

THE MOTIVATIONAL PROFILES OF GOLFERS AT VARIOUS STAGES OF THE TALENT
DEVELOPMENT CONTINUUM: AN ECOLOGICAL DYNAMICS AND SELF-
DETERMINATION THEORY PERSPECTIVE

By

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ABSTRACT

A central challenge in the acquisition of exceptional ability is that of creating the motivation required to engage successfully in the activity (Sosniak, 2007). Given that 'ability' is context specific, more knowledge of the construct of motivation is needed in the situated context of performance sport (Roberts et al., 2007). As such this study is an exploration of the self-determining characteristics of golfers at typical stages on a continuum towards world-class performance, including the change from amateur into professional sport.

Data was collected from the following sample groups: College Student (CS; n=14); Elite Amateur (EA; n=17) and Elite Professional (EP; n=18) using the Sports Motivation Scale-6 (SMS-6; Mallett et al., 2007). Internal consistency of the scale was tested based on Cronbach's coefficient alpha (Cronbach, 1951) before univariate analysis (ANOVA), multivariate analysis of variance (MANOVA) and post-hoc analyses were applied to the data. The EA group ($M=55.18$, $SD=17.96$) reported higher 'relative autonomy' than both the CS ($M=39.21$, $SD=10.44$) and EP ($M=44.61$, $SD=14.81$) groups. Individual subscale analysis suggests the CS group ($M=22.07$, $SD=2.64$) and EA group ($M=23.12$, $SD=3.28$) practice their sport for more intrinsic reasons than the EP group ($M=19.17$, $SD=4.33$). In relation to extrinsic motivation the EP group ($M=9.33$, $SD=3.58$), comparative to the CS group ($M=18.00$, $SD=5.16$) and EA group ($M=15.41$, $SD=6.32$) reported lower levels of this type of motivation.

These findings suggest that motivation is potentially affected by situational contexts, and the dynamic non-linear nature of human development. Once more is known about the prevailing cultures and demands of specific performance contexts more can be done to help the transition from one level of performance to the next.

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TABLE OF CONTENTS

Chapter 1: INTRODUCTION	1
1.1 Introduction to chapter	1
1.2 Talent Identification and development	1
1.3 Theoretical Background of the study	2
1.3.1 Ecological Dynamics.....	3
1.3.2 Self Determination Theory	4
1.4 Aim of the Study	6
1.5 Overview of the thesis	7
Chapter 2.0: LITERATURE REVIEW	8
2.1 Introduction to the chapter.....	8
2.2 Nature versus nurture	8
2.3 Modelling talent development.....	10
2.4 The practice hypothesis	15
2.5 Ecological dynamics.....	21
2.6 Non-linear pedagogy and constraints-led coaching	23
2.7 Early motivational theory	26
2.8 Self-determination theory	28
2.9 The Sports Motivation Scale and integrated regulation	37

2.10	Self determination theory and ecological psychology	38
2.11	Chapter conclusion	40
Chapter 3: METHODOLOGY		41
3.1	Introduction to chapter	41
3.2	Methodological Background	41
3.3	Theoretical rationale	42
3.4	Pilot Study	44
3.4	Research Design	46
3.4.1	Participants	46
3.4.2	Data Collection	47
3.4.3	Instrumentation - The Sport Motivation Scale 6	48
3.4.4	Data Analysis	49
3.5	Chapter Conclusion	50
Chapter 4.0: RESULTS AND DISCUSSION		52
4.1	Introduction to chapter	52
4.2	Results	52
4.2.1	Reliability and validity	52
4.2.2	Relative Autonomy Index	54
4.2.3	Individual Subscales	54

4.3	Discussion.....	57
4.3.1	Individual subscale analysis	57
4.3.2	The relative autonomy of high performance golfers	61
4.3.3	Non-normal data in non-linear systems.....	64
4.3.4	Theory to practice – pedagogy of emergence.....	67
4.3.5	Limitations and future directions.....	72
4.4	Chapter conclusion	74
	Chapter 5: CONCLUSION	75
5.1	Introduction to the chapter.....	75
5.2	Summary of research findings	75
5.3	Implications	77
5.4	Final thoughts	78
	Chapter 6: APPENDICES	80
6.1	Appendix A - The Sports Motivation Scale – 6	80
6.2	Appendix B - Example participant information letter	81
6.3	Appendix C - Example consent form	82
	Chapter 7: LIST OF REFERENCES	83

LIST OF TABLES

Table 1 – Cronbach’s Alpha values for the SMS-6 subscales.....	53
Table 2 – Mean difference in relative autonomy.....	54
Table 3 – Pearson correlations, means and standard deviations	55
Table 4 – One-way ANOVA’s between self-determined subscales and career stage.....	56
Table 5 – Mean differences self-determined subscales and career stage	57

LIST OF ILLUSTRATIONS

Figure 1 – The category of constraints that specify the optimal pattern of coordination and control (Newell, 1986).....	25
Figure 2 – Graphic overview of the self-determination theory view on the role of need satisfaction and need frustration (Vansteenkiste & Ryan, 2013).....	29
Figure 3 – The types of motivation and regulations within self-determination, along with their placement along the continuum of relative self-determination (Vallerand et al., 2008).....	32

ABBREVIATIONS

A list of abbreviations that are contained within the current thesis is provided below:

ACK - Autocatakinetic

ANOVA - Univariate analysis

ATDE - Athletic Talent Development Environmental Model

CS - College Student

DMGT - Differentiated Model of Gifted and Talented

DMSP - Developmental Model of Sports Participation

DP - Deliberate Practice

EA - Elite Amateur

ED - Ecological dynamics

EP - Elite Professional

LTAD - Long Term Athlete Development

MANOVA - Multivariate analysis of variance

M – Mean

RAI - Relative Autonomy Index

SDT - Self Determination Theory

SD – Standard deviation

TD - Talent development

TGfU - Teaching Games for Understanding

TID - Talent Identification and Development

SMS - Sport Motivation Scale

SMS-6 - Sports Motivation Scale-6

Chapter 1: INTRODUCTION

1.1 Introduction to chapter

In order to set the scene for the study, this chapter begins by offering a brief introduction to the field of talent identification and development (TID), and highlights some current issues and future directions for the field. After which the theoretical background and aim of the study is sketched out in order to orientate the reader to the direction and philosophical perspective of the work. The chapter concludes by presenting an overview of the thesis structure.

1.2 Talent Identification and development

TID is viewed as the best means with which to direct support to those individuals who have the greatest potential to achieve senior international success in sport (Abbott & Collins, 2002). However, due to the cost associated with the development of expert performance, only a relatively small number of individuals are selected for talent development initiatives. This has resulted in the expectation that TID must show a return on investment if it is to be meaningful (Tranckle & Cushion, 2006), particularly as a disproportionate funding bias is enjoyed by high profile elite sports (Collins et al., 2012). Potentially working within these parameters leads to unrealistic expectations and exploitation of young people for extrinsic gain (Tranckle & Cushion, 2006).

In many instances talent identification continues to be based on ‘one off’ performance observations that have been shown to be poor indicators of eventual attainment (Abbott & Collins, 2004; Martindale et al., 2005; Vaeyens et al., 2008). According to Martindale et al. (2013) effective TID practice does exist in some instances, however widespread and evidence

based policy and practice still eludes the talent development process. Instead, according to Collins and Bailey (2012), TID policy direction in the UK continues to be allured by successful national systems from other countries and ‘sciencey’ sounding initiatives that lend ‘credibility’ to otherwise dubious ideas. The latest manifestation of which has been the adoption in the UK of the Long Term Athlete Development (LTAD; see Balyi, 2002) model. Aside from issues in relation to the evidence base of the LTAD model (see Williams & Ford, 2009; Ford et al., 2011), and despite the inability of one dimensional, linear models to capture the multiplicative nature of biological organisms (Hristovski et al., 2010), LTAD has been implemented in the UK in much the same way as it has been implemented in other countries in relation to content and approach (Day, 2011). It is therefore comparatively clear that for the field of TID to move forward, at policy and practitioner level, meaningful debate must take place where new ideas are located within a comprehensive worldview and consistent epistemology (Butler et al., 2012). Furthermore the debate must take place using language that is ‘accessible’ to those not aligned to a particular philosophical position, only once this is achieved will reliable and valid evidence based research begin to contribute to the creation of sports ‘systems’ able to support young athletes in reaching their full potential (Pankhurst & Collins, 2013).

