are packaged in a distinctive tube which displays its contents on the outside). After replying "sweets", the experimenter reveals that the box actually contains a pencil which is then put back in the tube. Finally children are asked to say what another person who had never seen the tube before would think was inside.

Perner et al. (1987) found that typically developing 4 year old children correctly judged that another person would think it contained Smarties. Younger children failed to acknowledge another person's false belief and responded with the realist answer of pencils.

When this experiment was repeated with children with autism, Perner et al. (1989) found that only 4 out of 24 correctly answered the test question.

Perner et al.'s (1989) results confirmed and strengthened Baron-Cohen, Leslie and Frith's (1985) findings. Their results supported the idea that children with autism have a deficient theory of mind, resulting in mindblindness and that this could not be attributed to problems of make-believe as DeGelder (1987) had argued.

## **2.6 But what about the talented minority?**

There is, however, another problem with the theory of mind hypothesis of autism and that is a small but nevertheless significant number of children with autism regularly pass tests of false belief. These data seem anomalous if autism entails a lack of understanding that minds contain beliefs. There are three possible ways of explaining this finding.

- i). One extreme position is to say that the children who passed the tasks are wrongly diagnosed and are not in fact autistic. This seems very unlikely, but nevertheless is a possibility.
- ii). The diametrically opposed position is that the theory of mind hypothesis is incorrect because it simply cannot account for the children who pass the task and yet are autistic.
- iii). In between the two extremes, it could be argued that the theory of mind hypothesis may explain some of the cognitive impairments seen in individuals with autism but does not fully explain the disorder.

## **2.7 Second-order belief attribution**

Baron-Cohen (1989) attempted to salvage the theory of mind hypothesis of autism by suggesting that although some children with autism could pass first- order theory of mind tasks (showing an ability to think about another person's thoughts about an objective event), they could not pass second-order theory of mind tasks (showing an

ability to think about another person's thoughts about a third person's thoughts about an objective event).

Baron-Cohen suggested that autism was a delay in the development of a metarepresentational capacity rather than a substantive deficit. He argued that the 80% of children with autism who failed the Sally-Anne task were delayed in their first-order belief attribution unlike the 20% who passed.

Baron-Cohen set out to support his hypothesis by again using a paradigm first developed by Perner and Wimmer (1985). The scenario was once more enacted using two toys, John and Mary, who lived in a toy village which contained two houses, a church and a park. The story consisted of four episodes:

- Episode1. Mary and John saw the ice cream van in the park.
- Episode2. John went home to get some money and meantime Mary saw the ice-cream van move to the church.
- Episode3. John unexpectedly sees the ice-cream van at the church, so his belief about the van's location remains true.
- Episode 4. Mary sets out to look for John whom she is told, has gone for an ice-cream.

The participants were 10 typically developing children, 10 children with Down's syndrome and 10 children with autism who were all matched for verbal mental age.

They were all asked the test question:

" Where does Mary think John has gone to buy his ice-cream? "

The correct answer is "the park" because in the second order belief attribution task, participants have to make a judgement about Mary's belief about John's belief's; i.e., judgements about one person's false belief about another person's true belief.

Baron-Cohen (1989) found that 90% of the typically developing children (mean calendar age 7.5) passed the belief question; 60% of the children with Down's syndrome (mean verbal mental age 7.5) passed the belief question and none of the children with autism (mean verbal mental age 12.2) passed the belief question.

From these results Baron-Cohen concluded that although some individuals with autism may have the means of passing a first-order theory of mind task, they could not pass a second-order theory of mind task and therefore did not have a fully representational theory of mind.

Significantly, however, Bowler (1992) showed that 73 % of young adults with Asperger's syndrome were able to pass second-order belief attribution tasks, again using Perner and Wimmer's (1985) John/Mary design. Therefore, these individuals, who showed an autistic profile yet could pass both first- and second- order theory of mind tasks, posed another serious problem for the theory of mind hypothesis of autism.

## **2.8 The Eyes Task**

In order to keep the theory of mind hypothesis of autism alive, Baron-Cohen, Jolliffe, Mortimore and Robertson (1997) developed an "Advanced test of Theory of Mind" which they called "Reading the Mind in the eyes task" or "Eyes Task" for short. They argued that first- and second-order theory of mind tasks produce ceiling effects when the child has a mental age of between 6 and 7 and therefore such tasks were inappropriate for testing theory of mind in adults with Asperger's syndrome.

This time the experimenters moved away from tasks involving belief attribution. Instead, Baron-Cohen et al. (1997) showed participants photographs of the eye region of people's faces (from midway along the nose to just above the eyebrow). Before the main study, Baron-Cohen et al. (1997) asked normal adult judges to generate words to describe the mental states of the people in the photographs just from their eyes. The experimenters found that blind raters unanimously agreed with one another about the words selected by the judges. Baron-Cohen et al. (1997) then asked an adult group with high-functioning autism and Asperger's syndrome, an adult group with Tourettes's syndrome and a normal adult group if they could infer the mental states of the people from their eye region photographs.

Baron-Cohen and Jolliffe (1997) found that the autistic group were significantly impaired on the eyes task when compared with the control groups. Note that the adults with autism did not fail the task, but performed significantly less well in comparison to the control groups.

In the control Emotion Task, all the participants had to judge photographs of whole faces displaying basic emotions (happy, sad, angry, afraid, disgusted, and surprised). They performed at ceiling and so the experimenters ruled out any deficits in basic emotional expression understanding, as an explanation for deficits on the Eyes Task.

Baron-Cohen et al. (1997) argue that the Eyes task provides a pure test of theory of mind (requiring no executive function (see sections 2.10 and 2.11) component and no central coherence component (see section 2.13a). Consequently, Baron-Cohen et al. (1997) have moved the theory of mind hypothesis of autism a long way from the conceptual neatness that autism, on a cognitive level, amounts to a failure on theory of mind tasks. Hence, in trying to equate the Eyes Task to Theory of Mind tasks, Baron-Cohen et al. (1997) risk moving away from the precision offered by tasks like Sally-Anne.

## **2.9 How else could you pass a theory of mind task?**

Frith, Happé and Siddons (1994) suggested that autistic passers of both first- and second-order theory of mind tasks may have used non-theory of mind and non-mentalistic methods to solve the tasks; e.g. "hacking". By hacking, I understand Frith et al. (1994) to mean a logical method of processing the stories and coming out with the correct answer. Supposedly, the autistic passers do not infer the mental states of the protagonists in a false belief story. Instead they use this method of hacking to achieve the correct answer.

However, Perner and his colleagues' paradigms were well conceived and controlled, and in their view passing tasks could only be done if someone could understand mental states. Therefore, there is no reason to think that a correct answer can be hacked out. If it were true that someone could hack out a correct answer, then passing or failing a false belief task would not necessarily tell us anything about the mentalizing ability of the individual. Therefore purporting that a test of false belief would not be a good operationalization of a representation of theory of mind. In consequence, failing to acknowledge false belief would not be informative about the status of an individual's theory of mind.

Hence, the core phenomenon supporting the theory of mind hypothesis of autism would be undermined; failing to acknowledge false belief would not necessarily imply lack of theory of mind, given that a test of false belief would have dubious credentials as an operationalization of theory of mind.

### **2.10 Executive dysfunction hypothesis of autism**

There are other symptoms of autism which are not so easily explained by the theory of mind account. For example, consider the autistic individual's need for sameness, their difficulty in switching attention, a tendency to perseverate and a lack of impulse control. These symptoms are similar to those shown by individuals with frontal lobe lesions in executive dysfunction syndrome.



Denkla (1996a) lists four elements of executive function: initiating, sustaining, shifting and inhibition/stopping. Denkla (1996b) suggests that executive function may be considered as metacognitive, but that it ought to remain close to its clinical neurology roots of motor praxis or 'execution' in for example motor sequencing tasks (Denkla, 1996b). Ozonoff et al. (1991a) provide a more extensive definition:

"Executive function is defined as the ability to maintain an appropriate problem-solving set for attainment of a future goal; it includes behaviors such as planning, impulse control, inhibition of prepotent but irrelevant responses, set maintenance, organized search, and flexibility of thought and action." (p. 1083).

### **2.11 Neuropsychological tests of Executive function**

There are a number of tests of executive function and The Wisconsin Card Sorting Test is a widely used measure that assesses an aspect of inhibitory control (Baddeley, 1990). In this task, four cards are placed in front of the participant. They vary across three dimensions: colour, geometrical shape and number (e.g., a card may have two blue stars). The participants are asked to match a deck of similar cards to the target cards, but are not informed explicitly of the rules for sorting. Feedback regarding each attempted match is given. The initial unstated sorting rule is by colour and after ten consecutive correct responses the rule is changed, but without informing the participant.

For accurate performance a recently learned response rule, has to be inhibited.

Individuals with autism show similarities with those who have frontal lobe damage because they tend to persevere sorting the cards using the previous rule, even when told their responses are incorrect.

Ozonoff et al. (1991a) gave individuals with Asperger's syndrome and High-functioning autism several tests of emotion perception, theory of mind and executive function (including the Wisconsin Card Sorting Test). They found that in much the same way as individuals with frontal lobe damage, the high functioning autistic participants showed selective deficits in executive function.

The experimenters also found that the tests of executive function more accurately detected autism than either the emotion perception or the theory of mind tests.

## **2.12 How might executive function deficits be related to deficit in theory of mind? The Windows Task**

Russell, Mauthner, Sharpe and Tidswell (1991) devised the 'windows task' in which participants were presented with two boxes. One contained a chocolate treat and the other was empty, but in order to win the treat, participants had to point to the empty box. Russell et al. (1991) found that children with autism and typically developing 3 year olds behaved in much the same way, i.e. they seemed unable to resist pointing to the box that contained the treat, so the other player won the treat by default. In contrast, typically developing 4 and 5 year olds were able to resist the urge to respond impulsively and so were able to point to the empty box and win the chocolate.

The windows task cleverly links executive function with theory of mind based tasks because the participants must i). curb the impulse (executive control) to point directly at what they want and ii). be deceptive because the other player acts on the participant's gesture (if the other player does not find the chocolate, it remains in the other location for the participant to collect)

Russell et al. (1991) argue children with autism fail the unexpected transfer task not because that they fail to take into account Sally's mental state, but rather they act impulsively about the location of the ball.

## **2.13 Other theories of autism**

### **2.13a Central Coherence Theory**

Mottron, Burack, Strauder and Robaey (1999) state that in addition to Wing's triad of impairments of socialisation, communication and imagination, there are other "nontriadic" signs. That is, there are other characteristics of autism including tasks which individuals with autism are better at than typically developing people.

Frith and Shah (1983) found that children with autism scored above average on the Children's Embedded Figures Test, for their own mental age, and were better than chronologically and mental age matched typically developing children. In this test, participants were asked to locate a small target shape in a drawing of a larger everyday shape made up of confusing lines (e.g., finding a triangle shape in a picture of a pram). When looking at the figures it seems as if the larger shapes created by the criss-crossing lines are so compelling that the small embedded shape is simply not seen.

Frith and Shah (1993) also found that participants with autism were faster at reproducing 40 different block designs than learning disabled and normal controls. The Block Design is a subtest of the Wechsler Intelligence Scales and the participant is asked to assemble an identical image of a 2-D picture, as fast as possible, using painted cubic (3-D) blocks of red and white.

The key features of both the Embedded figures test and the Block Design Test is that a large geometrical shape has to be broken down or segmented into smaller shapes.

Frith (1989) argues that individuals with autism show better performance on these task because they have a cognitive style allowing them to attend to local rather than global details, i.e., they have weak central coherence.

Another source of evidence for this theory comes from idiosyncratic peaks in visuospatial and perceptual functioning, e.g. Happé (1996) found that participants with autism were less likely to succumb to two-dimensional visual illusions than were other groups. Happé (1996) argued that geometrical (e.g. Müller-Lyer) visual illusions 'work' because people typically see the entire picture as a global whole and that individuals with autism are better at processing local rather than global information and therefore they are less likely to 'fall' for those types of illusions.

However, there is a growing body of counter evidence for the above semantic deficit hypothesis. Brian and Bryson (1996) found that there was no significant difference in response times or accuracy between high function individuals with autism and developmentally matched controls in reaction times to meaningful (e.g., birthday cake), abstract and fragmented disembedded stimuli. Brian and Bryson (1996) also found that both the autistic and normal groups had more difficulty (as shown by slower reaction times) in finding a simple shape in a meaningful rather than non-meaningful drawing. Brian and Bryson (1996) argue that Shah and Frith's (1983, 1993) findings may have been due to developmental differences rather than

differences in cognitive styles between the normal and autistic populations.

Furthermore, Ropar and Mitchell (in press) discovered, in contrast to Happé (1996), that participants with autism were just as susceptible to two-dimensional visual illusions as controls. Ropar and Mitchell (in press) presented a variety of visual illusions to individuals with autism on a computer screen, and asked them to use computer keys to adjust stimuli to match target shapes. The experimenters concluded that individuals with autism were susceptible to visual illusions because when adjusting lines or circles, the participants systematically underestimated the stimuli's size in comparison to the control condition.

### **2.13b Socio-Affective theory**

Hobson (1990) argues that individuals with autism have specific impairments in understanding others as people with their own feelings. The theory of mind hypothesis of autism posits that the ability to understand other's emotions is secondary to a failure to develop a theory of mind. In contrast, Hobson's (1990) argument revolves back to Kanner's original clinical observation by postulating that the ability to form emotional contact with people is innate and it is this incapacity in individuals with autism which is the source of their social debilitation. Hobson (1990) states that there are specific forms of communication between a young child and adult which provide the necessary psychological basis for understanding minds. Brown, Lee and Hobson (1997) state that these forms of communication involve 1). patterned intercoordination of feeling between the child and others, 2). an ability to see or

otherwise apprehend the directedness of other people's attitudes towards a shared world, and 3). a propensity to identify with these outwardly focused attitudes of others, and to recognise the distinction between others' attitudes and one's own.

#### **2.14d Summary**

In conclusion, the theory of mind hypothesis of autism and the executive dysfunction account of autism are not the only theories which try to explain the disorder. (Nor are the two theories necessarily competing against each other; i.e., Perner (1997) and Russell (1996) have both suggested that theory of mind and executive function are linked).

Each and every theory about autism seems to be able to explain certain aspects of the disorder, but as yet there is no fully integrated account which manages to both describe and explain all the different characteristics of the disorder; tracing it from infancy through to adulthood and encompassing both individuals with severe learning disabilities and those who are higher functioning.