1.3 Theoretical Background of the study

Increasingly, the major independent variable mediating the transformation from one level of performance to the next is thought to be practice and concomitant with this is the use of time in the process (Deakin et al., 2007). As such the theoretical frameworks guiding this study are: Self Determination Theory (SDT), whose area of investigation is peoples’ inherent growth tendencies (see Ryan & Deci, 2000); and ‘ecological dynamics’ (ED) whose primary area of investigation is

the mechanisms by which biological ‘dynamical’ systems change as a function of time (see Svenson, 1998; Helensen, 1998; Urry, 2005). This study embeds these frameworks within a ‘functionalist’ ontological and epistemological worldview in which the organism and the environment constitute a single system. In keeping with a functionalist perspective, variables of interest are isolated (i.e. career stage and motivation) for the purposes of identifying the relationship between the variables and the preferred states of the collective variables (i.e. self-determined motivation) at different points in time and in different situations (Thelen & Smith, 2007).

1.3.1 Ecological Dynamics

Encouragingly the last few years has seen the emergence of different paradigms in the development of research on expert performance in sport (Hodges et al., 2007); and the polarities that engaged developmental theories of the past (e.g. nature versus nurture; genotype versus phenotype) have been replaced by theoretical models that have their roots in systems theories that stress the dynamic nature of human development (Lerner, 1998; Thelen & Smith, 2007). Although previous, and apparently ‘seminal’ research in the field of talent development (TD) has characterised the development of exceptional ability as a transformative and adaptive process spanning several years (Bloom, 1985); involving phenotypic gene expression induced by ‘time and effort’ and quality and quantity of practice (see Ericsson et al., 1993; Ericsson, 2007). They failed to provide evidence of casual relationship due to their one dimensional and overly reductionist methods. Encouragingly, ‘systems theories’ are beginning to broaden the ontological core of the field as they are not limited by one-dimensional portrayals, in which the developing person is biologised, psychologised or sociologised. Instead in contemporary developmental

theories the individual is ‘systemised’ within an integrated matrix of variables derived from multiple levels of organisation, as such development occurs from the dynamic relations among the variables within a multi-tiered matrix (see Lerner, 1998).

As such insights from theoretical frameworks such as ‘ecological psychology’ and ‘dynamical systems theory’ have the potential go beyond the microscopic explanations of the past because they attempt to describe, explain and predict how individual change occurs (see Chow et al., 2009). The term ‘dynamic systems’ in its most generic form refers to the elements of a system that change as a function of time (Thelen & Smith., 1998), which can be represented quantitatively or qualitatively. Framing human development in this manner is associated with the powerful influence of ‘functionalist’ philosophical thinking (Davids et al., 2007). The most prominent contemporary meaning of functionalism “...entails a commitment to defining all psychological phenomena and states in terms of causes and effects” (Overton 1998, p. 170) and a reluctance to resort to cognitive constructs such as mental representations in explaining human behaviour (Beek et al., 2004). Instead physical phenomena are characterised as dynamic, nonlinear biological systems (Seifert et al., 2013), capable of spontaneously self-organising under constraints (Renshaw et al., 2009); making them non-algorithmic, non-computational (see Hanford, 1997; Kondepudi, 2012; Turvey & Carello, 2012) and non-representational within one-dimensional and linear thinking.

1.3.2 Self Determination Theory

Research utilising ‘systems’ theory typically begin by the identification of one or two key variables that captures the degrees of freedom of multi-dimensional systems and the preferred states of these variables at different points in time (Thelen & Smith, 2007). Given the level of

intensity needed to reach elite levels of performance it is thought that a key 'dependent' variable mediating the acquisition of expertise is 'motivation' (Ericsson et al., 1993; Abbott & Collins, 2004; Sosniak, 2007). Furthermore motivation, just like all other neurophysiological constructs, is not an entity but a process (Roberts et al., 2007).

It is acknowledged by motivational theorist (e.g. Roberts et al., 2007) that studying individuals in isolation to their environment, when the situational criteria are clear (e.g. in performance sport), provides a far from clear understanding of the behavioural processes. Situated motivation is necessarily unstable, as situations elicit different emotions, interpretations of events and reactions from individuals (Page & Turner, 1994). However, not much is known about the construct of motivation and its effect on the acquisition of high levels of performance. As such a suitable guiding framework with which to begin to understand more about 'situated motivation' in high level sport is SDT (Ryan & Deci, 2000) as its area of investigation is the inherent growth tendencies and innate psychological needs that form the basis for self-motivation and personality integration. SDT postulates that the reasons why individuals choose to participate, exert effort, and persist in an activity can be classified along a continuum of self-determined behaviour (Hollembek & Amorose, 2005). The main thrust of which is the belief that no other single phenomenon reflects the potential of human nature more than intrinsic motivation (Ryan & Deci, 2000). At the most self-determined end of the continuum is intrinsic motivation, when an individual is this form of motivation their participation is thought to be volitional and for the pleasure of the activity itself (see Ryan & Deci, 2000). Crucially, however, SDT recognises that not all human endeavours are intrinsically enjoyable in which case self-determined behaviour is a reflection of the extent to which the individual is able to internalise and integrate the regulation of extrinsic behaviours (Ryan & Deci, 2000; Ryan & Deci, 2007). As

such, as well as representing the most non-self-determined form of motivation (amotivation) and the most self-determined type of motivation (intrinsic motivation; Hollembeak & Amorose, 2005); the continuum also reflects four different types of extrinsic regulations (external regulation, introjected regulation, identified regulation, and integrated regulation) each suggesting a different level of self-determination.

1.4 Aim of the Study

This study is an exploration of the self-determining, motivational characteristics of high performance golfers across three typical career stages on a continuum towards world class performance. As such the independent variable of ‘career stage’ (college student, elite amateur, elite professional) and the six dependent variables of self-determination theory (Intrinsic Motivation, Integrated Regulation, Identified Regulation, Introjected Regulation, Extrinsic Motivation and Amotivation) are isolated for the purposes of identifying the relationship between the variables and the preferred states of these collective variables at different points in time and in different situations (Thelen & Smith, 2007).

Whilst this study is ‘comparative’ in nature, it is tentatively hypothesised that the long intensive hours of practice needed to reach elite levels of performance (see Ericsson et al., 1993) is sustained by high levels of intrinsic motivation. Furthermore, and for the purpose of understanding more about the unique motivational orientations across varying career stages, secondary analysis of the data is conducted using a quasi-qualitative approach commonly adopted when using psychometric tests (Henn et al., 2006). Most contemporary theorists agree that motivation is not an entity but a process (Roberts et al., 2007); therefore if the findings reveal that elite golfers display a high level of a certain type of motivation then this information could

greatly influence coach and player education by providing knowledge about, and interventions to enhance, the motivational development of golfers over time.

1.5 Overview of the thesis

Chapter 2 is a literature review that, where possible, presents a chronological overview of the theoretical development of the field of TD and motivational research. Chapter 3, as well as outlining the procedural aspects of the methodology adopted (i.e. data collection and data analysis), discusses in more detail the rationale for a functionalist ED approach to investigating the construct of talent. Chapter 4 presents the results of the study, including issues relating to reliability and validity, and then goes onto to discuss and interpret the findings. In the final part of the thesis, Chapter 5 concludes the study by drawing out the implications of the research, the limitations inherent in the work and potential future directions for the field.

Chapter 2.0: LITERATURE REVIEW

2.1 Introduction to the chapter

This chapter details, chronologically where possible, the theoretical development of the fields of Talent Development (TD) and motivational research. Given the prominence of the theory of deliberate practice (see Ericsson et al., 1993) to contemporary discourse in TD, particular attention is given to the ‘definitional’ aspects of the framework by way of critical analysis. The field of ED, responsible for a full scale paradigm shift in thinking (Summers, 2009) in the fields of skill acquisition and TD, is then introduced alongside its companion frameworks of nonlinear pedagogy and constraints-led coaching. Section 2.7 begins by suggesting a link between the concept of ‘motivation’ and TD and goes onto introduce ‘early theories of motivation’. Section 2.8 introduces the motivational framework of SDT and highlights its potential role in the development of our understanding of TD. The chapter concludes with a brief overview of the compatibility of ED and SDT and their appropriateness as frameworks with which to conceptualise the construct of talent.

2.2 Nature versus nurture

Up until the early part of the 21st century, dominant discourse in the field of TID continued to be centered on the role of innate talents (e.g. Howe et al., 1998; Davids & Baker, 2007) and the effects paradigm of nature versus nurture. Nature versus nurture, first articulated by Sir Francis Galton, draws on the biological distinction of the genotype and phenotype which assumes that development is caused either by genetic factors or by environmental ones (Hayes, 1996). Galton objected to “...pretensions of natural equality...” (Galton, 1869 p. 14) believing

instead that eminence was the result of heritable natural gifts. Increasingly however biology and developmental genetics would begin to question such a deterministic viewpoint (see Turvey, 2009). According to Brandtstadter (1998), heritability coefficients provide only limited evidence as to the lesser or greater variance in developmental traits. As Brandtstadter suggests, the genome does not rigidly determine a developmental phenotype, rather it defines the norm of a reaction for a given genotype and the norm of environmental influences. That is to say that development patterns will appear fixed only as long as epigenetic conditions remain constant or within critical margins. It is more likely that Galton's conceptualisation of eminence, as resulting from heritable natural gifts, accounts for the positive environmental norms available to the upper classes and accounted for the inequalities of developmental resources (e.g. knowledge and facilities) available to those from the lower classes. Notably, Tanner (1992) suggests that the inequalities of the 19th century still exist in the United Kingdom, reporting that social class accounts for a 2cm difference in height which serves as indication of the health status between the well-off and less well-off. Despite the apparent shortcomings of Galton's thinking, his presumptions would remain the model view among people outside of behavioural genetics more than one hundred years later (Ericsson et al., 1993).

According to Howe et al. (1998) the preoccupation with the nature versus nurture debate was a blind alley for the field of TD and the polarities that engaged developmental theories of the past (e.g. nature versus nurture) would be replaced by theoretical models characterising high achievement as a series of transformations and adaptive processes (e.g. Bloom, 1985) across the life span of the individual (Sayler, 2007).

2.3 Modelling talent development

Despite issues regarding the theoretical definiteness of the components of the model (see Williams & Ford, 2009; Ford et al., 2011); and its construct validity (see Sports Development, 2004), LTAD (see Balyi, 2002) has been the most prominent model of TD in the UK for over a decade. Not least because of National Governing Body insistence that for a 'sport' to receive state funding it must have an LTAD plan (Day, 2011). In the absence of construct validity, Trochin (2006) suggests you will "find" theories and concepts to support what goes on inside your mind in terms of the ideas, theories, hunches and hypotheses that you have about the world. Arguably LTAD is based on 'personal philosophy' and 'empirical observation' that emerged out of the epistemologies of the athletes involved in the Canadian Men's Alpine Ski team across three Olympic cycles (see Balyi, 1990), and then aligned to popular models of athlete development.

One of the earliest and most popular models of talent development emerged from Bloom's (1985) characterisation of the talent development process as a series of transformations and adaptive processes spanning several years. Bloom studied high achievers from six different domains and found that only a few children who were regarded as child prodigies developed into world class performers. As such the project found that irrespective of an individuals' ability, unless there is long intensive processes of encouragement, nurturance, education, and training, individuals will not attain extreme levels of capability in their chosen field.

Arguably, Bloom's project was the catalyst for much of today's thinking on TID and has been responsible for the current conceptualisation of 'expertise' as a developmental construct. Bloom, in dividing athletes' careers into stages (initiation stage, development stage and mastery stage), inspired the metaphoric description of an athletes' career as a miniature life span course

(Alfermann & Stambulova, 2007). In light of Bloom's research a period of crystallisation emerged in the TD literature. Ericsson et al's. (1993) description of the attainment of expert performance relies on Bloom's three stages of development (initiation stage, development stage and mastery stage). According to Ericsson and colleagues, the successful transition from one stage of development to the next relies on successfully negotiating the constraints of motivation, effort and resources. Côté (1999) uses these constraints to provide the theoretical basis for the Developmental Model of Sports Participation (DMSP). As well as identifying three key stages of sports participation (sampling, specialising and investment years), the DMSP highlights the importance of appropriate training patterns and social influences during the development of expertise.

More recently, Côté and Fraser-Thomas proposed a modified version of the DMSP to illustrate more clearly the benefits of the earlier model (see Côté & Fraser-Thomas, 2007). The model proposes that future elite performers can either decide to specialise early, begin deliberate practice immediately, and consequently run the high risk of poor physical health and reduced enjoyment, or alternatively begin their pathway within the sampling years (age 6 -12). At this latter point they can choose to remain as recreational players or to embark on an elite pathway, under both circumstances, it is suggested that the participants are likely to experience similar psychological and health benefits. Recently, Bridge and Toms (2013) have provided empirical support for the 'sampling' trajectory of the DMSP within the context of UK sport. In their analysis of 1006 UK sports people they reported that individuals who participated in three sports at the ages of 11, 13 and 15 were more likely to compete at a national level than those who participated in one sport. However, Bridge and Tom's conclusion that early specialisation is not a requirement to reach high standards of performance highlights a limitation of the early versus

late specialisation debate. Not only is there a tenuous correlation between success at a particular 'age group' and future elite success (MacNamara & Collins, 2013), clearly a distinction needs to be made between the participation histories of 'experts' who have fame and fortune and perform on a world class stage and the developmental activities of those who reach 'high' levels of performance (Ericsson, 2013). For example in the UK, a golfer can undertake their training to become a fully qualified Professional Golfers Association of Great Britain (PGA) professional when they attain a handicap of 4 and pass a playing ability test that requires them to return a score, over 36 holes, of twelve over par or better (see www.pga.info). Whilst these standards of performance may be better than the national average, these performers may not even be amongst the very best players at their local golf clubs. Baker (2003) suggests that evidence supporting early specialisation is sound, as such proposing alternatives to early specialisation is clearly very difficult especially as it is hard to ascertain to what, if any, extent involvement in multiple sport participation contributes to the eventual level of attainment in a single sport.

Whilst Bloom (1985) & Côté (1999), provide useful descriptions of the existence and order of athletes' normative career transitions they do not explain the transformation process (Alfermann & Stambulova, 2007). With this in mind, Abbott and Collins (2004) draw on Côté's model (see Côté, 1999) to look at the psycho-behaviours that mediate the successful transition from one stage to the next. As such they suggest that the successful transition through the stages, irrespective of the environmental opportunities afforded to them, is dependent on an individual developing and applying a range of psycho-behavioural strategies (e.g. goal setting, imagery, self-talk). Abbott and Collins (2004) highlight that an individual only reaches their true potential when they are able to transfer from one stage of development to the next, and this is mediated by developing psychological strategies that underpin an individual's true potential for growth.

Building on this work MacNamara et al. (2010a; 2010b), as well as examining the careers of successful athletes to identify the attributes required to reach and sustain elite levels of performance, investigate the ‘time and environment’ based differences in these attributes. Significantly it emerged that athletes experience nonlinear development trajectories characterised not only by macro-stages of development but also less predictable micro-stages. Ennis (2013) describes this process as a ‘bifurcation’ in the systems dynamics that results from small changes cascading through the system leading to bigger more pronounced changes. These findings concur with Simonton (1999; 2001; 2005), who suggests that not only can two individuals with the same apparent talent develop via contrary epigenetic routes; they do so in an emergent, dynamic and multiplicative manner. However, as previously suggested by Brandtstadter (1998), the genome will remain fixed when epigenetic conditions remain constant. Under such circumstances the forces and flows acting upon the genome, to stimulate a developmental transition, can be said to be at zero. Contrary to this the ‘epigenetic process’ is characterised by the expression of dormant genes in the bodies DNA (Ericsson, 2007a), as such the developing performer can be thought of as a nonlinear dynamical system because the environmental factors that act to perturb reorganisation of system dynamics in one individual may not be the same in another. This suggests that in relation to TD, the starting state of the organism offers little in the way of predictive powers in relation to its potential mature form.

Encouragingly, MacNamara et al. (2010b) recommend that the application of successful TD interventions can only meet the needs of the performer when an individualised and flexible approach is adopted. This highlights a key weakness of the ‘overly reductionist’ previous attempts to model talent development. As Gulbin et al. (2013) suggest, there are no standardised stages and phases during the talent development process and yet most contemporary models have

proposed between three (i.e. Bloom, 1985) and six (i.e. Balyi & Hamilton, 2004). In reducing the concept of talent to so few variables these models are insufficient in their ability to capture the non-normative phase transition that characterises the dynamic multiplicative nature of the human system (Alfermann & Stambulova, 2007; Lickliter, 2009).

Other developmental ‘models’ have tried to conceptualise talent within in a broader frame of reference, for example the Differentiated Model of Gifted and Talented (DMGT) proposes that the transformation of gifts into talents all sit outside of the talent concept itself (see Gagné, 2004). Gagné describes the core of the talent development process as the transformation of outstanding natural abilities (or gifts) into outstanding systematically developed skill (or talents) facilitated by three catalysts (intrapersonal catalysts, environmental catalysts & chance). Within the intrapersonal catalyst are mental and physical states whilst environmental catalysts exist on the macroscopic scale (i.e. geography and sociology) and the microscopic scale (i.e. family size and socioeconomic status). Gagné suggests that at the microscopic scale of the environmental catalyst consideration must be given to the people who interact with the gifted individual (i.e. parents, siblings, friends, educators, mentors, idols), in particularly how by ‘chance’ they may exert a positive or negative catalytic effect on the development of the person. The key limitation of Gagné’s model is that its applicability to a sporting context still requires verifying and it only conceptualises elite and pre-elite students (Gulbin, et al., 2013).