## **Chapter 3**

### **How can we help individuals with Autism acquire interpersonal understanding?**

" Education is an admirable thing, but it is as well to remember from time to time that nothing that is worth knowing can be taught ".

(Oscar Wilde)

#### **3.1 What help is available for individuals with Asperger's syndrome?**

With all the cumulative knowledge present in the literature about autism and especially its associated cognitive impairments, can anything be done to help in a practical way?

In a review of treatments for autism, Howlin (1998) states that there is a paucity of service provision for individuals with Asperger's syndrome because their needs are poorly understood. Howlin (1998) argues that because of their uneven profile of skills and deficits, these individuals may need even more specialised help than those with more global learning disabilities.

As stated previously, individuals with Asperger's syndrome have relatively high cognitive ability, yet show real problems in understanding the subtleties of social



interaction and display mindblindness in their everyday lives.

It would, therefore, be invaluable if there was a way of making these individuals understand how other people think or feel, or why people respond in the way they do. For example, perhaps M. (see chapter 2.1) could learn that laughing at someone who injures themselves is considered a socially unacceptable thing to do. Is there is way of making these individuals into mindreaders?

### **3.2 Can rules for understanding the mental states for others be taught?**

For the same reason that the diagnostic criteria of autism cannot be separated from theory, the approach selected for any intervention depends upon the theoretical viewpoint. Consequently, if Wing's triad of impairments arises from a theory of mind deficit then it follows that if individuals with autism could be provided with a means to understand others' mental states; e.g., via a set of rules, then this would be very beneficial to them. If the intervention succeeded, it would also provide evidence to support the theory of mind hypothesis of autism.

Swettenham (1995) and Hadwin, Baron-Cohen, Howlin and Hill (1996, 1997) tried to teach rules to children with autism, for working out the underlying mental states of others. Hadwin et al. (1996) specifically set out to answer the question,

" Can we teach children with autism to understand emotions, belief, or pretence? "

To do this Hadwin et al. (1996, 1997) assigned thirty autistic children to one of three equal-sized groups: a belief group, an emotion group and a pretence group. The

experimenters pretested the children and categorised them into one of five levels. Level 1 was the simplest level of understanding and Level 5 the most complex. Assessment of belief and emotion understanding started at Level 1 and progressed to Level 5. The assessment stopped when children failed two consecutive levels. At each level, children had to demonstrate an understanding of the concept being tested by passing four tasks in succession.

To assess pretence, children were observed at play and their activities were also categorized into one of 5 levels, which reflected both the quality and quantity of the children's play. The children were video recorded for 10 minutes playing with a set of toys and this recording was coded to establish the initial level of pretence.

Once the child's level of belief/emotion/pretence had been established, the experimenters then proceeded to train/teach the children with a view to helping them to reach higher levels.

The next page shows the teaching method for level 5, the highest level in the belief group.

*Level 5. False Belief*

Example. Unexpected transfer.

**Let's play a game with Claire.**

**Look Claire has a penny.**

**Here are two purses, a black purse and a red purse.**

**Claire puts her penny into the black purse.**

**Claire is going out to play now.**

**Claire has gone out. She can't see what we are doing.**

**Shall we play a trick on Claire? We'll take the penny out of the black purse and put it in the red purse!**

**Here comes Claire back from the playground.**

*Belief Question.* **Where does Claire think the penny is?**

*justification Question.* **Why does Claire think it is in the [black/red] purse?**

*Check question.* **Where did Claire put the penny?**

*Teaching*

*Belief Question.* *For an incorrect response.*

**Remember, Claire didn't see us hide the penny in the red purse, so Claire doesn't know there is a penny in the red purse. She won't think it is in there.**

**Claire will think the penny is in the black purse, because she put the penny in the black purse.**

Then teach the general principle:

*If people don't know that things have changed then they will think things are just the same.*

Hadwin et al. (1996) found that it was possible to teach the children to pass emotion and belief tasks, and once taught simple tasks they were able to move on to more complex tasks. Additionally, the children passed similar tasks on two month follow up. However, the children in the pretence group showed no significant improvement in their production of spontaneous pretend play.

Furthermore, the children from all three groups did not generalise their taught understanding of mental states in one area, to understanding mental states in untaught areas. For example, children in the emotion group did not show improvements in their understanding of beliefs or in their production of play.

### **3.3 Does teaching rules work?**

Hadwin's approach is questionable because solely teaching someone rules to pass tests may be considered a very crude procedure:

1. The rules may be learned and applied, but without understanding. The experimenters' own impressions were that the children "may have learned to pass the tasks rather than understanding the concepts underlying the rules" (Hadwin et al., 1996, p.359).
2. Learning rules does not necessarily mean that the children will understand and apply what they have been taught in the context of real life situations. Hence the teaching might serve no practical purpose.

In a related study, Hadwin et al. (1997) asked the question "Does teaching theory of mind have an effect on the ability to develop conversation in children with autism?".

Hadwin et al. (1997) studied language acquisition and theory of mind. More specifically the experimenters wanted to see if their method of teaching children with autism, to pass tasks that assess understanding of mental states, had any ameliorating effect on parallel understanding; in this case the children's conversational ability.

Hadwin et al. (1997) looked at two aspects of autistic children's communicative ability. Firstly, their ability to develop and expand on conversation. Secondly the children's frequency of use of mental state terms (e.g., think, believe etc.) in their speech.

The experimenters assessed the children before and after teaching. To assess conversational skills the children were encouraged to read a story from a picture book with their caregiver (usually their mother). There were no written words in the stories just illustrations. Caregivers were asked to prompt children to encourage them to tell the stories; e.g., "What are they doing?" The story telling sessions were video-recorded and transcribed, firstly, according to conversation ability, based on the coding scheme used by Tager-Flusberg and Anderson (1991) and, secondly, by counting the number of mental or internal state terms used by the children.

The experimenters found that the teaching of mental state terms to children with autism had little effect on either of the measured aspects of conversation.

### **3.4 Theory of mind in everyday life**

Even if someone with autism passes theory of mind tasks, does that mean they then are socially able? According to Frith, Happé and Siddons (1994) the answer is 'not necessarily'. They found that although some children with autism could pass first and second order theory of mind tasks, they still lacked interpersonal understanding, as rated by carers using The Vineland Adaptive Behavioural Scales (VABS) and Frith et al.'s (1994) additionally devised items for the VABS. The majority of participants with autism demonstrated "mind-blindness" in the laboratory as well as in everyday life. Then there were those individuals, according to Frith et al. (1994), who learned strategies to pass the theory of mind tests, but still showed no evidence of mentalizing in everyday life. Finally there was a third sub-group of autistic individuals who were able to represent mental states in the lab and in real life: Happé's talented minority.

Frith et al. (1994) screened the expanded and survey forms of the VABS for items which appeared to rely upon the understanding of mental states. Seventy items were compiled and were given to undergraduate students with instructions to categorise items into two sets: items which required the attribution of independent states (a theory of mind) and items which did not. Items which received an inter-rater agreement of greater than 75% were then narrowed down still further to 2 sets (active and interactive sociability) of 16, by five experts in the area of theory of mind (Frith et al, 1994).

Frith et al. (1994) called the sets **Active sociability** and **Interactive sociability**.

Active sociability items refer to behaviours which could be performed without the ability to mentalize and interactive sociability items which refer to behaviours which could not be performed without this ability.

### **3.5 The Bubble Dialogue computer program**

Hadwin et al's (1996, 1997) studies succeeded in teaching children with autism rules for understanding beliefs and emotions, but did not succeed in increasing the children's quality and quantity of pretend play and nor did the children generalise their learning to untaught areas.

Frith et al. (1994) looked at theory of mind in everyday life and found that even some passers of second order theory of mind tasks did not show mentalizing outside the laboratory.

So is there another way of improving the interpersonal understanding of individuals with autism, that does not rely upon rule-based teaching?

Frith (1989) wrote that " In order to develop a theory of mind one needs not only the ability to mentalize, but also experience. One needs experience with people who have different relationships to each other, and different personal interests. " (p.166).

If we could somehow create the experience of role taking, simulate the experience of seeing mentalistic processes in action, then perhaps this could facilitate the understanding of others' minds.

To meet that ideal, this study used a computer program, Bubble Dialogue (Gray, Creighton, McMahon & Cunningham, 1991), to i) improve the interpersonal understanding in high functioning adults with Asperger's syndrome and ii) try and gain further insight into the nature of autistic cognition and deficient theory of mind.

### **3.6 How does Bubble dialogue work?**

Bubble Dialogue is a hyper-card application which runs on the Apple Macintosh system. It creates an interactive comic-strip world made of "stacks" generated by the computer and displayed on screen. A stack is rather like a compressed book which has its pages stacked one on top of the other. Because the pages are displayed on a computer screen, only one can be seen at a time. The best way to illustrate Bubble Dialogue is by example (see Figure 2, p. 49).




RT  
 1  
 2  
 3  
 4  
 5  
 6  
 7  
 8  
 9  
 0  
 QUIT


**PROLOGUE**


Jane and Paul have just bought drinks at MacDonalds.

Jane



Paul






Dialogue


RT  
 1  
 2  
 3  
 4  
 5  
 6  
 7  
 8  
 9  
 0

I really like MacDonald's, but the queues are so long.

Jane



Paul



1 of 7

Figure2.

On the opening page, the users are introduced to a particular scenario through a "prologue". Clicking on the "hand" icon moves the program onto the next screen to begin the dialogue.

Each program user adopts the role of one of two on-screen characters. The users have the opportunity, by clicking on icons, to insert text into a speech bubble above the head of their character and then to insert text into a thought bubble which replaces the speech bubble once that is complete. The dialogue thus alternates between the users and each has access to the speech and thoughts generated by the other; i.e., where each user has access to what the other user publicly says and privately thinks.

There are two modes in Bubble Dialogue: a creation mode and a review mode. In creation mode, users can only move forward to the next speech or thought bubble. In review mode users can move backwards or forwards and make changes to what they wrote previously. Review mode was designed so that users could be reflective.

Bubble Dialogue allows the users to reflect on speech as dialogue and also alerts them to thought content as something distinct from speech. The program regulates turn-taking and serves as an interface between the two users. In this way the Bubble Dialogue might allow the meeting of minds to occur in an explicit process.

The program developers describe Bubble Dialogue as:

"...a computer-based technique which combines elements of role play, comic strip creation and reflexive dialogue analysis. Users play out the parts of characters

on the screen, creating dialogue in the characters' private domain (their thoughts or "inner speech") as well as in the public domain." (Gray, Creighton, McMahon & Cunningham, 1991, p.3).

However, O'Neill and McMahon (1991) realised how the Bubble Dialogue application differed from full role-play: for it offered an opportunity for users to "project themselves onto other characters on the screen, rather than into roles. People normally reluctant to step into roles in front of others might easily be drawn into exploring roles on the screen" (p.30).

Swettenham (1996) used information technology to teach theory of mind to children with autism and suggested three reasons why computers would be attractive to children with autism. Firstly, the computer provides social and emotional distancing by acting as interface. Secondly, the computer intrinsically accommodates the autistic need for sameness. Thirdly, it allows the individual to take active control and work at his/her own tempo.

In Contrast to Swettenham's (1996) study, the Bubble Dialogue program does not teach any rules explicitly, rather it allows the participants to literally mindread and it is this experience of role-play which might acquaint participants with aspects of thought that individuals without autism are easily able to infer. By making thoughts visibly concrete, rather than leaving them as hypotheticals that have to be inferred, autistic individuals might acquire the knack of routinely considering what kind of



thought underlies speech. This ability may then filter into their everyday lives and make them better mindreaders.

The potential value of Bubble Dialogue, is hinted at by the results of a study conducted by Hurlbert, Happé and Frith (1994). They found that people with Asperger's syndrome tended to report their inner thoughts in images and so computer graphics may be more in tune with their iconic cognitive style. Furthermore, Parsons and Mitchell (1999) found that children with autism were capable of understanding thought bubbles as representational devices.

Moreover, Howlin (1998) states that other computer programs designed for children with autism have been successful when they have induced turn taking and structured reciprocal interaction. A visual medium and reciprocity are both integral to Bubble Dialogue.

### **3.7 "Putting yourself in someone else's shoes" : Simulation**

Harris (1991) theorizes that mental simulation is the key to understanding another person's mental states. Harris (1991) argues that this process requires the capacity to engage in two successive steps: 1). the imagination of a particular desire or belief and 2). the imagination of the actions, thoughts or emotions that would ensue if one were to have those desires or beliefs.

Harris (1991) argues that in childhood individuals start to understand other people's mental states by this process of simulation which allows the individual to make predictions about others' reactions, behaviours and internal states.

Bubble Dialogue not only allows the process of mental simulation to be structured and experienced through computer role play, but also to be replayed, reviewed and revised on screen. Bubble Dialogue inherently creates the framework for simulation, although what characters say and think still requires their users' imaginative contribution.

### **3.8 Previous experimental work with Bubble Dialogue**

The Bubble Dialogue technology has been used by Jones and colleagues to explore self expression and communication in children (Jones & Selby 1997) and to support learning in children with emotional and behavioural difficulties (EDB) (Jones, 1996), and explore their responses to interpersonal conflict in mainstream and EBD schools (Jones, Price and Selby, 1998). The formal definition of emotional and behavioural difficulties in the U.K. refers to "children who...(present)...inappropriate, aggressive, bizarre or withdrawn behaviour", and who have, " developed a range of strategies for dealing with day-to-day experiences that are inappropriate and impede normal personal and social development and make it difficult for them to learn" (Jones et al., 1998, p.67).

Jones and Selby (1997) state that Bubble Dialogue can help children communicate and express their feelings and views when they find it difficult to communicate more directly. They also state that the role playing element of Bubble Dialogue provides an emotional "distance" which allows specific issues in the child's life to be raised without direct reference. Hence, the children can play characters without having to identify too closely with them.

Bubble Dialogue has proven helpful in facilitating communication in children with EDB who find communication problematic and are often difficult to engage. It seems appropriate to use the technology with individuals with autism because autism is a disorder of communication and individuals with autism and EBD share many additional similarities. Rock, Fessler and Church (1997) list six specific critical deficits in individuals with emotional and behavioural difficulties: Cognitive processing, Executive functioning, Language functioning, Behavioural functioning, Social/Emotional functioning and Academic performance (often poor due to a disrupted schooling history).

Rock et al. (1997) also list Environmental Variables (e.g, quality of social support) and Biophysical Variables (e.g., additional learning disabilities such as dyslexia) as factors which can affect the outcome of someone with EBD.

Therefore, because of the similarities between the autistic and EBD populations, it would seem valuable to compare the dialogues produced by individuals with EBD

with those produced by individuals with Asperger's syndrome.