Similarly, others have attempted to capture talent in a more holistic manner, for example Henriksen et al. (2010) propose a holistic ecological approach to modelling talent development. However the development of their Athletic Talent Development Environmental Model (ATDE), whilst promising in its ambition, is limited in the extent to which it can generalise about the process of TD. The extent to which the ATDE of the Danish national sailing teams tells us

anything about talent development is unknown given that no cross sports comparisons were made to establish the common features with other ATDE's. More recently Collins et al. (2012) attempt to present a more coherent and unified approach to sport development, unlike previous approaches that have conceptualised sport development linearly (i.e. stages and phases) or as twin track approaches, where participation and performance sport are presented as non-compatible entities. Instead, and characterised as the 'biopsychosocial' approach, they conceptualise participant development in terms of age related fluctuations in psychological, sociological and biological variables; and their subsequent interaction with the 'three worlds' of Elite Referenced Excellence, Personal Referenced Excellence, Participation for Personal Well-being. Whilst their account is more 'operational and propositional' in nature than it is 'explanatory', they raise interesting questions and present testable hypotheses in relation to the conceptualisation of the nonlinear nature of talent development.

2.4 The practice hypothesis

Whilst the models of talent development detailed in the previous section have all contributed to the theoretical development of the field, they have all failed to make the impact that Ericsson et al's. (1993) theory of Deliberate Practice (DP) would have on the psyche of the field by the end of the first decade of the 21st century. If the academic literature of the past was being ignored because academics obfuscate or present information that seems non-transferable to practical settings (see Pankhurst & Collins, 2013), the accessibility and simple message presented by Ericsson and his colleagues would be immediately appealing to not only the field of TID but also to the mass media (e.g. Syed, 2010; Colvin, 2008; Gladwell, 2009; Coyle, 2009). Quite simply Ericsson and colleagues proposed that those who practice longer, and to the greater level

of intensity, eventually become the best in their field. Expert performance therefore was proposed to be the end result of an individual's prolonged effort to improve performance and not the result of any particular innate talent for the act. Specifically, Ericsson et al. (1993) advocate that expert level of performance was the end result of effortful activities (deliberate practice) extended for a minimum of 10 years. Whilst the theory of DP would reach the public domain largely via the popular psychology and pseudo-science literature, the framework was also receiving widespread attention and was beginning to have a significant impact on the academic literature (e.g. Helsen et al., 1998; Soberlak & Côté, 2003; Baker et al., 2005; Johnson et al., 2006; MacMahon et al., 2007; Nordin et al., 2006). To such an extent it was responsible for the change in emphasis in talent identification, from the belief that unique talent will flourish, to a measurement and evaluation of practice (Hodges et al., 2007). Despite its prominence, and growing popularity amongst practitioners, academics are increasingly beginning to question the 'definitional aspects' of the framework particularly as its original conceptual argument is based on data from musicians (Côté et al., 2012).

The conceptual arguments emanate from what is known as the 'expertise approach' (see Ericsson & Smith, 1991) to studying high achievement. This approach has been the driving force behind the analysis of experts for over two decades (Janelle & Hillman, 2003). Methodologically, the expertise approach involves seemingly representative tasks in laboratory settings followed by an analysis of the captured performance using methodology that reflects the cognitive processes underlying the performance (such as verbal protocol analysis). Finally, once the mechanisms that mediate expert performance are in place, an assessment of the different experiences and practice activities are used to explain the acquisition of expertise (Ericsson, 2003).

A central criticism of the deliberate practice framework is that the development of expertise is a much more complex task than that of studying learning in a controlled laboratory environment (Côté et al., 2007). Furthermore laboratory settings are clearly not representative of the complex movements required in the dynamic environments that characterise many sporting activities (Handford, 1997). Increasingly the inadequacies of studying biological organisms in isolation to their natural setting, is being addressed by the fields of ecological dynamics and dynamical systems theory (see section 2.5). The ‘smartness’ of the biological organism, it is argued, has evolved to adapt to the conditions in its environment (see Shaw & Kinsella-Shaw, 2012). However, under circumstances where an organism is isolated from the key affordances for action in its target context, it begins to lose function (Turvey, 2009). This has led contemporary skill acquisition theorists to conclude that settings that do not represent the performance context, and are not designed to induce physical, psychological and performance adaptation should not be considered as talent development environments (Cobley et al., 2011). As such, settings that lack ‘ecological validity’ (see Pinder et al., 2011) potentially have an effect on the output and relevance of the research and the extent to which it can generalise to real world settings.

In the second part of the expertise approach, verbal protocol analysis is used to study the underlying cognitive processes mediating the superior performance of experts. Using verbal protocol analysis and other tools from cognitive psychology as a means with which to gain an insight into the control processes can be problematic. Think aloud protocols, used to analyse expert performance, are more suited to tasks that involve few if any motor skills (Hodges et al., 2007) and according to Chi (2007), experts often cannot articulate their knowledge as much of their knowledge is tacit. Furthermore, the relative contribution of practice to the attainment of expertise may be clouded by the tendency for retrospective practices estimates to become over

inflated, resulting from an inadequate distinction between ‘time’ spent practicing and time spent ‘at’ practice (Helsen et al., 1998; Hodges et al., 2007).

For example, Johnson et al. (2006) found major discrepancies and idiosyncrasies in the amount of accumulated hours of practice as compared to that alluded to in the DP framework. At the most extreme level one individual was amongst the best swimmers in the world eight months after starting deliberate practice, a year later he won gold at the Sydney Olympics. Johnson and his colleagues (2006) argue that a probable explanation for this was that organisms adapt at varying rates and this would affect behavioural workloads. Contention also exists in relation to the applicability of the framework to sport in relation to the suggestion that for practice to be considered DP it must be: structured to improve performance, highly relevant to the particular domain, substantial enough to require concerted effort and not inherently enjoyable. According to Deakin and Cobley (2003) no practice activities in any sport studied to date meet the conditions of high ratings for relevance and effort, with low ratings of enjoyment. Clearly, if coaches use the DP framework in its literal sense, a danger exists that the inherent enjoyment of participation in sport will be lost to future generations of young people.

However, Renshaw et al. (2012) propose that it is possible for practice to be structured in such a way that makes it both developmentally appropriate and intrinsically motivating. As such they propose that a nonlinear pedagogy, underpinned by a constraints-led approach (see section 2.6), is theoretically and conceptually linked to the development of life enhancing self-determined motivation (see Renshaw., et al 2012). Unlike traditional theories of learning, i.e. behaviourist, top-down and coach-led strategies (see Jess et al., 2011), that have been unable to show how individual differences can be accounted for and designed into the learning process (Davids et al., 2012), non-linear pedagogy is predicated on the notion that the planning and

structure of effective learning should be focused on the individual in a bottom-up, student-led approach (see Chow et al., 2013). Not least because variations in an individual's intrinsic dynamics are likely to lead to progress occurring across varying time scales (see Phillips et al., 2010). Therefore whilst behaviourist approaches, given their prescriptive nature, are more likely to be associated with the development of an external regulation for participation (see Amorose, 2007), non-linear pedagogy has the potential to navigate participants to more autonomous forms of motivation. For example, in a student-led approach the development of regulation through identification (identified regulation; see Ryan & Deci, 2000) could be part of a two-way process involving coach and player. The identification of factors crucial to progression to a higher level of performance, when developed in an autonomy supportive manner, has the potential to form the basis for these factors to be integrated into the performer's sense of themselves. Integration occurs when identified factors, through the choice of the individual, are successfully brought into congruence with other aspects of the performer's life in order to achieve a specific outcome (see Ryan & Deci, 2000; Ryan & Deci, 2008). Integrated regulation is close to intrinsic motivation in its qualities (Ryan & Deci, 2000) and as such may be a crucial factor in sustaining the energy needed to excel in an activity. Concepts such as external regulation, identified regulation and integrated regulation that form part of the SDT continuum are discussed in more detail in section 2.8.

In the final part of the 'expertise approach' the acquisition of expertise is related to practice activities. Ericsson et al. (1993) contend that with proper attention to DP the asymptotic effects of practice can be circumvented. Whilst the relationship between 'time' spent in practice and improvement in proficiency is one of the most salient in behavioural science (Côté et al., 2007), the prevailing view of this phenomena had been Newell and Rosenbloom's (1981) 'power

law of practice'. According to Newell and Rosenbloom "...there exists a ubiquitous quantitative law of practice..." (p. 2) that follows a power function based on response time against practice trials. As such improvement through practice is not exponential but instead decreases linearly with the logarithm of the number of practice trials taken (Johnson et al., 2003). Put simply, during the learning of a new skill, the learner is thought to typically experience rapid improvement the first few times the skill is executed, followed by a decrease in improvement as the skill is continued to be performed (Sassi & Greene, 1998). That is to say that under these circumstances a performance asymptote occurs as a function of time and fosters the arrested development associated with the autonomous stage of learning.

A key distinction between deliberate practice and 'the power law of practice' is the hypothesis that a performance asymptote can be avoided as long as the performer remains in the cognitive/ associative stages of learning. It is a mistake therefore, according to the theory of DP, for a performer to strive for effortless execution as this will prematurely bring on the arrested development associated with the autonomous stage of learning. According to Ericsson (2003) when a performer reaches the autonomous stage, further experience and accumulated further experiences will not bring about any marked improvement in performance.

Recent research confirms however that the averaging of data over subjects and conditions can distort the interpretation of change in performance over time (Newell & Lee Hong, 2007). It is more likely, according to Heathcote et al. (2000), that there exists an 'exponential law of practice'. That is to say that growth will continue up until an essential nutrient required for growth is exhausted. According to Ericsson et al., DP represents the essential nutrients for growth, so much so that the attainment of higher levels of performance is non-exhaustible until such time as the performer gives up their pursuit of excellence. Not only does DP lack an

adequate neurophysiological explanation of this process (Vandervert, 2007), and failed to provide evidence of causal relationship (Baker & Horton, 2004), more fundamentally, it lacks clear testable hypotheses which makes it non-falsifiable (Summers, 2004) and unsustainable as a theory of human high achievement.

2.5 Ecological dynamics

The separation of humans from their environments is rooted in the foundations of modern science from around the time of the enlightenment (see Svenson, 1998; Glimcher, 2005). A central criticism of which is the presumption that physical phenomena are fundamentally deterministic in nature, which according to Lickliter (2009) is unnecessarily reductionist and not supported by current understanding of biological and psychological development. During the first part of the 20th century the emerging discipline of quantum physics (see Glimcher, 2005) would show that at an atomic and sub atomic level particles demonstrated fundamentally indeterminate behaviour and could only be described probabilistically. Given that 'learning' takes place in dynamic and unpredictable contexts, evidence also suggests that living systems are inherently indeterminate (see Hall, 2006) and as such the interaction between an individual and its environment must also be inherently indeterminate in nature (see Chow et al., 2011).

In an indeterminate physical world the environment, and the situations we encounter in it, acts to produce an external flow of energy that the biological organism dissipates by producing its own internal entropy (see Kondepudi, 2012). As such from ED perspective an organism and the environment constitute a single system (Turvey, 2009) because the value of each can be predicted from the value of the other, under all considered circumstances (Beek et al., 2003). With this in mind, in ED, the appropriate scale of analysis for understanding, and potentially predicting,

human behaviour is the interaction between the organism and the environment. As such a biological system, able to exchange energy and matter with the environment, is said to have ‘agency’ because when it interacts with an environment it is subsequently changed by the interaction (Ovens et al., 2013).

The process of producing internal entropy as a dissipative response to external (environmental) entropy is known as ‘catalysis’ (see Cuff, 2007). When stochastic perturbations act to disrupt their system dynamics, open systems strive to self-organise and develop new structure where no previous knowledge of the structures impending form is known (see Stephen et al., 2009). Biological systems display ‘meta-stability’, that is to say that they have access to multiple solutions to performance problems (Phillips et al., 2010). They exhibit nonlinearity in their ability to respond to environmental constraints. Insights such as these have their origins in biology, physics and psychology (see Seifert et al., 2013) and have given theoretical impetus to the development of ‘nonlinear pedagogy’ and the ‘constraints-led approach’ to motor learning (see Brymer et al., 2010).

According to Simon (2007), the field of ED has been responsible for a full scale paradigm shift in thinking about the acquisition of superior performance in sport. The ecological approach was developed, in many respects, as an alternative to highly structured, mechanistic and overly cognitive ‘enrichment theories’ (Araujo & Davids, 2011) such as DP. In enrichment theories environmental stimuli are ambiguous, individuals overcome ambiguity by developing increasingly sophisticated processes and internal structures (see Davids et al., 2012). In contrast, a central notion of the ecological perspective is the premise that it is not possible for the individual to plan performance behaviour prior to the emergence of ‘affordances for action’, as such the ED approach, unlike the theory of DP, rejects the notion of ‘homunculus control’ (see

Smith, 2012). An affordance, simply put, refers to the environment and the action opportunities that it affords the individual (see Withagen & van Wermeskerken, 2010).

2.6 Nonlinear pedagogy and constraints-led coaching

If ED is to be what it purports to be about; the science of the environment and the end directed striving of living things (see Swenson, 1997), then clearly it is appropriate to consider to what extent these theoretical insights can contribute to the debate in relation to the development of appropriate TD processes. As previously mentioned, if we are to produce sports systems capable of adequately supporting young athletes then the likelihood is we will do this as a result of valid and reliable research (Pankhurst & Collins, 2013) presented to ‘practitioners’ in an accessible manner. Of particular significance to the TD process is the self-organising propensity of neurobiological systems that have evolved to adapt to the stresses of their environments. The adaptive process, that characterises the transition from one level of performance to another, places the biological organism in a highly adaptive state ‘far from equilibrium’ and on ‘the edge of chaos’ (see Ovens et al., 2013). Under these circumstances the critical thresholds for self-organisation and emergence are heightened (Ovens et al., 2013), for example endurance athletes routinely experience hypertrophy in the left ventricular of the heart which speeds up the flow of blood to meet their increased need for oxygen (see Rawlins et al., 2009; Gruber et al., 2010), whilst professional key board players, through specific training, develop enlarged myelin cells that facilitates quicker nerve conduction allowing them to perform to a standard of precision and timing that is not achievable by lesser performers (see Münte et al., 2002; Stewart, 2008). These instances of physiological and neurophysiological adaptations are the direct result of training stimulation and the ‘end directed striving’ to become an elite level performer.

Importantly however Wadden et al. (2012) caution that training stimulation that is repetitive and non-specific is not likely to produce long term change in the neuroanatomical or neurophysiological systems that control performance. Theoretical insights such as these are a feature of ED, for example one way the coach can encourage the ‘functional’ self-organising propensity of the human system is through a process called ‘constraints-led coaching’ (see Renshaw et al., 2009) which is a feature of nonlinear pedagogy (see Chow et al., 2007). In constraints based coaching the practice session takes place with all ‘specifying’ information sources present and flowing (e.g. the mental, technical, tactical, physical aspects of performance). This defines the notion of ‘representative task design’ and the requirement from an ED perspective for ‘ecological validity’ (see Pinder et al., 2011). When these conditions have been met the coach can manipulate the key constraints that impinge on performance, such as the task, the organism and the environment (see Figure 1); in doing so a constraints-led coach is attempting to perturb the ‘agentic’ organism into a performance enhancing adaptation. According to Davids et al. (2006) designing tasks in this way exemplify how learning is dependent on the interacting constraints that are specific to the performance context.

Research invoking an ED perspective in relation to the development of superior performance in sport has tended to focus on the ‘information-movement coupling’ aspect of the theory. Information movement coupling, according ecological psychologists (e.g. Gibson, 1979), occurs when the specifying variables in the environment are acted upon in the form of a functional (or non-functional) movement response/solution. Under such conditions skill is considered to be an emergent attribute constructed when an ‘agent’ firstly becomes aware of the key information sources in the environment; and secondly fine tunes the movement/decision making response. For example Montagne et al. (2000) demonstrated that long jumpers use visual

regulation (perception/action coupling) to control their stride pattern in the run up phase, whilst Rugey et al. (2002) demonstrated how humans achieve precise positioning of the feet during walking based on optical specification of the required movement and temporal control (perception/action coupling), suggesting an emergent quality to locomotor pattern generation. Renshaw et al. (2007) investigated the effect on timing and coordination of the forward defensive stroke in cricket of practicing against a ball projection machine. Their findings suggest that artificial settings, impoverished of real world information, allow the performer to forward plan movements that, by implication, are non-representative of the performance context. Whilst these findings are important in relation to TD, particularly in relation to the development of functional movement solutions that are transferable to the performance context, it remains the case that very little research has been conducted into the places and spaces where instruction/practice takes place, and their relational effect on the development of the mechanisms required to be a successful performer.