### **3.9 How do we know if the experience of Bubble Dialogue effected any change in the mentalizing ability of individuals with Asperger's syndrome?**

To measure the real life efficacy of the Bubble Dialogue experience, I needed to employ a test which measured mentalizing in everyday life. For this purpose, I selected Frith et al's (1994) supplementary items devised for the Vineland Adaptive Behavioural Scales (VABS).

I also needed tests which would allow me argue that any change in the VABS could only be from the experience of Bubble Dialogue and not for any other reason, e.g., maturation resulting in increased global cognitive functioning of the individual.

#### **3.9a Control tests**

If the Bubble Dialogue experience induced a general change in functioning, then we would find improvements in scores on the supplementary VABS items, British Picture Vocabulary Scale (BPVS) and Wisconsin Card Sorting Test (WSCT) between pretest and posttest. However, if the BD experience induced a change that was specific to social functioning, as hypothesized, then we would find a change in VABS but not in BPVS or WSCT.

I opted for two tests which measure very different aspects of cognitive function because converging and corroborative evidence from both tests would more powerfully suggest that Bubble Dialogue was affecting the mentalizing ability of the participants with Asperger's syndrome.

### **3.10 How could we obtain a more detailed definition of the adjective 'autistic'?**

To answer this question, I asked blind raters to rate the character's speech and thoughts produced by the individuals with Asperger's syndrome and the individuals with EBD, relative to the speech and thoughts of the characters I played.

I selected three dimensions which I envisaged would best elicit the polarities of Autism and EBD.

1. Emotionally charged – emotionally flat: I selected this dimension to access the lack of affect which Hobson (1990) proposes in his socio-affective account of autism.
2. Polite – coarse: I selected this dimension because the participants with Asperger's syndrome live in residential care homes and attend mainstream colleges of Further Education. Whereas the participants with EBD attend a residential school almost exclusively for adolescents who had been excluded from mainstream state education because of antisocial and/or criminal disorderly conduct. Hence I



expected the characters played by the individuals with Asperger's syndrome to be more polite than the characters played by the individuals with EBD.

3. Pursuing a topic too little – pursuing a topic too much: I chose this dimension to elude ratings reflecting the autistic tendency for perseveration.

I anticipated that the individuals with Asperger's syndrome would be rated as emotionally flat, polite and pursuing a topic too much. I expected to see the reverse for the individuals with EBD.

Additionally, with increased experience of Bubble Dialogue I expected the participants with Asperger's syndrome to show improvements, with time, along the three rated dimensions.

## **Chapter 4**

### **Method**

#### **4.1 Participants**

Four participants were recruited by myself after I approached two residential care homes and one residential school, within the West Midlands region. Before starting the pre-testing and Bubble Dialogue sessions, I visited the homes and school so that I could get to know the participants, their carers and their teachers and they could get to know me.

##### **i. Participants with Autism**

D. and N. both have a diagnosis of Asperger's syndrome. They live in different residential care homes in the West Midlands. Both men attend local colleges and their long-term goal is to live independently.

D.'s main interest is science and he frequently borrows books from his local library about evolution, physics, astronomy and chemistry. As well as science fact, D. is interested in science fiction and has fifty comics of that genre. D. can be very quiet, but becomes enquiring and verbose when he talks about science. D. attends three local colleges where he studies pottery, photography, biology and information technology. D. would like to have a career in the science industry.

One of N.'s main interests is the German language. Initially N. was self taught, though with tuition he passed GSCE German. N. has visited Germany and he often reads his German dictionary. N.'s parents have a satellite dish and he watches German television programmes whenever he visits them at weekends. N. also plays personal computer games and console-based games. N. attends a local college and studies, amongst other things, information technology. Additionally, N. works once a week at the local branch of the National Autistic Society.

At the start of testing,

D. was 23 years and 4 months and

N. was 23 years and 2 months.

#### ii. Participants with Emotional and Behavioural Difficulties

P. and W. have Emotional and Behavioural Difficulties and both young men live and attend the same residential school for children with EDB in the West Midlands.

I was told by P.'s teacher that he had a slight hearing problem, but he did not seem at all impeded in either his hearing or speech production. P. was very talkative and regaled me with anecdotes, including one about how he and his friends "Jacked a Volvo" parked in the hospital situated behind their school. P. also asked me how expensive the Apple classic computer was and how much he could "flog one for".

W. was also very chatty. He asked me if I smoked and on one occasion told me not to tell his teacher that he had some cigarettes and a lighter in his pocket. He told me a story about how a friend of his was so desperate for a cigarette that he "rolled up" some tea leaves and smoked them instead.

At the start of testing,

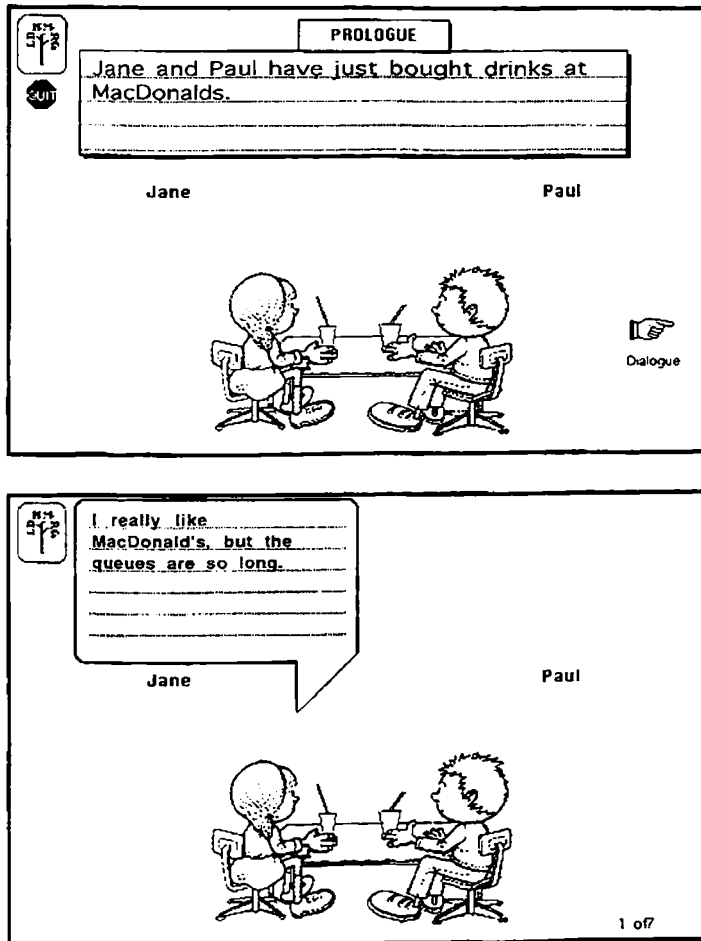
P. was 14 years and 9 months and

W. was 14 years and 10 months.

## 4.2 Apparatus

The principal piece of hardware was an Apple Mackintosh Classic computer installed with Bubble Dialogue (Gray, Creighton, McMahon and Cunningham, 1991) and Hypercard program. Figure 3, below, is the beginning of the scenario 'Jane and Paul', for Bubble Dialogue session number 1.

Figure 3



### **4.3 Measures and Procedure**

All three of the following tests were administered both before and after the six Bubble Dialogue sessions.

The care assistants/support workers who knew D. and N. the best were interviewed using the Vineland Adaptive Behavioural Scales (VABS) supplementary items (Frith et al., 1994).

D. and N. were tested with the Wisconsin Card Sorting Test (WCST) (Grant and Berg, 1948).

Additionally, D. and N. were tested with the British Picture Vocabulary Scale (BPVS) which provides an assessment of verbal comprehension (Dunn et al, 1982).

N.B. D., N. and their carers received no debriefing about the tests after the first administration.

P. and W. were not tested and participated in the Bubble Dialogue sessions only.

Ideally both D. and N. and their carers would have been tested and interviewed on the same dates. However, this was not possible because of limited access to D. and N. and their keyworkers were not always on shift when I tested D. and N.

The Bubble Dialogue sessions with D. and N. took about one hour with the frequency of approximately 1 per week for 6 weeks.

Table 1 below shows the dates when D. was tested.

<u>Test (D.)</u>	<u>Date of pre-test</u>	<u>Date of post-test</u>
Wisconsin Card Sorting Test (WCST)	11/3/98	27/5/98
British Picture Vocabulary Scale (BPVS)	11/3/98	27/5/98
Vineland Adaptive Behavioural Scales (VABS)	29/3/98	27/5/98

Table 2 below show the dates when N. was tested.

<u>Test (N.)</u>	<u>Date of pre-test</u>	<u>Date of post-test</u>
Wisconsin Card Sorting Test (WCST)	22/3/98	3/6/98
British Picture Vocabulary Scale (BPVS)	1/4/98	10/6/98
Vineland Adaptive Behavioural Scales (VABS)	22/3/98	10/6/98

Table 3 below shows the dates when D. and N. experienced the Bubble Dialogue sessions.

<u>Participant</u>	<u>Date of Scenario 1 Session 1</u>	<u>Date of Scenario 2 Session 2</u>	<u>Date of Scenario 3 Session 3</u>	<u>Date of Scenario 4 Session 4</u>	<u>Date of Scenario 5 Session 5</u>	<u>Date of Scenario 6 Session 6</u>
D.	29/3/98	31/3/98	3/4/98	6/4/98	19/5/98*	19/5/98*
N.	1/4/98	8/4/98	22/4/98	29/4/98	13/5/98	27/5/98

\* see chapter 5.3a p. 102.

#### **4.4 Test administration**

##### **4.4a Vineland Adaptive Behavioural scales supplementary items**

**(Frith et al., 1994)**

The VABS is not a test given directly to the individuals. Rather it takes the form of a semi-structured interview with a third party, i.e., with someone who knows the individual well.

I said to the respondent that,

1. there are no right or wrong answers,
2. people perform different activities at different ages and stages in their life
3. and the focus is not on what the individual can do but on what he *does*. The prime emphasis was on whether or not a given activity is *usually* or *habitually* performed, whether is it sometimes or partially performed, or not at all?

I encouraged the respondent to feel free to ask questions at any point during the interview.

In accordance with the general guidelines of administering the scale I,

1. Never read and never permitted the respondent to read any of the items,
2. and conducted the interview for at least 5 minutes before scoring any items (to establish rapport).



### Scoring Procedures with the VABS

- Score 2 - Activity is usually/habitually performed
- Score 1 - Performed sometimes or with partial success
- Score 0 - is never performed, has not had the opportunity to perform the activity, or if the respondent has no knowledge of the individual's performance.

Below is the entire list of Frith et al's (1994) supplementary items for the VABS.

There are 32 items in total. Sixteen items make up the active sociability section and 16 items make up the interactive sociability section.

## Active Sociability

(Behaviours probably not requiring a theory of mind)

Shows a desire to please

Takes turns in conversation

Shares toys when asked *(shares/lends possessions if asked)*

Recognises happiness and sadness in others

Initiates social contacts *(socially active or passive)*

Initiates fixed small talk

Uses appropriate table manners

Delivers a simple message

Says please when asking for something

Names favourite TV programmes and times

Ask permission to play with a toy *(asks permission to use other's things)*

Plays board games

Follows time limits set by care-giver

Responds appropriately when introduced

Apologises for errors

Returns borrowed items

### Interactive Sociability

(Behaviours probably requiring a theory of mind)

Chooses appropriate presents

Responds to hints and indirect cues in conversation

Makes confidences

Recognises surprise and embarrassment in others

Initiates conversation of interest to others

Initiates flexible small talk

Supplies important missing information

Expresses ideas in more than one way

Refrains from statements that might embarrass

Engages in elaborate make-believe activities

Knows behaviour appropriate for different people

Plays hide and seek or cheat appropriately      *(plays strategic games requiring bluff or deception, e.g., poker)*

Has realistic long-range goals and plans

Keeps secrets for as long as is appropriate

Apologises for hurting other's feelings

Weighs consequences of actions

Items 3 and 11 (active sociability) and item 12 (interactive sociability) were

inappropriate to ask about adults so I contacted Happé who suggested the changes in italics.

#### **4.4b The Wisconsin Card Sorting Test**

The procedure for administering the WCST followed the instructions provided in the WCST accompanying manual (Heaton, 1981).

##### Administration

I read out the administration instructions verbatim and followed the administration procedure.

" This test is a little unusual, because I am not allowed to tell you very much about how to do it. You will be asked to match each of the cards in these decks to one of the four key cards.<sup>a</sup> You must always take the top card from the deck,<sup>b</sup> and place it below the key card you think it matches. <sup>c</sup> I can't tell you *how* to match the cards, but I will tell you each time whether you are right or wrong. If you are wrong leave the card where you've placed it, and try to get the next card correct. Use this deck,<sup>d</sup> and then continue with the second deck. There is no time on this test."

- a. Lay out the stimulus cards across the table from the participant, in the standard order, with the first card at the participant's left side.
- b. Throughout the test, the stimulus cards and the cards in the decks should be kept in order. Never shuffle the cards or allow the participant to do so. As they face the participant, the figures on the cards should have the following configurations (triangles have the bases facing down, and stars have two points facing down): cards

with only one figure have it in the centre; cards with two figures have one in the upper left and one in the lower right; when there are three figures they are in the configuration of an equilateral triangle, with two figures on either side of the top and the third centred at the bottom of the card; when there are four figures they are in the configuration of a square, with one figure at each corner of the card.

c. Point to the four stimulus cards.

d. Examiner hands the first deck to the participant, and places the second deck to the side.

(Heaton, 1981)

### Procedure

I began by responding 'right' each time the participant matched to colour, and 'wrong' each time he did not match to colour. This continued until the participant completed 10 *consecutive* colour responses. I then, without comment, changed to form (shape) as the correct response.

Form remained the correct sorting principle until the participant had again completed 10 consecutive correct responses. Then I (again giving the participant no warning or clue as to what was happening) changed the sorting principle to number. After 10 consecutive number responses I switched back to colour, and then form and number.

The test continued either until the participant had completed the six categories, or until both decks had been used. At no time did I indicate to the participant that I was changing the sorting rule, or gave the participant any information that was not contained in the initial instructions.

### Scoring

Perserverations (**psv**) is the number of perseverative responses, in which the participant continued sorting by a previously correct category despite negative feedback. According to Heaton (1981) this score is the best predictor of prefrontal dysfunction derived from the WSCT.