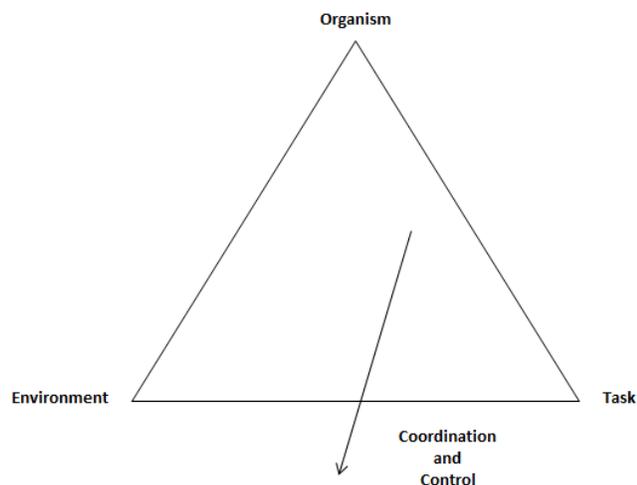


Figure 1 – The category of constraints that specify the optimal pattern of coordination and control.

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This is an important next step for the field of ED in relation to its contribution to the TD problem. Only once more is known about the key environmental constraints mediating the acquisition of superior performance, in specific sporting and cultural contexts, can these findings be incorporated into a ‘constraints-led’ coaching framework. For example Araújo et al. (2010) analysed the ecological constraints mediating the development of expertise in Brazilian football and highlighted the highly unstructured, unconventional and somewhat aversive TD processes in this particular country. Clearly then a constraints-led framework, within a nonlinear pedagogy, has the potential to have big influence on the future direction of TD field. In particular these insights could have an influence, not only at practitioner level, but also in relation to the development of talent development facilities designed stimulate the biological organism into performance enhancing adaptation.

2.7 Early motivational theory

Whilst the limitations of the DP framework have been discussed in a previous section (see section 2.4) no-one so far has suggested that the development of exceptional ability can be achieved without high quantities of time and effort. With this in mind there is growing consensus that the central challenge in helping people develop exceptional abilities is that of creating and maintaining the motivation required to engage in an activity for the many years it takes to develop expertise (Sosniak, 2007). Abbott & Collins (2004) suggest that motivation may be the most crucial determining factor in acquiring and maintaining expertise as an individual’s motivation will determine the frequency and persistence of their actions. De Bruin (2006) found a link between achievement motivation and the maintenance of high levels of training intensity and concluded that some individuals may possess a ‘talent to practice deliberately’.

Early theories of motivation focused on the psychological drives as the source of energy for all motivated behaviour (Deci & Moller, 2007). The most obvious early influence was Sigmund Freud's (1915/1925) psychoanalytic 'Instinct Theory' that asserted all behaviour was reducible to two primary instincts; namely, sex and aggression (see Deci & Moller, 2007). According to Cairns (1998), by the 1930's psychoanalysis had undergone multiple divisions and research could be defined as 'post Freudians' (those who extended Freud's Theory) and 'neo-Freudians' (those who revolted by challenging certain inviolable assumptions of his theory); or alternatively 'challengers' as belonging to the heterodox (White, 1959). The most prominent 'post Freudian' theory was Hull's (1943) Drive theory (see Deci & Moller, 2007; White, 1959; Model, 2005). In Hullian Drive Theory, Freud's sex and aggression drives were extended upon to include thirst and hunger. As such Hull proposed that a drive occurs (namely hunger, sex, thirst and avoidance of pain) and provides energy for our actions (Model, 2005). One of the first researchers who could be described as belonging to the heterodox was Abraham Maslow (see Maslow, 1943); Maslow argued that any drive that is somatically based was atypical rather than typical in human motivation. Instead Maslow propositioned that no need or drive should be treated as if it were isolated or discrete and as such every drive is related to the state of satisfaction or dissatisfaction of other drives. For example, Maslow highlights that all people in society have a need or desire for a stable high evaluation of themselves, and the respect of others. Satisfaction of these needs leads to empowering feelings, such as: strength, confidence, worth, capability and usefulness; whilst the thwarting of these needs produces feelings of inferiority, of weakness and of helplessness.

Another prominent "neo-Freudian" who articulated the growing discontent with drive based theories of motivation was White (1959). Drawing from extant literature, White

highlighted that several researchers' had found behaviours that seemed to be motivated by scenarios that could not be tied back to any of Hulls four drives (Model, 2005; Beilock & Gray, 2007). For example, experiments with minimal sensory input have shown that neural mechanisms attempt to produce some degree of stimulation (e.g. hallucinations) even in the absence of external input (Fogiel, 2003). Furthermore, White argues that given the directedness and persistence of the behaviour that leads to feats of learning, it was unlikely that motivation was derived entirely from one of the primary energising drives or instincts. Instead, White claimed that the motivation needed for such persistence was energised by psychological satisfaction; specifically feelings of effectance and competence and in doing so proposed that the energy to develop such competences was an innate propensity in humans (Ryan & Deci, 2007).

In putting forward such new thinking White proposed that this should be called 'effectance' motivation. A central tenet of which involves a feeling of efficacy, derived from behaviour that is exploratory, varying, and experimental in character and produces changes in the stimulus field. According to White, having this character leads the organism to find out how the environment can be changed and what consequences flow from these changes. This work has been highly influential in the motivational literature. As such, most contemporary theorists now agree that motivation is not an entity but a process, and the term motivation has largely been abandoned and in its place are descriptions of cognitive processes such as self-regulation and self-systems (Roberts et al., 2007). Nowhere has the work of White (1959) been more influential than in SDT (see Ryan & Deci, 2000).

2.8 Self-determination theory

As stated in section 2.7, and by implication of the time and effort needed to attain high levels of performance, it is not surprising that the role of motivation in human performance is now one of the most popular areas of research in sport and exercise psychology (Roberts et al., 2007). A suitable guiding framework to enhance our understanding of this may well be SDT, as its area of investigation is peoples' inherent growth tendencies and innate psychological needs (see Ryan & Deci, 2000).

A fundamental postulate of SDT is that humans have three innate psychological needs, that when satisfied, appear to be essential for facilitating growth, social integration and well-being (Ryan & Deci, 2000). According to Ryan (1995), the needs for competence, autonomy and relatedness, when supplied with the appropriate nutrients, heighten an individual's experience of integrity and autonomy; whilst contexts where these needs are neglected promote fragmentation and alienation (see Figure 2). It is relatively clear therefore why the principals of SDT are of particular interest to the field of TD, and also to those concerned with young people's healthy participation in competitive sport.

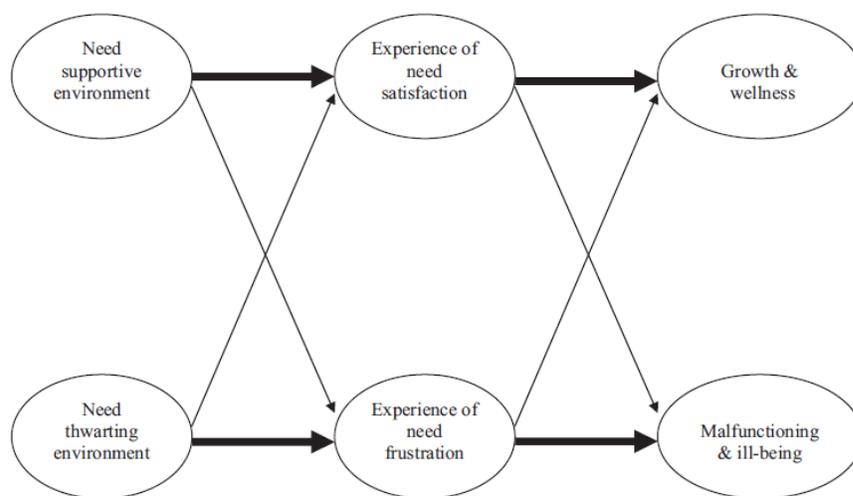


Figure 2 - Graphic overview of the self-determination theory view on the role of need satisfaction and need frustration.

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The need for competence reflects our desire to perceive our behaviour as effective in relation to how we interact with our environment (White, 1959). According to Ryan and Deci (2000), perceived competency can either be enhanced or diminished by social contextual events such as feedback and other forms of communication, all of which contribute to our sense of intrinsic motivation. Within environments such as those found in competitive sport, the role of the 'coach', and/or the prevailing culture within a club, may be a crucial interface between an individual and their sense of competence. Markland and Vansteenkiste (2007) suggest that competency is supported when an individual is offered clear but neutral advice that allows them to embrace realistic expectations; and where the individual is encouraged to self-set realistic goals, and are given positive and non-judgemental feedback. Clearly then intrinsically motivated behaviour, and a greater sense of competency, would seem more likely to develop in conditions of positive feedback and optimal challenge (Ryan 1995).