The failure to maintain set score (**ftms**) is the number of times in the test that the participant makes five correct responses in a row but fails to get the 10 that are required to complete the category (i.e. runs of five to nine consecutive correct responses). When the participant does this, s/he has shown definite insight into the correct sorting principle, has almost certainly had unambiguous correct responses reinforced, and nevertheless had not been able to consistently use the strategy that has been successful.

**Categories** is the number of categories (colour, shape, number) in which the participant correctly made the criterion of 10 consecutive responses.

**Errors** are the total number of incorrect responses. The score is the sum of non perseverative errors and perseverative errors.

#### **4.4c The British Picture Vocabulary Scale**

The BPVS is a standardised test of verbal language comprehension. It is widely used in developmental psychology research to verbal mental age match control participants with autistic participants.

At the beginning of the test, I had to introduce the test and use the training plates by saying:

*I want you to look at some pictures with me.*

*Look at all these pictures on this page.*

*I will say a word; then I want you to tell me the number of, or point to, the picture which best shows the meaning of the word. Let's try this one. Tell me the number of, or point to, the picture which best tells the meaning of the word 'dog'*

*Good. Now show me man.*

*Good. Now show me swing.*

*Now show me sleep.*

N.B. I had to remember that with individuals with autism, if I asked them "Can you show me man? ", they might have replied, "Yes" (Overliteral speech).

If the participant chose the wrong illustration on any training plate, I gave the correct choice and explain why it was correct and went onto the next plate.

When I established the desired response, I turned to the correct starting point plate as indicated on the Test Record, and said:

*Fine! Now I am going to show you some other pictures. Each time I say a word, you say the number of, or point to, the picture which best shows the meaning of the word. As we go through the book you may not be sure you know the meaning of some of the words, but look carefully at all of the pictures anyway and choose the one you think right.*

### Rules for Administration

Below are some of the key elements of administering the BPVS.

1. I never preceded the stimulus word by an article (a, an, the). This rule was established to prevent giving clues, since only nouns are introduced by articles.
2. The participant took any reasonable amount of time per item to make a choice, since this is not a test of speed. However, if a minute had passed and no choice had been made, I encouraged the participant to choose by saying: *Try One.*  
*Point to the one you think is correct.*



(There was no penalty for guessing, and the participants were informed of this).

3. I always tried to secure a response. Nevertheless, if someone was completely unwilling/unable to choose, I recorded NR (no response) on the Individual's Test Record, while making a comment such as:

*That is a difficult one. Let's try another.*

#### **4.5 Bubble Dialogue sessions**

Both D. and N. were tested and had the Bubble Dialogue sessions in their own homes.

P. and W. had the Bubble Dialogue sessions in their school library.

#### **Bubble Dialogue Scenarios**

The scenarios, 1 to 6 (p.77 - 82), were given in that sequence.

While I was booting up the program, I asked the participant how he was and what he had done during the week and so on. I then produced the floppy disk, with his name written on it, and inserted it into the computer and selected the scenario for that session.

I then showed the participant the scenario, for that session. The participant read through the scenario as often as he wanted. Once we were both ready, I clicked on the speech icon for the character I played (I always played the character whose turn it was next to speak). After I had typed in the speech bubble what I wanted my character to say, I clicked on the thought icon. The speech bubble disappeared and was replaced by a thought bubble. I proceeded to type in what my character thought and when I had finished I clicked on the participant's characters speech icon.

When the empty speech icon for the participant's character appeared, the previous speech of my character reappeared. Then the participant had the opportunity to type in whatever he wanted. Once he had typed what he wanted to say, I clicked on the

thought icon for him and a thought bubble appeared to replace the speech bubble. Once the participant understood the procedure of clicking on the icons to bring up the thought and speech bubbles, I left that task entirely to him.

He and I continued the dialogue until we either ran out of time (because he had another activity or lesson to go to) or we exhausted all the avenues to progress our dialogue further.

After that I asked the participant if he wanted to review what we had written. If he wished to, I clicked the review button and he and I had the opportunity to go back through the entire dialogue and change whatever text we wanted to.

1. Simple Perspective taking (p. 77)

Understanding sources of informational access

"seeing leads to knowing"

2. Complex perspective taking (p. 78)

Understanding implications of physical disability

3. False Belief (p. 79)

Communicating with someone who holds a false belief

4. Deception-Lie (p. 80)

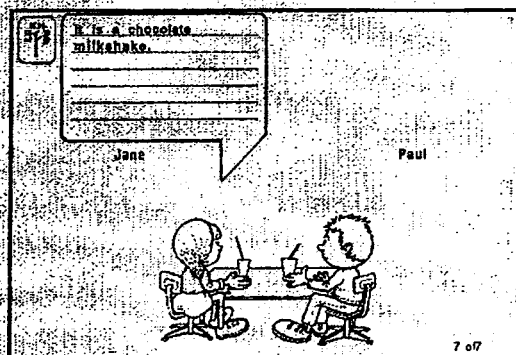
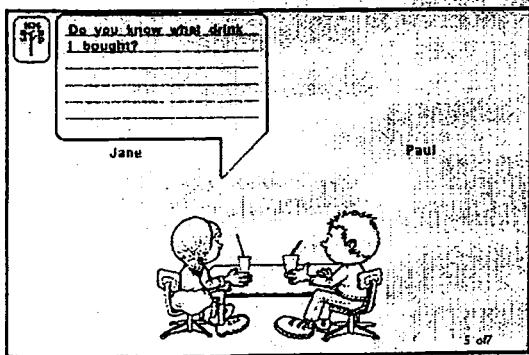
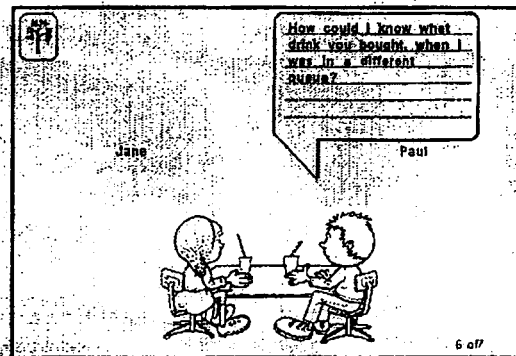
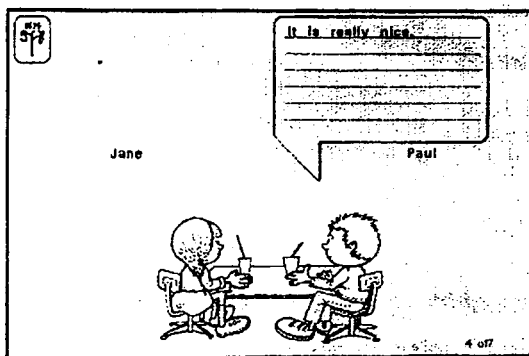
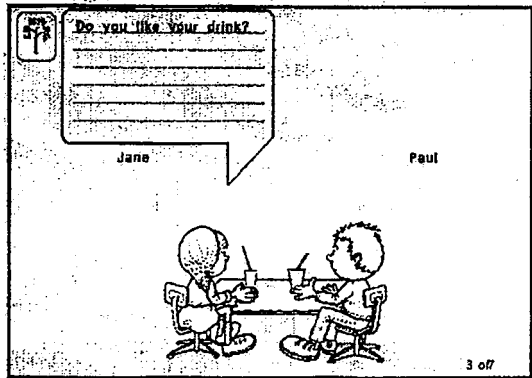
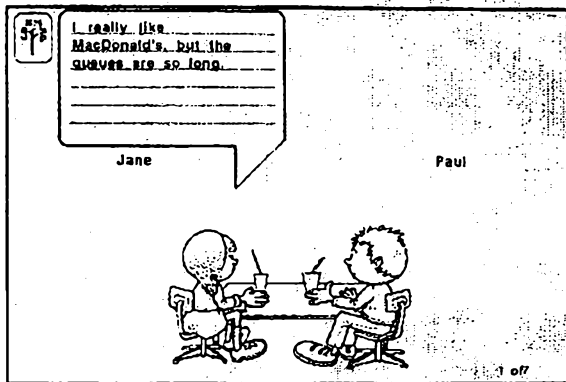
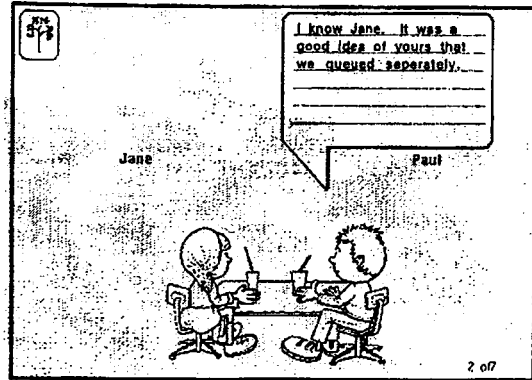
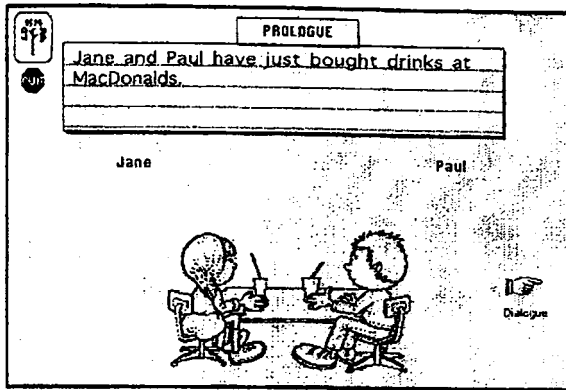
Lying to a parent about your whereabouts

5. Deception-'White' lie (p. 81)

Organising a surprise birthday party

6. Making a friend (p. 82)

Introducing yourself to a stranger



PROLOGUE

Debbie and David had just met in the school library.

Debbie Dave

Dialogue

Of course, what's it called?

Debbie Dave

2 of 7

Dave, I wonder if you could help me find a geography text book I have been trying to find?

Debbie Dave

1 of 7

'Human Geography'. I think it is in the social science section.

Debbie Dave

3 of 7

The social science section is on the top shelf of row 2b. I will show you if you want?

Debbie Dave

4 of 7

Why Debbie?

Debbie Dave

6 of 7

Brilliant thanks. Would you get it down for me please?

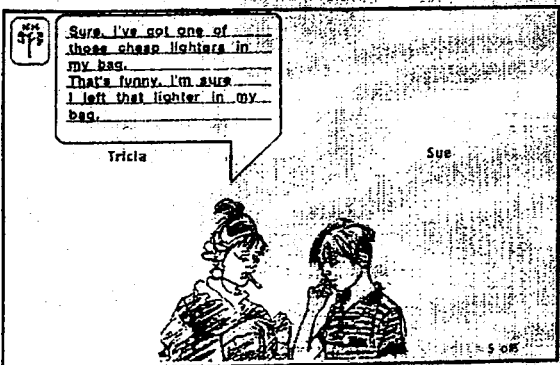
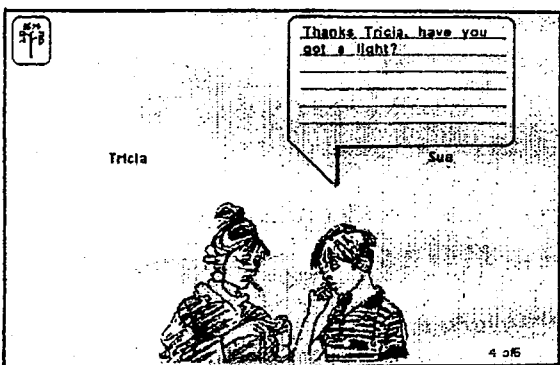
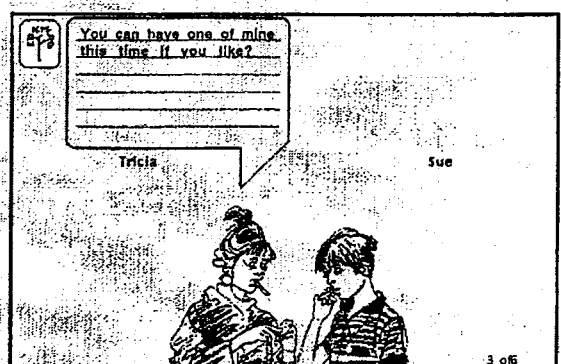
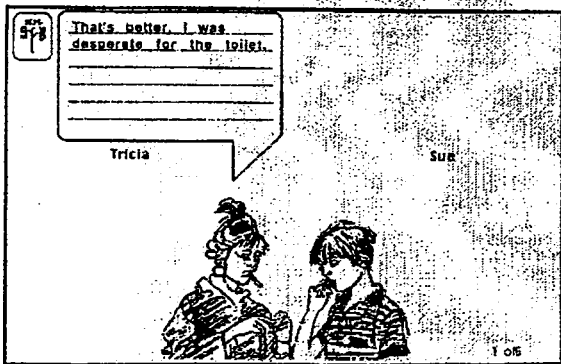
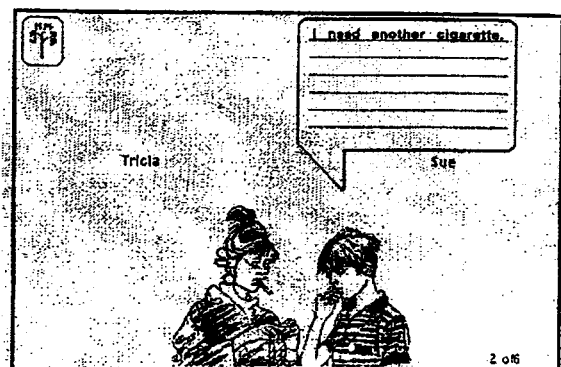
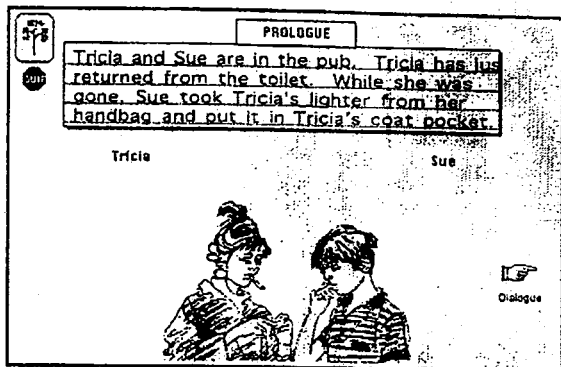
Debbie Dave

5 of 7

Because being in a wheelchair means that I cannot reach for any book which are high up.

Debbie Dave

7 of 7



PROLOGUE

Dean has spent the day in town and not in School.

Dean Mum

Dialogue

Where have you been?

Dean Mum

2 of 5

Hi Mum. I'm hungry. What's for tea?

Dean Mum

4 of 5

I have been at school.

Dean Mum

3 of 5

I have just had a phone call from your Headmaster. He told me that you arrived for registration and then did not go to a single lesson.

Dean Mum

4 of 5

Sorry Mum.

Dean Mum

5 of 5



PROLOGUE

James and Scott are trying to arrange a surprise birthday party for their friend Sarah.

James Scott

Dialogue

Yes, I'm going to tell Sarah that you and I are going to meet her for a drink in a bar.

James Scott

2 of 6

Right Scott, have you got any ideas about arranging Sarah's party?

James Scott

1 of 6

So Sarah is going to think that she is celebrating with just you and me?

James Scott

3 of 6

That's right, but really we have hired the entire bar and all her friends and family are going to be there.

James Scott

4 of 6

Yes, but it's just to get her to come to the pub. It will be a lovely surprise birthday party for her.

James Scott

6 of 6

So we are going to lie to Sarah?

James Scott

5 of 6

PROLOGUE

Katie is in a pub and she sees a man who she thinks looks nice. She decides to go over and talk to him.

Katie Man

Dialogue

Yes I do, but I have only recently moved into the area.

Katie Man

2 of 4

Hi I have not seen you in this place before. Do you live around here?

Katie Man

1 of 4

My name is Katie by the way.

Katie Man

3 of 4

Nice to meet you Katie. I'm Tony. Can I get you a drink?

Katie Man

4 of 4

#### **4.6 Rating of Bubble Dialogue scripts**

The speech and thought bubble dialogues for all four participants were converted into script form to then be blind rated. The transcribed scripts resemble play scripts or screen plays (see Appendix for transcription of all the scripts produced, i.e., all 4 participants engaged in 6 scenarios). Additionally, the characters' thoughts were italicised, so that the raters could easily differentiate the thoughts from speech.

I recruited 33 blind raters to assess the dialogue scripts. The raters were psychology third/final year undergraduates following a course in theory of mind. They knew, in advance, that some of the scripts were produced by participants with Asperger's syndrome, but did not know which ones. They were randomly assigned to one of three teams (11 in each). Eleven raters rated all the four sets of six scripts (4 participants, 6 scenarios), along one of three dimensions:

1. Emotionally charged – emotionally flat
2. Polite – coarse
3. Pursuing a topic too little – pursuing a topic too much

The raters were asked to rate the dialogues of both characters (one of which was played by the participant and the other played by the experimenter (myself)) by circling one line on a 6 point bi-polar scale (see Appendix for an example).

The raters were intentionally not given any examples of what constitutes ‘emotionally charge or flat’, for instance. The same was true for the other two dimensions, their interpretation was also left open-ended.

I believed that the participants’ scripts ought not to be rated in isolation because the discourse was between two people. Therefore, I asked the raters to rate both the participants’ scripts and the experimenter’s (my) scripts. They did this by circling one of the line points on six point bi-polar scale. There were two scales, one for each character. I then subtracted my rated scores from the participants rated score. This gave a number which reflected the interaction between both the BD users and was correspondingly used in quantitative analysis. This number which was either positive or negative, reflected how, for example, emotionally flat or emotionally charged the participant’s character was relative to mine. Therefore a negative number indicates that the participant was rated emotionally flat relative to me along that particular dimension.

After my rated scores had been subtracted from the participant’s rated scores, these subtracted ratings were then summed across all six scenarios.

The scripts were all rated in the order of scenarios 1-6 for D, followed by N. P. and W, i.e., both the autistic scripts were rated first. This procedure meant that the entire rating booklet of approximately fifty pages, (the ordered dialogue scripts and rating scales) could be photocopied identically and so reduced the risk of commingling

scripts and rating scales.

Because the scripts were not randomised, I risked order effects. However, I felt that it was more prudent to accurately compile the rating booklets and more efficiently score the 33 scripts. Moreover, many raters reviewed and re-rated the scripts after having worked through the booklet.

## **Chapter 5**

### **Results**

#### **5.1 Results from the battery of tests given to the participants with Asperger's syndrome both before and after the six Bubble Dialogue sessions.**

The results from table 4 below show there is virtually no difference in the VABS scores for D. and only a slight difference for N., between their scores before and after the Bubble Dialogue sessions. There is very little difference in the BPVS scores before and after the Bubble Dialogues sessions for both D. and N. However, both D. and N. show a striking improvement in WCST in terms of number of perseverations and how many categories they managed to correctly sort. Note that low scores on perseverations on the WCST mean improved performance. Note also that the maximum number of categories that can be sorted on the WCST is 6. Therefore, any increase in number of categories sorted shows an increase in performance on this test.

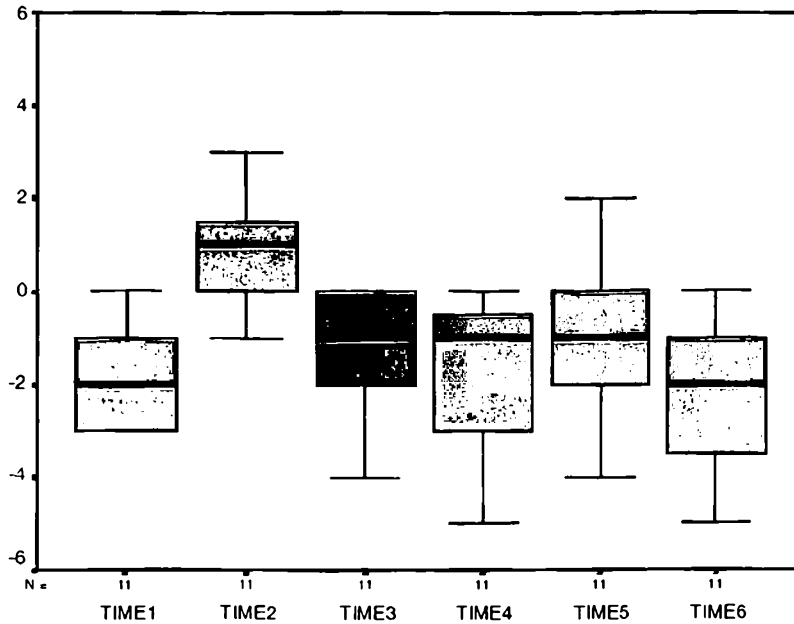
Table 4 below shows Vineland Adaptive Behavioural Scales supplementary items devised by Frith et al. (1994), Wisconsin Card Sorting Test and British Picture Vocabulary Scale score for both the participants with Asperger's syndrome before and after the six Bubble Dialogue sessions.

Test	Score: Pre Bubble Dialogues For D.	Score: Post Bubble Dialogues For D.
<b>VABS</b>		
Active score (max 32):	20	20
Interactive score (max 32):	14	14
<b>Executive function</b>		
WSCT psv	105	28
WSCT films	0	1
WSCT Categories	2	3
WSCT errors	85	76
WSCT psv errors	83	27
<b>BPVS</b>		
Raw score:	123	121
BPVS Verbal mental age:	14-9	12-5
BPVS Verbal IQ: (Standardized score)	76	74
Test	Score: Pre Bubble Dialogues For N.	Score: Post Bubble Dialogues For N.
<b>VABS</b>		
Active score (max 32)	19	21
Interactive score (max 32):	11	9
<b>Executive function</b>		
WSCT psv	65	9
WSCT films	1	0
WSCT Categories	2	6
WSCT errors	67	21
WSCT psv errors	53	9
<b>BPVS</b>		
Raw score:	111	122
BPVS Verbal mental age:	12-8	14-7
BPVS Verbal IQ: (Standardized score)	64	75

**5.2a Results from the blind rating of the Bubble Dialogue Scripts**

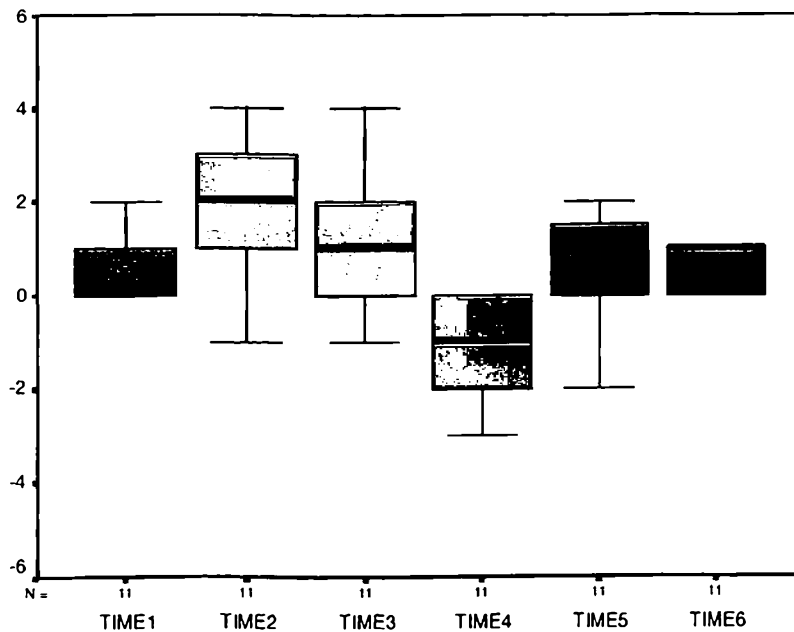
**Change over time – for the dimension emotionally flat to emotionally charged**

**Autistic person 1 (D.) (Boxplot 1)**



**Change over time – for the dimension emotionally flat to emotionally charged**

**Autistic person 2 (N.) (Boxplot 2)**





Thirty-three blind raters rated the Bubble Dialogue scripts produced by the 4 participants and myself. They did this by circling one of the line points on six point bi-polar scale. There were two scales, one for each character. I then subtracted my rated scores from the participants' rated score. This gave a number which reflected the interaction between the participant and myself.

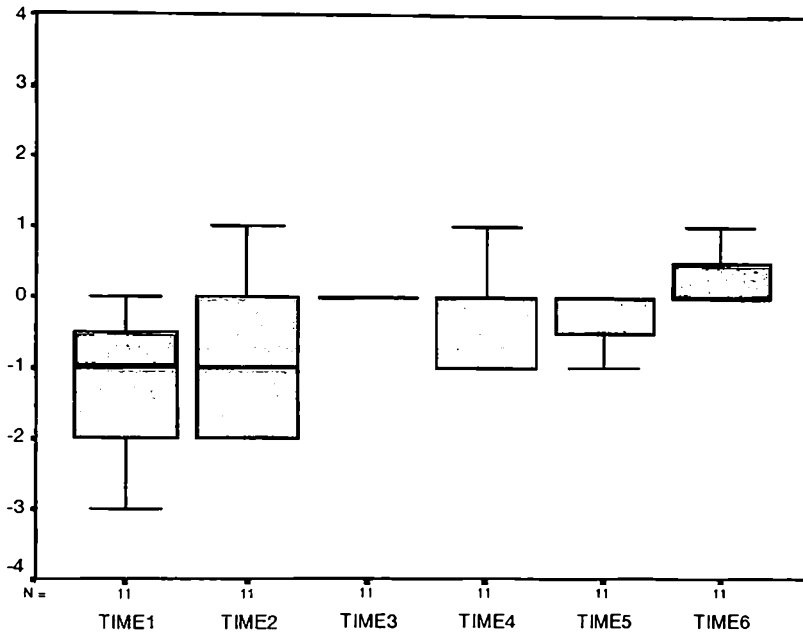
This number which was either positive or negative, reflected how, for example, emotionally flat or emotionally charged the participant's character was relative to mine. Therefore a negative number indicates that the participant was rated emotionally flat relative to me along that particular dimension.

Both boxplot 1 and boxplot 2, show that there is no pattern of change in rated Bubble Dialogue script scores for both N. and D. (along the dimension of emotionally flat- emotionally charged), as they progress from the first Bubble Dialogue session to the sixth Bubble Dialogue session.

This result suggests that that there was no measured improvement in their simulated interpersonal skills with time (as indexed by the number of Bubble Dialogue sessions). Therefore, this result corroborates the lack of change in the VABS supplementary items scores before and after the Bubble Dialogue sessions.

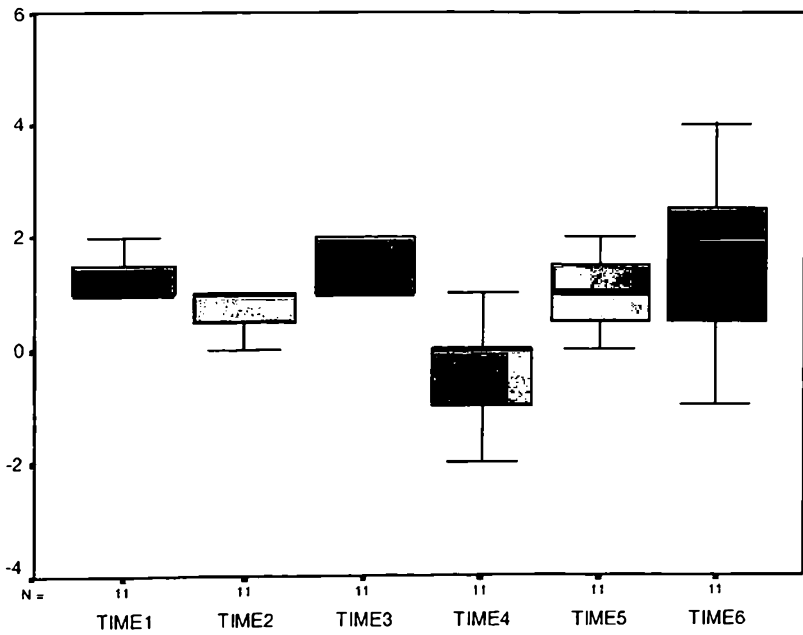
Change over time – for the dimension polite to coarse

Autistic person 1 (D.) (Boxplot 3)



Change over time – for the dimension polite to coarse

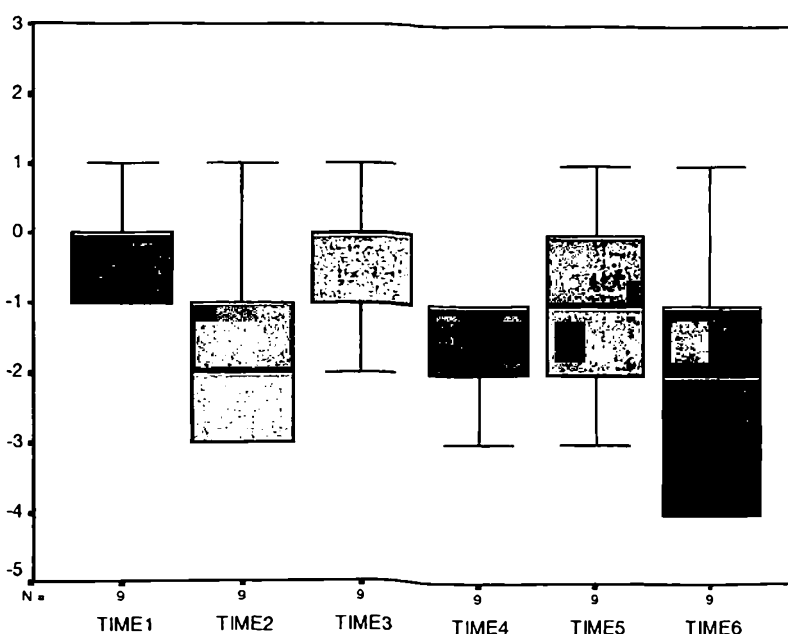
Autistic person 2 (N.) (Boxplot 4)



Both boxplot 3 and boxplot 4, show that there is no pattern of change in rated Bubble Dialogue script scores for both N. and D. (along the dimension polite - coarse), as they progress from the first Bubble Dialogue session to the sixth Bubble Dialogue session.