However Ryan and Deci (2000) caution a sense competence will not enhance intrinsic motivation unless it is accompanied by a sense of autonomy. Autonomy is reflected in the belief that we are the originators of our own actions (Amorose, 2007), and that we have exercised choice in relation to the level of engagement we have with an activity (Rodgers et al., 2012). Within a TD environment, the basic psychological need for autonomy is more likely to be satisfied when the coach includes the athlete in the decision making process, and where choice is cultural in all aspects of their training and performance (see Treasure et al., 2007).

Finally, an environment that affords the development of competency and autonomy but fails to nourish the need for relatedness is still expected to produce impoverished well-being (Ryan & Deci, 2000). Relatedness occurs when an individual feels the love and caring of significant others, giving them a sense of security and belonging to the social context that they

frequent (see Amorose, 2007; Vansteenkiste & Ryan, 2013). According to Reinbotha and Duda (2006), in sporting contexts with heightened inter-individual comparisons, characteristic of ego-involved climates (see Dweck, 2006), a sense of relatedness to others can potentially be undermined. Such circumstances are likely to cause a sense of ‘need-frustration’, and could account for any observable malfunctioning in performance and behaviour (Vansteenkiste & Ryan, 2013). Clearly a greater understanding of the basic psychological need for competence, autonomy and relatedness should be of great significance to those individuals who “...wish to motivate others in a way that engenders commitment, effort and high quality performance” (Ryan & Deci, 2000, p. 76). Nowhere is this more relevant than in a TD context in relation to those people who are such a crucial ingredient in young people’s enjoyment and ongoing participation in sport.

Tied to these basic psychological needs is the belief that no other single phenomenon reflects the potential of human nature more than intrinsic motivation (Ryan & Deci, 2000). The absence of extrinsic expectations and constraints has been shown to be beneficial to an individual at all levels of life (sport, relationships, persistence of actions etc.), because individuals with high levels of self-determined (intrinsic) motivation are more likely to choose to work hard, experience lower levels of performance-related anxiety, and exhibit greater levels of skill learning (Hollembek & Amorose, 2005).

SDT works by measuring human motivation on a continuum of low to high self-determination (see Figure 3), according to the extent by which it is autonomous/self-determined versus controlling/non-autonomous (Edmunds et al., 2006). At the most self-determined end of the continuum is intrinsic motivation, when an individual is this form of motivation their participation is thought to be volitional and for the pleasure inherent in the activity (see Ryan &

Deci, 2000). In SDT, intrinsic motivation is defined as the “inherent propensity to actively develop skills, engage challenges, and take interest in new activities even in the absence of external prompts or rewards” (Ryan & Deci, 2007 p. 2).

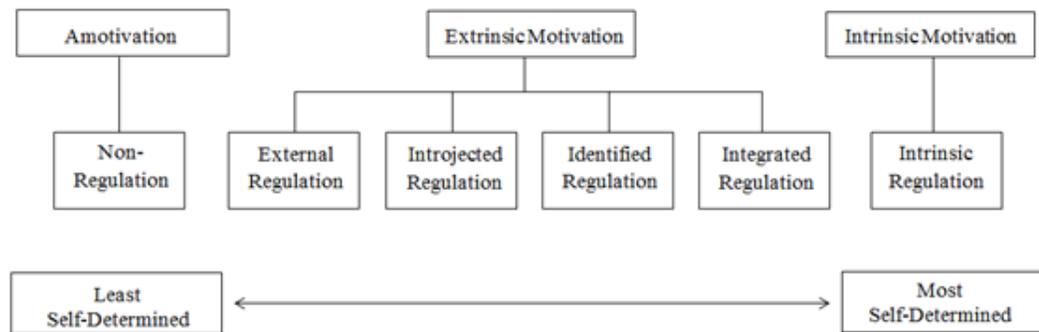


Figure 3 - The types of motivation and regulations within self-determination, along with their placement along the continuum of relative self-determination.

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According to Ryan and Deci (2000), students who are taught by a controlling coach, or have controlling parents, experience lower levels of intrinsic motivation than those individuals with autonomy supportive parents and coaches. Ryan and Deci argue that factors such as material rewards and imposed goals bring about an external locus of casualty, whilst a feeling of choice and opportunity for self-discovery induces an increased feeling of autonomy. Central to SDT is the distinction between these controlling and autonomous forms of motivation, the distinction is often viewed on a continuum reflecting the perceived origin of the individual’s motivated behaviour in a given context (Hagger & Chatzisarantis, 2007). Crucially, SDT recognises that not all human endeavors are intrinsically enjoyable, in which case self-determined behaviour is a reflection of the extent to which the individual is able to internalise and integrate the regulation of extrinsic behaviours (Ryan & Deci, 2000; Ryan & Deci, 2007). As such, as well as representing

the most non-self-determined form of motivation (amotivation) and the most self-determined type of motivation (intrinsic motivation) the continuum also reflects four different types of extrinsic regulations (external regulation, introjected regulation, identified regulation, and integrated regulation), each suggesting a different level of self-determination (Hollembek & Amorose, 2005).

Whilst intrinsic motivation is characterised by activity energised out of the pleasure inherent in the activity; amotivation, at the least self-determined end of the continuum, is characterised by not having energy or desire for the activity (Ryan & Deci, 2007). Such feelings may result from a sense of incompetency and uncontrollability, which have been shown to be related to drop-out in physical activity and sport (see Vallerand, 2007). In elite level sport, this type of motivation may be manifest in the development of burnout and maladapted performance outcomes (see Treasure et al., 2007). Early prediction of this debilitating form of motivation may well significantly reduce drop-out rates amongst young people in competitive sport and greatly enhance their wellbeing.

The least autonomous form of extrinsic motivation is external regulation (Ryan & Deci, 2007), extrinsic motivation refers to participation that is motivated by a separable outcome (Ryan & Deci, 2000), where behaviour is highly controlled by external influences. For example, when a golfer practices their sport at the demand of a controlling parent or coach, the motivation for doing so is highly externally regulated. However not all extrinsically driven behaviour is purely non-autonomous, when an individual practises an activity because they associate its value in relation to a desired outcome, they are doing so even though the act itself is not inherently enjoyable. As such it is recognised that extrinsic motivation can vary greatly in its relative autonomy.

A second type of extrinsic motivation is introjected regulation, this type of motivation suggests that the regulation of action has been partially internalised, but is driven by factors such as ego involvement and approval from peers (Deci & Ryan, 2008). This form of regulation, according to Ryan & Deci (2000), involves behaviour that is performed to avoid guilt or anxiety. In such cases participants report feeling pressure to think, feel, or behave in particular ways; they are motivated to demonstrate ability, avoid failure and this is connected to their feeling of self-worth (see Deci & Ryan, 2008). Despite the negative connotations of being motivated by ego involvement, and the avoidance of shame, introjected regulation may play an early role in the adaptation towards more internalized modes of behaviour (Vansteenkiste et al., 2005). Reasons for not dropping out of sport have been shown to closely reflect introjected regulation, indicating that the avoidance of guilt and social disapproval may well fuel continued participation (see Gillison et al., 2009).

Towards the more autonomous end of the SDT continuum is identified regulation, whilst introjected regulation is associated with the feeling that one should behave in a certain way (Eccles, 2007), identification of regulation is behaviour that is conducted out of choice, and is highly valued by the individual (Vallerand, 2007). An example of this is whilst a golfer may not find it inherently enjoyable to play several time consuming practice rounds in preparation for a tournament, the vital information that is gained from doing so is highly valued by the player. Perhaps significantly Sarmiento et al. (2008) found that, when compared to amateur performers, professional and semi-professional football players demonstrated no significant difference in intrinsic motivation but significantly higher levels of identified regulation. This type of motivation may well represent a key distinguishing feature in motivational behaviour when comparing amateur to professional level performers.

Finally, the most autonomous form of extrinsic motivation is integrated regulation, which occurs when an individual successfully integrates an identified regulation with their true or integrated self (Deci & Ryan, 2008). In this way it has become a highly valued behavioural choice (e.g. playing time consuming practice rounds) that they have been able to integrate into their sense of self in order to engage autonomously in the activity (Markland & Vanstreenkiste, 2007). The failure to integrate, into one's life, highly valued behavioural choices, establishing a sense of autonomy of action, may well be responsible for maladapted responses to new performance environments. Clearly this particular form of motivation warrants further investigation. The difficulties in identifying and measuring this potentially important form of motivation is discussed in the next section of this chapter (see section 2.9).