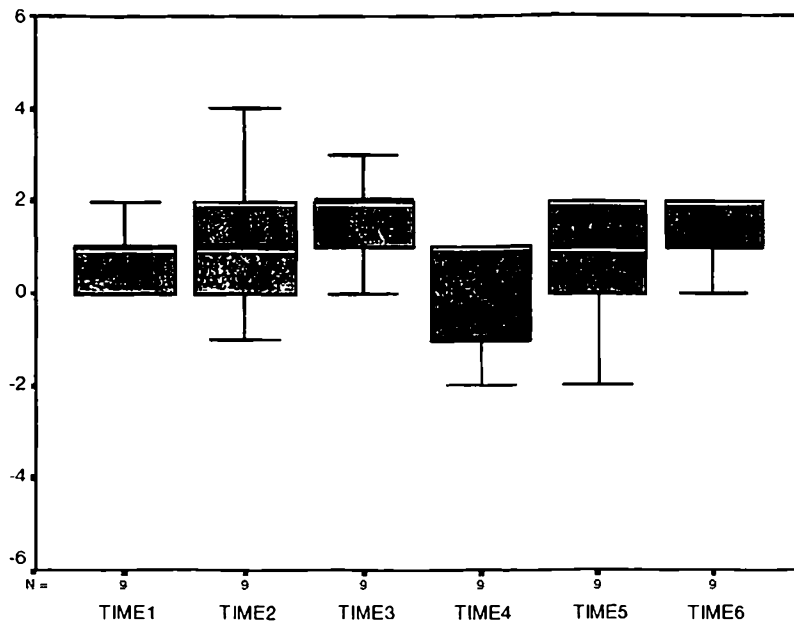
**Change over time – for the dimension pursuing a topic too little to too much**

**Autistic person 1 (D.) (Boxplot 5)**



**Change over time – for the dimension pursuing a topic too little to too much**

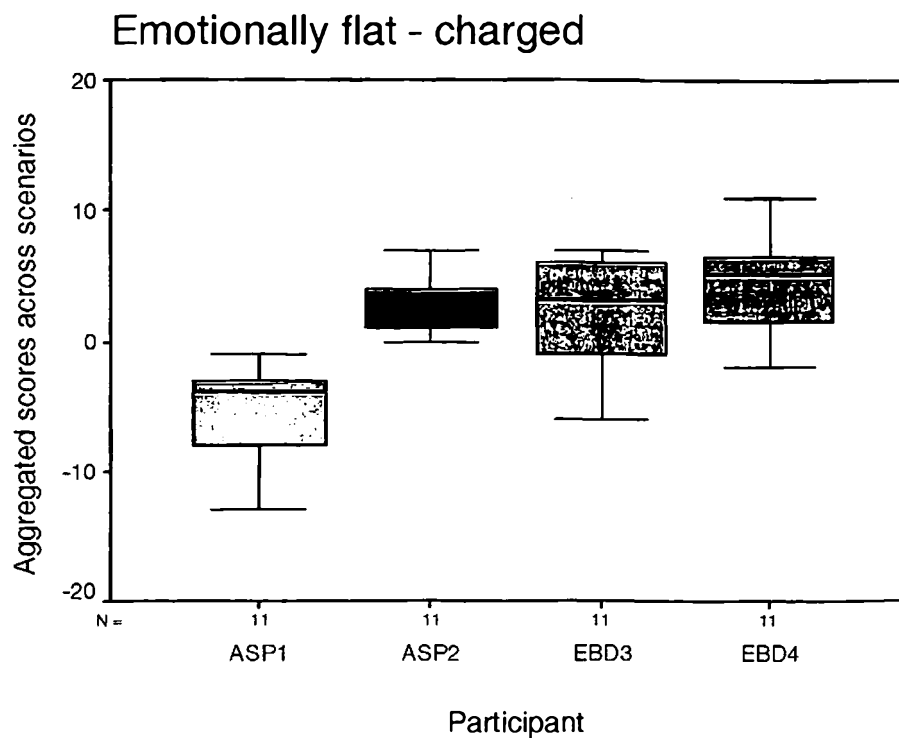
**Autistic person 2 (N.) (Boxplot 6)**



Both boxplot 5 and boxplot 6, show that there is no pattern of change in rated Bubble Dialogue script scores for both N. and D. (along the dimension pursuing a topic too little – pursuing a topic too much), as they progress from the first Bubble Dialogue session to the sixth Bubble Dialogue session.

## 5.2b Results from the rated dialogue scripts continued.

### (Boxplot7)



After my rated Bubble Dialogue script scores had been subtracted from all the participants' rated scores, these subtracted ratings were then summed across five scenarios (rather than all six). **Note that the scores for scenario No. 5, for all four participants, were not included in the aggregation and subsequent analysis because D. only produced one sentence for that scenario.**

The data were analysed using a one way within subjects (repeated measures) ANOVA, with four levels:  $F(3,30) = 14.8, p < 0.001$ .

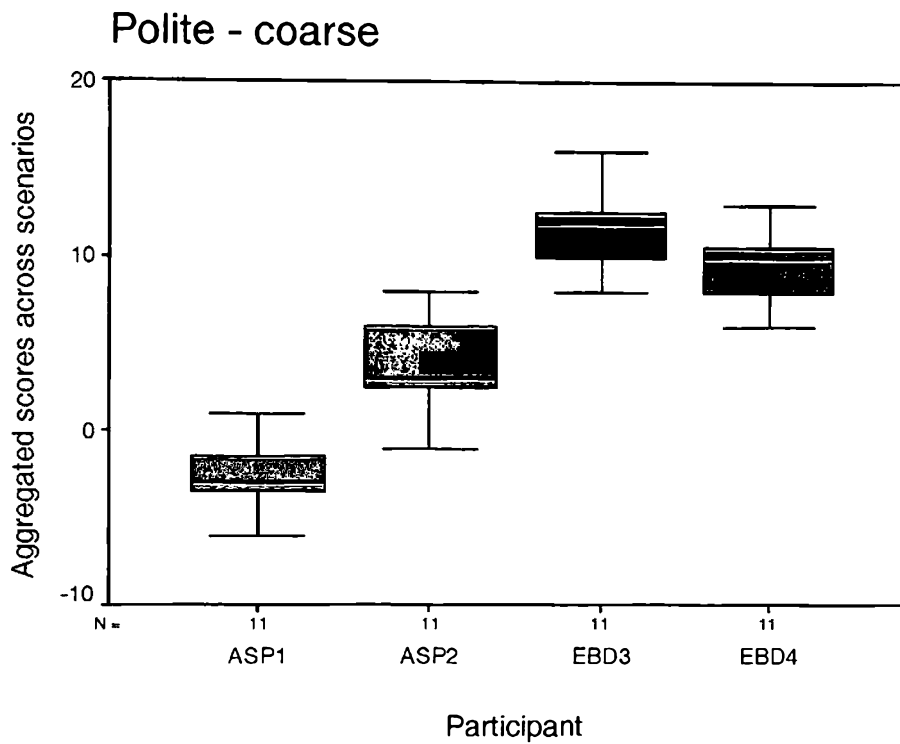
Paired Samples Test (Table 5)

		Paired Differences Mean	t	df	Sig. (2-tailed)
Pair 1	ASP1 – ASP2	-7.6364	-5.000	10	.001
Pair 2	ASP1 – EBD3	-7.1818	-3.454	10	.006
Pair 3	ASP1 – EBD4	-9.1818	-4.805	10	.001
Pair 4	ASP2 – EBD3	.4545	.361	10	.726
Pair 5	ASP2 – EBD4	-1.5455	-1.741	10	.112
Pair 6	EBD3 – EBD4	-2.0000	-2.119	10	.060

N.B. for paired comparisons to be significant they had to reach the 0.008 significance level (significance level  $\div$  number of pair comparison, i.e.,  $0.05 \div 6$ ), Bonferoni Test.

The analysis shows that there is a significant difference between the four individuals. Additionally, the paired comparison t-tests reveal that D.'s (Asperger 1) scripts were rated as emotionally flat relative to N.'s (Asperger 2) and P.'s (EB3) and W.'s (EBD4). Both D. and N. have the same diagnosis (Asperger's syndrome), but N.'s ratings show his dialogue scripts were not rated as significantly different from the two individuals with EBD.

**(Boxplot 8)**



Rater no. 5 omitted to rate scenario 3 for participant EBD4. Hence his/her score was estimated by calculating the average (mean) score given for EBD4, by the sum of the five other scenarios and dividing by five.

Within subjects (repeated measures) ANOVA:  $F(3,30) = 63.1, p < 0.001$ .

Paired Samples Test (Table 6)

		Paired Differences Mean	t	df	Sig. (2-tailed)
Pair 1	ASP1 - ASP2	-6.8182	-4.963	10	.001
Pair 2	ASP1 - EBD3	-14.0909	-13.668	10	<.001
Pair 3	ASP1 - EBD4	-12.0000	-12.000	10	<.001
Pair 4	ASP2 - EBD3	-7.2727	-5.682	10	<.001
Pair 5	ASP2 - EBD4	-5.1818	-5.391	10	<.001
Pair 6	EBD3 - EBD4	2.0909	2.101	10	.062

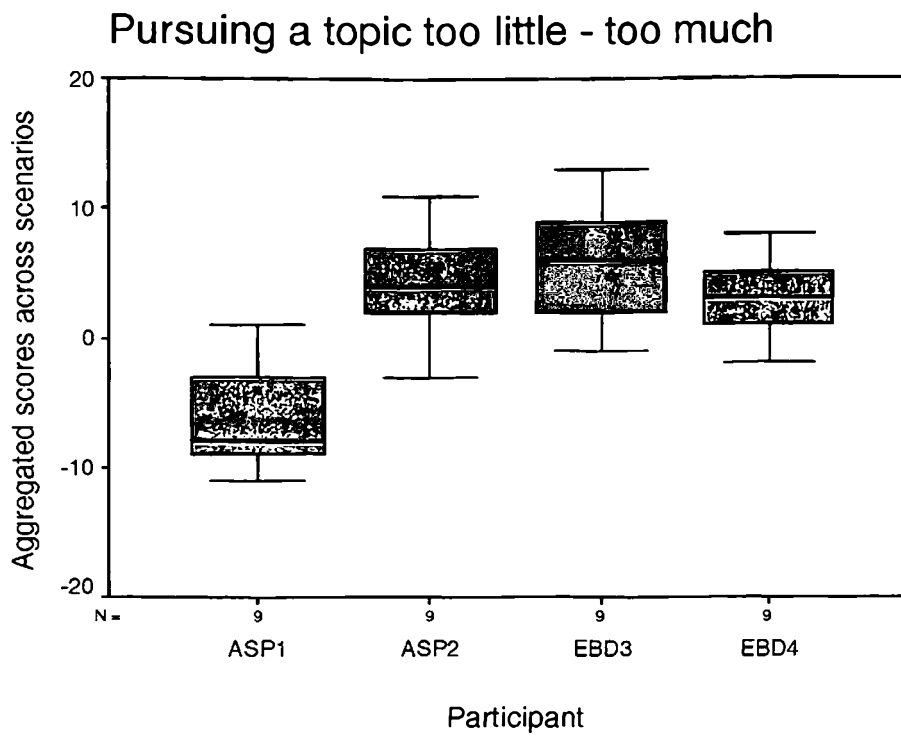
N.B. for paired comparisons to be significant they had to reach the 0.008 significance level (significance level  $\div$  number of pair comparison, i.e.,  $0.05 \div 6$ ), Bonferoni Test.

The analysis shows that there is a significant difference between the four individuals and that both D. and N. are rated as more polite than both the EBD participants.

However the paired comparison t-tests reveal that only EBD3 and EBD4 are non significant (i.e., they are alike).



**(Boxplot 9)**



Raters nos. 3 and 4 did not complete rating all the scripts, so their entire ratings for the dimension 'pursuing a topic too little - pursuing a topic too much' were discounted.

Within subjects (repeated measures) ANOVA:  $F(3,24) = 11.268, p < 0.001$ .

Paired Samples Test (Table 7)

		Paired Differences Mean	t	df	Sig. (2-tailed)
Pair 1	ASP1 - ASP2	-10.0000	-3.625	8	.007
Pair 2	ASP1 - EBD3	-11.6667	-5.433	8	.001
Pair 3	ASP1 - EBD4	-9.4444	-4.839	8	.001
Pair 4	ASP2 - EBD3	-1.6667	-.652	8	.532
Pair 5	ASP2 - EBD4	.5556	.216	8	.834
Pair 6	EBD3 - EBD4	2.2222	3.468	8	.008

N.B. for paired comparisons to be significant they had to reach the 0.008 significance level (significance level  $\div$  number of pair comparison, i.e.,  $0.05 \div 6$ ), Bonferoni Test.

The analysis shows that there is significant difference between the four individuals. However the paired comparison t-tests reveals that, based on the relative rating of his scripts, D. (Asperger 1) was rated as significantly pursuing a topic too little compared with N. (Asperger 2) and P. (EBD3) and W. (EBD4). Both D. and N. have the same diagnosis (Asperger's syndrome), but N.'s rating shows his dialogue scripts were not rated as significantly different from the two individuals with EBD. The paired comparison t-tests also reveal that the script ratings for P. (EBD3) and W. (EBD4) were on the cusp of a being significantly different.

## **5.3 Qualitative Analysis**

### **5.3a D. (Asperger 1)**

During the very first Bubble Dialogue session (scenario 1, 'Jane and Paul'), when the very first thought bubble appeared, D. said, " I don't know what Jane is thinking ".

Below is an extract from the Bubble Dialogue scripts from scenario 1, between D. and myself. D. plays Jane and I play Paul.

	Paul says:	" Do you like your chocolate milkshake then Jane."
	<i>Paul thinks:</i>	<i>" Jane's question is really silly. How could I know what drink she bought when I was in a different queue?"</i>
Jane says:	" Yes I do "	
	Paul says:	" Mine is a strawberry shake. ' It's my favourite."
	<i>Paul thinks:</i>	<i>" Actually I really like chocolate shakes as well. I wish I could try some of Jane's."</i>
Jane says:	" I don't like Chocolate Milkshake. My favourite is Vanilla."	
<i>Jane thinks:</i>	<i>" I am going to buy a Chicken Burger."</i>	

From the extract, Jane's speech and thought are very lacking in affect relative to Paul. Paul seems to be doing all the conversational 'work' and selecting avenues to continue with the interaction. Jane does not ask any questions and questioning is a conversational device which shows reciprocity and elicits responses.

From the outset, D. seemed to understand the comic book format of the program when D. said that it was, " hard to do comics because people who do *Judge Dread* (an established science fiction comic) do it because they have a creative imagination ".

D. mentioned that at school he found it hard to write a story, so he asked his sister to write it for him. He said it was because, " I have not got much of a creative imagination." D. said that it was hard to write stories because you have to make it up and he said that it was also true for writing for programmes like *Eastenders* or *Brookside* (both are long running terrestrial TV channel soap operas in the UK) because they are not real life. D. continued by saying that those programmes were not boring either. He said it was interesting how they make (presumably by 'they' he meant the programme makers) the story carry on. He asked me how people who make *Eastenders* and *Brookside* carry the storyline on. He asked me if they just made it up.

D. typed text into the speech bubbles for all the characters he played. However, D. seemed to find it very difficult to type what his character was thinking. Therefore he frequently did not type anything in the thought bubbles. D. often asked me, " should I write 'I don't know' ?", in the thought bubbles. I replied, " It is up to you what you write ".

As we progressed through the scenarios, D. seemed to find it increasingly difficult to type even speech. For example in scenario 3 (*Tricia and Sue*) both characters are chatting in a pub. When D. seemed to get stuck on this scenario, I eventually prompted him with some ideas about what to write: "What do people drink?", "What would they chat about? ". I played Tricia and D. played Sue.

Tricia says: " That is funny because I was so sure that my lighter was in my bag Sue."

*Tricia thinks: " I don't mind Sue borrowing my lighter, but I wish she put it back where she got it from."*

Sue says: " I am going to buy a pint of Cider."

Tricia says: " Are you planning on getting drunk Sue? If you are having a pint of Cider then so will I."

*Tricia thinks: " Sue can be such a bad influence on me, but she is my best mate."*

Sue says: " Yes, I am planning on getting drunk. I drink Cider like water."

Tricia says: " I know you do, but I get drunk very easily. Anyway I thought you hated cider and were a beer drinker? "

*Tricia thinks: " I really admire Sue because she can drink so much."*

Sue says: " I like Cider because it has a sweet taste. I don't much like beer much because it has a bitter taste."

Tricia says: " You know how bad for you smoking is? Have you every thought about giving up?"

*Tricia thinks: " I want to give up smoking, but Sue might not think I am cool anymore if I do."*

Sue says: " Yes, I do know how bad smoking is. I have thought about giving up, but I will carry on smoking for some time."

In session 5, D. was quite negative about things in his life and found it frustrating because he could not think of anything to type. In fact he only typed one sentence for scenario 5. Therefore, I decided to start scenario 6 during that session. D. seemed to find it easier to think of things to say, for his character, for that scenario and his confidence returned

In the example below D. also showed some evidence of impulse control. Jane is played by D. and Paul is played by myself.

Paul says: " I've run out of money Jane. May I borrow some from you and I promise to pay it back?"

*Paul thinks: " If I leave it long enough, maybe Jane will forget that I owe her some money."*

Jane says: " O.K. how much money do you want."

Paul says: " £1.50 will be enough thanks."

The dialogue shows that D. plays his character correctly by not acting on the information that resides in the deceiving private thoughts of my character

### 5.3b N. (Asperger 2)

The very first question N. asked me when we started the first Bubble Dialogue session was, " Can you do it in German? ". (One of N.'s obsessions is German. He can read, write and speak the language).

Eventually on the final dialogue scenario 6 (Katie and Tony), N. played a native German who spoke in English, but thought in German. Originally his character started to think in English, but in review mode he erased all the thoughts written in English and replaced them with German.

N.'s character's thoughts (in brackets) were translated by myself and edited by a Dutch postgraduate research student who spoke German.

		<i>Tony thinks:</i>	<i>" Gott im Himmel! Hier ist mein gluckiche Nacht. OHH JA! " (God in Heaven! This is my lucky night, OH YES!).</i>
Katie says:	" You're very quiet Tony. What are you gong to drink?"		
Katie thinks:	<i>" I hope he is not too shy. I wonder what he is thinking."</i>		
		Tony says:	" I'd like a nice, crrr, oh I'm sorry I feel somewhat shy about what's in for me."
		<i>Tony thinks:</i>	<i>" Mein Gluck hat rech!" (My luck is in!)</i>
Katie says:	" Don't be shy Tony. I know I'm very chatty but I'm quite a shy person inside."		

*Katie thinks: "It's nice to meet a man who does not just talk about sport and himself all the time."*

Tony says: "Did you know I'm German, actually I'm from the small province of the Rhine. Can you speak German at all, I love to here you speak German have a go?"

*Tony thinks: "Ich hoffe, dass sie Deutsch sprechen kann, oder sonst fahre ich nach Deutschland. Ohh bitte, sag doch etwas!"  
( I hope that she can speak German, otherwise I will go to Germany. Oh please, say something!).*

As N. and I progress through the first session, he said, "It's good this, it makes you think about thinking."

In contrast to the Bubble Dialogue sessions with D., N. and I would often laugh spontaneously about what our characters' wrote. While we were engaged in scenario 1, N. said, "I'm really enjoying this. I would like to do this all day. Before I wanted to do German all day. Now I want to do this".

During the third session (Scenario 3, *Tricia and Sue*), N. said, "I would not say this normally, but in thought this is what many people might put. This is the first time that I have used it. If you don't mind" (This is when N's character Sue thinks, "Fuck...", see extract below).



I replied to N., " You can put whatever you want ".

N. said, " This is very good because it expressed what people think and how they cope with arguments and things ".

I replied, " It is not you, it is the character you are playing ".

N. said, "You [Experimenter] can express yourself in the same way if you want " (i.e., my character could swear).

I replied, " No, I'm going to play it differently as a contrast ".

N. said, " It is going to make me look bad ".

I said, "No it is going to make her [Sue] look bad ".

Tricia says: " Okay, calm down.  
Let's not fight over something trivial.  
How about a drink? "

*Tricia thinks " I really like Sue, but sometimes she annoys me because she is in the wrong and gets upset with me."*

Sue says: " If only you're responsible for what had damn well happened?!!!! "

*Sue thinks: " FUCK IT! I wish people would stop being so indespicable!"*

Tricia says: " Fine let's forget the whole thing.  
To show how considerate I am, I'll buy the first round. What do you want to drink? "

While N. and I were doing scenario 5 (James and Scott), N. called me by my character's name, playfully saying, "Thanks James". Jones (1996) states that one of the strengths of Bubble Dialogue is its use as a tool for emotional expression. Jones (1996) found that some participants identified with their on-screen character by typing the personal pronoun 'I'. In the above occurrence, N. demonstrated that he comprehended my two identities: as character on-screen and as player in real life by using the my character's name, James, to refer to me in real life. N. showed that he identified with character's on-screen because he was able to take those roles out of the screen and into real life.

**5.3c P. (EBD 3)**

In contrast to D. and N., I unfortunately had very little time to spend with and get to know both P. and W.

I was left with the impression that both P. and W. really enjoyed the Bubble Dialogue experience. They both seemed to find it very liberating and I think it facilitated the building of a relationship between us.

Below is an extract from Scenario 5 (James and Scott). Scott is played by P. and James is played by myself.

Scott says: " i know that sarah will be exited but what is the fucking matter with you."

*Scott thinks: " he worries too much.....the fucking arsshole."*

James says: " All right. We'll do things your way, but you can lie to her because I am not."

*James thinks: " I think maybe I need not worry so much."*

P.'s characters were often very aggressive, coarse and usually evoked a strong response from my character. However, at no point did P. or I feel any animosity between us in real life because there was always an emotional distance provided by the computer.

### 5.3d W. (EBD 4)

W. played equally aggressive, but not quite as coarse characters as P. and in scenario 3 (Tricia and Sue) W. showed appreciation for an act of friendship. In this extract from scenario 3, Sue is played by W. and I played Tricia.

Tricia says: " That's okay you can borrow my lighter anytime. Do you fancy a drink? "

*Tricia thinks: " I wish that Sue would put things back where she got them from."*

Sue says: " thankyou that is nice.you do not mind"

*Sue thinks: " i wish she would ask me for a drink. "*

Tricia says: " I'll buy the first round. Do you want Cider, Beer, or a Vodka and Orange? "

*Tricia thinks: " I really like Sue because she can drink as much as me."*

## **Chapter 6**

### **Discussion**

" Education costs money, but then so does ignorance. "

(Sir Claus Moser)

#### **6.1 Does the Bubble Dialogue experience bring about any change in interpersonal understanding in adults with Asperger's syndrome?**

From the results it seems that the experience of Bubble Dialogue, presented through six theory of mind inspired scenarios, did not induce a detectable change in interpersonal understanding as measured by Frith et al.'s (1994) supplementary VABS items. The lack of change in interpersonal understanding, as indicated by the VABS scores, is supported by the blind ratings of the emotionally flat to emotionally charged dimension for both D. and N. These ratings show no increase in relative emotional 'chargedness' from session 1 to session 6 for both participants with Asperger's syndrome which suggests D. and N. have shown no improvement in this dimension over time, with increased experience with Bubble Dialogue.

The results could be interpreted in four ways,

1. The experience of Bubble Dialogue produced an improvement in interpersonal understanding, but was too weak to be detected by the supplementary VABS items.
2. The VABS is not a sensitive enough measure to detect/pick up any such change, despite being a widely used clinical tool.
3. That both D. and N. already possessed the ability to mentalize and so the Bubble Dialogue experience was of no further benefit to them.
4. That D. and N. do not have the ability to mentalize and that the experience of Bubble Dialogue did not help improve their interpersonal understanding.

The supplementary item VABS scores, for both D. and N., were very similar in comparison with the children with autism who participated in Frith et al.'s (1994) study. In their investigation, children who passed the first and second order theory of mind tasks scored a mean of 20 for active sociability (behaviours that could be performed without the ability to mentalize) and 8.8 for interactive sociability (behaviours which supposedly could not be performed without the ability to mentalize). Only three of the autistic passers had moderately high interactive scores (11, 15 and 22, out of a maximum of 32).

Before and after the Bubble Dialogue experience, D. scored the same for both active and interactive sociability: 20 and 14 respectively. Before the Bubble Dialogue experience N. scored 19 and 11 for active and interactive sociability respectively and

after the BD experience scored 21 and 9. Therefore D. and N. may be amongst the 'talented minority' and hence were able to mentalize in everyday life prior to the experience of Bubble Dialogue

## **6.2 Is it better to teach rules for understanding others' mental states or is it better to learn by experience: role taking via simulation?**

The results leave this question still unanswered because Hadwin et al. (1996, 1997) found that rule based teaching did not bring about a generalised improvement in non-taught areas and the results of this experiment did not reveal any improvement in interpersonal understanding.

However, N., P. and W. often said how much they enjoyed the Bubble Dialogue experience and I (as the experimenter) found it very engaging too. Therefore in addition to being interactive, Bubble Dialogue provides a very humanistic and non socially threatening way to engage role-play and experience other people's perspectives.

It is interesting to note how both D. and N. viewed the sessions. N. thought that he was engaged in something very psychological (and perhaps a form of therapy) because when a house mate of his interrupted us during one session, N. said to him, "Excuse me, we are doing some psychology work here".

D. in contrast saw the sessions as a piece of creative English language work. At first he believed that the Bubble Dialogue experience would provide him with a creative imagination, but as he and I progressed to the latter sessions he became increasingly disillusioned as he realised that this was not going to happen.

Both adolescent men with EBD also became very engaged with Bubble Dialogue. They seemed to enjoy the open-ended nature of the program which enabled them to play characters that did not have to conform to any of the social rules that they themselves probably had to observe at school. Their characters could say and think anything they wanted. Both P. and W. asked me for copies of their scripts to keep.

#### **6.2a What does the experience of using the Bubble Dialogue program and the Bubble Dialogue scripts tell us about autism?**

During the Bubble Dialogue sessions, D. articulated that he wished he had a creative imagination. Leslie (1988, 1991) argues that the ability to pretend, which depends upon imagination, is probably the most basic form of understanding about metarepresentation. Accordingly, pretence is importantly and inextricably linked with the attribution of mental states to other people (Leslie 1988, 1991). Moreover, Harris (1991) states that it is imagination that facilitates the ability to put oneself in someone else's position, so it could be argued that it is imagination that drives the ability to mentalize.



Therefore, if imagination and pretence form the basis of a representational theory of mind and Bubble Dialogue intrinsically necessitates the use of imagination to role play, then this capacity ought to be better reflected in the VABS scores. Although D. was disappointed in his own inadequate ability, both D. and N. had sufficient imagination to engage in Bubble Dialogue. According to Leslie's (1988, 1991) and Harris's (1991) theories, both D. and N. have the ability to mentalize. Consequentially, it could be argued that Frith et al.'s (1994) supplementary VABS items do not provide a sensitive measure of mentalizing in everyday life.

Hadwin et al. (1996) found that the pretence group in their study showed no significant improvement in their production of spontaneous play, which suggests that rule-based teaching of mental states does not influence the imaginative and pretending capacity of individuals with autism.

It is probably the case that the kind of experience engendered in Bubble Dialogue offers a better opportunity to improve imagination than rule-based teaching.

## **6.2b Are individuals with Asperger's syndrome capable of metarepresentation?**

While N. and I were engaged in scenario 4 (James and Scott), N. called me by my character's name. He said to me, "Thanks James". In this example, N. actually labels me with the name of an on-screen character. N. did not confuse my real identity with the character's identity, and so it seems that he understood that I had two representations: the character on screen and person playing the character. N.'s identification of both my roles seems in direct contradiction to Leslie's dysfunctional metarepresentational device theory of autism because it could be argued that to play Bubble Dialogue, users have to comprehend that the on-screen characters and the individuals playing the character are metarepresentations and primary representations respectively.

According to Leslie (1988, 1991), the inability to pretend X is Y arises because of failure in autism to 'decouple' the pretend identity of 'X' from the primary identity 'Y'. D. and N. appear to have no such difficulty because they both are able to role-play characters and by that virtue are able to be both themselves and their on-screen characters.

### **6.3 Blind ratings of the Bubble Dialogue scripts**

The Bubble Dialogue scripts and the participants' comments are insightful and interesting in themselves. However the objective analysis required a method to analyse the scripts quantitatively.

Autism remains an enigmatic disorder and the adjective 'autistic' still requires further complete definition. The blind rating of these autistic scripts offers the opportunity for an insight into the speech and perhaps more interestingly the thought of people with autism. Of course the underlying assumption is that the participants with autism conduct their characters in a similar way in which they function themselves.

Another way of investigating this would be to work 'backwards', by asking blind raters to describe the Bubble Dialogue scripts and then construct dimensions based on the raters' adjectives and comments. For example, one group of blind raters might be asked to list all the adjectives that they would use to describe the dialogues produced by the participants with Asperger's syndrome. Next, a second set of blind raters would be asked if they agreed with the adjectives chosen by the first rater group. Then we could start to quantify the degree of inter-rater agreement and select those adjectives with highest degree of agreement and use them to form the rating dimensions for a third set of blind raters. This procedure would allow us to further investigate what the adjective 'autistic' means.

This method could form the basis of another investigation using the Bubble Dialogue scripts from the current study and future studies.

#### **6.4 The method of analysis**

Bubble Dialogue is a program where typically two users interact. Hence, one player's character's rated scores are going to reflect the interaction between both the users' characters.

The method used in this study involves the subtraction of the experimenter's (my) rated scores from the participants' rated scores. This produces a number which reflects the interaction between both the Bubble Dialogue users, a numerical value which can then be used in quantitative analysis.

For example, this number may represent how emotionally charged a participant's character is relative to my character. A negative number means that their character was rated less emotionally charged than my character. A positive number means that their character was rated more emotionally charged than my character.

The methods of,

1. using blind raters and
2. formulating a numerical value which represents an interaction between two people,

are both potentially useful because they are methods that could be applied to qualitative transcriptions from any source. For instance it could be used to investigate *scaffolding* in teacher-child collaborative learning, e.g., if/how teachers ‘teach’ children the private/public distinction between thoughts and speech. Blind raters could be asked to assess teacher-child Bubble Dialogue scripts for leakage from thought of person A to speech of person B as if the thought of person A were not private and subjective.

### **6.5 What do the blind ratings show?**

The blind rating analyse, in the three dimensions, show that although both D. and N. have the same diagnostic label of Asperger’s syndrome, the Bubble Dialogue scripts they produced were rated differently from each other. N.’s scripts adduced ratings that were not significantly different from both adolescents with EBD, along the emotionally flat-charged dimension and pursuing a topic.

Does this mean that N. was incorrectly diagnosed? This seems unlikely. The rating differences perhaps highlight that even individuals with the more specific autistic label of Asperger’s syndrome can vary, and Bubble Dialogue could elicit social interactions indistinguishable from other populations.

It is important to note that autism is usually diagnosed after looking at an individual’s developmental history rather than a ‘snapshot’ of their profile at one point in time.

The blind rating analysis also highlights how similar, though in different ways, the adolescents with EBD are in comparison with at least one individual with autism. Arguably normal controls are needed to further emphasize the differences and similarities between individuals with autism and individuals with EBD.

### **6.5a Emotionally charged – emotionally flat**

The results from the analysis for both D. and N. support Hobson's socio-affective theory and Kanner's original clinical observations that individuals with autism are impaired in their social and emotional connectedness because the Bubble Dialogues D. and N. produced were rated as being the most relatively emotionally flat of the four participants. Moreover, their rated level of emotionality did not change with increased exposure to Bubble Dialogue.

### **6.5b Polite – coarse**

These results show that despite their lack of affect some individuals with Asperger's syndrome can be viewed as polite. This raises the interesting question, "Can a person be truly polite if s/he does not have the ability to mentalize?". I argue that in order to be truly polite an individual needs the capacity to impute mental states to others, otherwise being polite is merely a behaviourally learned response to a set of social cues.

### **6.5c Pursuing a topic too little – pursuing a topic too much**

The 'Pursuing a topic' dimension was designed to tap into autistic perseveration. However, the raters rated D.'s character as pursuing a topic too little relative to my character.

Therefore this dimension may have been picking up how lacking in social reciprocity D.'s character was being relative to my character. Accordingly, the raters might have viewed and rated D.'s character as not being sensitive or responsive enough.

Indeed perseveration may not be a characteristic of individuals with Asperger's syndrome who show normal scores on the WCST (as D. and N. do on post-test), because according to Shallice (1988) individuals who do not show frontal lobe patient scoring on the WCST have an intact Supervisory Attentional System (SAS) (Norman and Shallice, 1986).

The SAS allows the individual to change a program once it starts running.

Shallice (1988) uses this computational analogy to illustrate that perseverative scoring on the WCST indicates that once an internal program has been fixed or set (i.e., sort by colour) it cannot be changed because of damage to the SAS.

**6.6 Are there any other questions that could be answered by using the same blind rater method?**

When using Bubble Dialogue, thoughts (which are normally private and hidden) become public and visible and so typically two users have access to the thoughts of each others' character. In short, the users are able to mindread. If a user plays their character 'correctly', then their character will not act upon the knowledge that resides in the private thoughts of the other user's character. However, the user's informational access to thoughts may unwittingly or knowingly be fed into the verbal responses of the user's character.

A possible way to capture and quantify this complex process could be to ask blind raters to assess whether there is leakage from thought of person A to speech of person B as if the thought of person A were not private and subjective.



## 6.7 Control measures

The control measures in the study were the British Picture Vocabulary Scale and the Wisconsin Card Sorting Test.

The results show very little difference in the BPVS scores before and after the Bubble Dialogues sessions for both D. and N. However, D. and N. show a striking improvement in WCST in terms of a reduction in the number of perseverations and an increase in the number of categories they managed to correctly sort.

What does this mean, given that WCST is thought to be a measure of perseveration (Pennington and Ozonoff, 1996)? There 3 questions worth considering.

### 1 Is there a general improvement in overall functioning?

This seems unlikely because the BPVS scores are stable for D. and N. both before and after the Bubble Dialogue experience. This suggests that there was no increase in overall cognitive function as a result of the Bubble Dialogue experience nor was there any global 'across the board' increase in cognitive function arising from developmental changes.

### 2 Have D. and N. learned a strategy for overcoming their perseverations? If so what is this strategy?

How could D. and N. overcome perseverating? Could it be that they used their memory in some way? (Note that good rote memories make up part of the

Asperger's syndrome profile). D. and N. could have worked out a strategy for remembering the WSCT, but how?

### 3 Did the Bubble Dialogue experience bring about the change in WSCT scores?

A way to have tested the above three points, would be to have used The Behavioural Assessment of the Dysexecutive Syndrome (BADS ) (Wilson et al., 1996) which according to Evans, Chua, McKenna and Wilson (1997) is ecologically valid test of executive function.

If D. and N. improved on the BADS as well as the WSCT then perhaps the conclusion would be that their executive function did improve as a result of the Bubble Dialogue experience.

However, if they improved on the WSCT, but did not improve on the BADS, then it could be that their executive function has not improved but they are utilising, learning and applying strategies from their memory of their previous encounter/testing with the WCST.

It is impossible to know whether the improvement in the WSCT scores was a true effect of the Bubble Dialogue experience, or if it was simply due to the effect of practice/memory. The only way to determine this would be to have given D. and N. the WCST more than once before the dialogues (AABA, i.e, give D. and N. more than

one pre-Bubble Dialogue baseline). We could re-test them now and see if the effect has worn off (rather like in a drug paradigm). However, the change in the learning of the WCST could be permanent.

If there was no improvement in the BADS between the two pre-dialogue administrations, and if improvement then occurred only after the dialogues, this would provide evidence that the higher WCST scores really were due to the Bubble Dialogue experience.

Ferland, Ramsay, Engeland and O'Hara (1998) found that clinically normal male participants showed little evidence of gaining in performance after repeat (two) administrations of the WCST. Ferland et al's (1998) normal male group (n=22) scored a mean of 11.0 perseverative responses on the first administration of the test and 6.6 on the second administration. The group sorted a mean of 5.7 categories on the first administration and 6.0 categories on the second. Neither of these results were statistically significant which suggests that the WCST scores are robust over administrations.

In comparison, D. made 105 perseverative responses and sorted 2 categories before the Bubble Dialogue sessions. He made 28 perseverative responses and sorted 3 categories after the Bubble Dialogue sessions.

N. made 65 perseverative responses and sorted 2 categories before the Bubble Dialogue session. He made 9 perseverative responses and sorted 6 categories after the Bubble Dialogue sessions.

Ferland et al.'s (1998) results show how 'prefrontal' both D. and N.'s scores were prior to the Bubble Dialogue intervention, in comparison to normal males. Yet strikingly, post Bubble Dialogue, N.'s scores were almost identical to Ferland et al.'s (1998) normal male group.

It could be argued that testing clinically normal individuals with the WCST might result in ceiling effects on the number of perseverations because the typical clinical procedure in the WCST is to continue the test until six categories are sorted. Ferland et al. (1998) neatly ruled out this possibility by analysing their results in two ways,

- i. based on the responses made up to completing six categories for all 128 responses, whichever came first (which is the procedure used in this study and in clinical practice).
- ii. based on all 128 responses for all participants.

Even when the experimenters analysed their results based on all 128 responses, they found no significant decrease in perseverative response from the first to the second administration.

Therefore, although it cannot be concluded that the Bubble Dialogue experience produced an improvement in executive function in the participants with Asperger's syndrome, Ferland et al's (1998) results suggest that this explanation cannot be ruled out either.

### **6.8a Does Bubble Dialogue provide a link between Theory of Mind and Executive function?**

Returning to Norman and Shallice's (1986) Supervisory Attentional System model, it could be argued that aspects of Bubble Dialogue require executive function resources because the,

"SAS is construed as being necessary for effective control of action in a number of situations: situations that involve planning or decision making; situations that involves error correction or troubleshooting; situations where responses are not well learned or contain novel sequences of actions; situations judged to be dangerous or technically difficult; and finally situations that require the overcoming of strong habitual response or resisting temptation."

(Evans et al., 1997, p. 636)

When using Bubble Dialogue, thoughts (which are normally private and hidden) become public and visible and so the users have access to the thoughts of each other's character. The users are literally able to mindread. If a user plays their character

'correctly', then their character will not act upon the knowledge that resides in the private thoughts of the other user's character. This ability requires the inhibition/impulse control of actions that might stem from knowledge acquired from the other user's character's thoughts.

Additionally, using Bubble Dialogue effectively needs flexibility of thought and action and it requires planning in how next to progress the dialogue.

### **6.8b Is the development of Executive function the precursor to the development of a Theory of Mind?**

Speculatively, it could be that development in executive function precedes changes in mentalizing and that is why D. and N. showed improved scores in the test of executive function (WCST). There might be a time lag before we see parallel improvements in the supplementary VABS items (the measure of mentalizing in everyday life).

This raises a cardinal question in contemporary developmental psychology: how is executive function related to theory of mind? Ozonoff et al. (1991a) list four explanations of how deficits in the two may be related:

1. one deficit is primary and causes the other, which is secondary,
2. one deficit is primary, but does not cause the other which is a correlated deficit caused by brain damage to a neuroanatomically proximal system,

3. a third deficit is primary and causes both executive function and theory of mind impairments,
4. both executive function and theory of mind deficits are independent primary deficits of autism.

Perner (1997) argues that actions are as based on intention and therefore some higher order desire/want/need antecedes the planning and organisation required for that goal to be attained. Consequently, Perner (1997) states that a theory of mind is prerequisite to executive function. Perner uses Ozonoff et al.'s (1991) term Executive Function as a generic term for both Baddley's (1990) Central Executive and Norman and Shallice's (1986) Supervisory Attentional System. However, Perner does not acknowledge the link between cognitive and sensorimotor expressions of executive function.

Denkla (1996a) lists four elements of executive function: initiating, sustaining, shifting and inhibition/stopping. Denkla (1996b) suggests that executive function may be considered as metacognitive, but that it ought to remain close to its clinical neurology roots of motor praxis or 'execution' in for example motor sequencing tasks (Denkla, 1996b).

According to O'Neill and Jones (1997) individuals with autism, across the autistic spectrum, exhibit stereotypic perseverations (e.g., coin spinning). Furthermore, O'Neill and Jones (1997) counsel against attempts to systematically investigate one

aspect of autism in isolation because such a stance does not reflect the complexity and multidimensionality of human behaviour. Hence Perner's narrow view of executive function fails to integrate other non cognitive characteristics, i.e., movement disorders associated with autism (Bauman, 1992; Maurer and Damasio; Wing and Attwood, 1987).

This argument cannot be made against Russell (1996) who advocates that theory of mind tests rely on executive function abilities. Russell's (1996) position both accommodates and is compatible with the theoretical integration of the motor features of autism with its cognitive characteristics.

If D. and N. show improvements in executive function before improvements in mentalizing then the data would support Russell's (1996) position and any temporal relationship between improvements in executive function and improvement in mentalizing would indicate the direction of causality.

A way to test this would be to interview D. and N.'s carers again, at a future point, with Frith et al.'s (1994) supplementary items for the Vineland Adaptive Behavioural Scales. If it was found that after some time both D. and N. were rated as showing increased mentalizing, then it would suggest that before an individual develops the ability to represent mental states they first develop the ability to plan and execute the actions, i.e., actions before intentions.



## **6.9 Conclusion**

The results of my work suggest that future research needs to be directed at developing simulation/experiential interventions, and investigating their efficacy, for individuals with Asperger's syndrome rather than rule teaching-based programmes. The use of computer software, like Bubble Dialogue, provides an engaging and humanistic way of facilitating this.

The methodology of using blind raters, developed in this study, is a technique that can be applied to other investigations; i.e., experiments where it would be valuable to obtain blind, third party, descriptive measures of participant produced scripts from any source.

Additionally, more research needs to be carried out detailing the cognitive neuropsychology of autism and using the executive function paradigm to provide a more complete theoretical picture of autism.

I advocate that this future research needs to support an evidence based paradigm shift to integrate both the cognitive and sensorimotor profiles of autism.

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