In reviewing the literature in relation to these different forms of regulation and the effect of self-determined motivation at an elite level of performance, it is clear that a paucity of research in this area exists. Research featuring performance sports people tends to focus on the role of the coach/teacher in fostering self-determined motivation (e.g. Gagne et al., 2003; Reinboth et al., 2004; Hollebeak & Amorose, 2005; Ommundsen & Eikanger Kvalo, 2007; Smith et al., 2007; Taylor & Ntoumanis, 2007; Taylor et al., 2008; Pope & Wilson, 2012). However, research guided by SDT has predominantly tended to focus on: the social contextual conditions that facilitate versus forestall healthy psychological wellbeing (Ryan & Deci, 2000; Standage & Ryan, 2012); the relationship between self-determined motivation and exercise behaviours in physical activities (e.g. Ingledeew et al., 2004; Matsumoto & Takenaka, 2004; Ntoumanis et al., 2004; Ntoumanis, 2005; Drylund & Wininger, 2006; Edmunds et al., 2006; Thogersen-Ntoumani & Ntoumani, 2006; Chatzisarantis et al., 2007; D'Angelo, et al., 2007; Wininger, 2007; Chatzisarantis et al., 2008); its effect on achievement goals (e.g. Ntoumanis, 2001; Reinboth &

Duda, 2006; Hein & Hagger, 2007; Vansteenkiste et al., 2007), and the effect of body image on self-determined motivation (e.g. Markland & Ingledew, 2007; Thøgersen-Ntoumani & Ntoumani, 2007).

Arguably, the lack of research on elite performers is attributable to the incongruence between high levels of intrinsic motivation and the externally referenced nature of elite level sport (e.g. winning, commercial endorsements, adulation), and the apparent absence of a reliable mechanism with which to operationalise a study of this nature. For example, the Sport Motivation Scale, (SMS; Pelletier et al., 1995) in its original form is unable to capture 'integrated regulation' which is inconsistent with SDT (Mallett et al., 2007). According to Treasure et al. (2007), integrated regulation, as the most autonomous form of extrinsic motivation and therefore the closest to intrinsic motivation, may well be the gold standard in elite level sport. This is supported by Mallett and Hanrahan (2004), who in their study of five male and five female elite track and field athletes, inductively interpreted the data to suggest the existence of characteristics consistent with integrated regulation. However they were unable to quantify its existence or its relationship to the other subscales on the SDT continuum, as such it remains far from clear if any such gold standard of motivation exists in elite level sport.

In conclusion, and given that no other activity would seem to epitomise the need for motivation more than sport (Ryan & Deci 2007), it would seem appropriate to attempt to enhance knowledge in the area of performance motivation and then theorise how it might apply it to the field of TD. Due to the paucity of research that currently exists in relation to elite populations and SDT it is hoped that the present study is able to advance knowledge in this particular area. It is tentatively expected that given the high levels of commitment and practice that is required to reach elite levels of performance that the performers in this study will be highly self-determined.

It is not however known whether or not motivation fluctuates from one level of performance to another or whether EP's after achieving great success, and potentially financial freedom, continue to exhibit high levels of self-determined motivation.

2.9 The Sports Motivation Scale and integrated regulation

According to Markland and Vansteenkiste (2007), 'integrated regulation' occurs when the individual is able to internalise extrinsically driven behavioural regulations and is able to integrate them into their sense of self in order to engage autonomously in the activity. The ability to bring extrinsically driven behavioural regulations into congruence with ones sense of self may be a crucial factor in mediating the successful adaptation from the inherently intrinsic environment of amateur sport to the inherently extrinsic environment of professional sport. Clearly a better understanding of the specific motivational characteristics, in particularly integrated regulation, of elite level performers is needed as these constructs seem to be directly related to intensity of participation and persistence of effort (Martins & Webber, 2002).

The omission of a subscale to measure integrated regulation represents a weakness in the SMS when measuring the motivation styles of elite level professional players. This issue was addressed in the redeveloped SMS-6 (see Mallett et al., 2007). The primary purpose, of redeveloping the SMS was to include items to measure integrated regulation, consistent with the theories of motivation upon which the instrument was based. Potentially the SMS-6 will help researchers identify the contribution and significance of integrated regulation in the context of elite sport. Such information can facilitate knowledge of, and enhance interventions in the motivational development of athletes (Pelletier & Sarrazin, 2007).

More recently Pelletier et al. (2013) have addressed the criticism levelled at the original SMS and have included items measuring integrated regulation in their revised sports motivation scale (SMS-II). Pelletier and colleagues are highly critical of the ‘external validity’ of the SMS-6 given that some of the items used in the scale are taken from other SDT motivational scales and then adapted to a sporting context. This perhaps represents a greater issue when measuring integrated regulation than it does the other measures of extrinsic motivation (i.e. external, introjected, and identified regulation). Integrated regulation is abstract in nature and represents the assimilation of the ‘other’ values and needs of an individual (Ryan & Deci, 2000), which in performance sport is likely to be context specific, as such problems with ‘external validity’ may well represent a major issue for this subscale. As such, Pelletier et al. (2013) acknowledge that future research will be required to assess fully the psychometric properties of their revised scale, its ability to predict performance and the role of integrated regulation in the optimal functioning in the sporting domain.

2.10 Self-determination theory and ecological psychology

The theoretical development of the field of talent development is increasingly concerned with conceptualising human development within a broader frame of analysis. This notion is specified in Bronfenbrenner’s bio-ecological model of human development (see Bronfenbrenner & Morris, 2006), which specifies that the development of an individual occurs according to the ecological and social forces that affect and are affected by a developing child. As previously discussed a biological ‘dynamical’ system exhibits ‘agency’ and is changed by its interaction with the environment (Ovens et al., 2013). Through interaction, ‘catalysis’ (see Cuff, 2007) disrupts system dynamics forcing them to self-organise and develop new structure (see

Stephen et al., 2009). The notion of an ‘agentic’ biological organism, capable of exchanging energy and matter as a dissipative response to external (environmental) entropy, has led to the introduction of a thermodynamic interpretation of human behaviour. In thermodynamics an autocatakinetic (ACK) system emerges out of the relationship between two sets of variables (Cuff, 2007). ACK systems evolve the capacity to draw on available resources to develop a self-sustaining relationship with the environment (Ovens et al., 2013) and they do this to establish some form of autonomy over their encounters (see Turvey & Carello, 2012).

In accordance with this ‘worldview’, SDT views humans as adaptive organisms naturally inclined to orientate their psychic elements to their experiences in order to bring about relative unity (see Deci & Ryan, 2000). Fundamentally the psychological ‘need’ for competence, relatedness, and autonomy are neurophysiological constructs that act in a transformative manner to bring about a satisfying situation (see Deci & Ryan, 2000). It is acknowledged by motivational theorist (e.g. Roberts et al., 2007), that studying individuals in isolation to their environment, when the situational criteria are clear (e.g. in performance sport), provides a far from clear understanding of the behavioural processes. Situated motivation is necessarily unstable, as situations elicit different emotions, interpretations of events and reactions from different individuals (Paris & Turner, 1994). Accordingly, integrated regulation lends itself to an ACK description, in that behavioural regulation is integrated with a sense of self for the purpose of performing functionally in a chosen activity (Markland & Vanstreenkiste, 2007). It would seem therefore that Fortier and Kowal’s recommendation that “future studies would do well to include SDT within a broader ecological model to examine complex phenomena such as physical activity behaviour change” (Fortier & Kowal, 2007, p. 123) represents a logical progression for the field. A progression that may well lead practitioners to stop idealising certain types of motivation (e.g.

intrinsic motivation) in which “...attention is directed to enduring characteristics of the individual rather than the enduring features of situations that elicit such orientations” (Paris & Turner, 1986, p. 216).

2.11 Chapter conclusion

The aim of this chapter was to review existing empirical and theoretical literature relevant to the fields of TID and SDT. Particular attention was also given to the key theoretical frameworks that guide the present study and the potential role that these frameworks can play in furthering our understanding of the concept of TID in sport. The emerging field of ED was discussed and whilst little empirical research exists from a TID perspective it is hoped that the appropriateness of this framework to any study interested in human performance was fully established. The next chapter outlines the methodology and processes that were followed that allowed the self-determining characteristics of players across differing career stages and phases to be obtained.

Chapter 3: METHODOLOGY

3.1 Introduction to chapter

This chapter outlines the methodology adopted in this study and the procedural aspects of collecting and analysing data. The background of the participants is discussed in more detail as it was deemed important, in a study of this nature, to portray as fully as possible the level of the participants sampled. The rationale for interpreting the data from a functionalist ED philosophical perspective and the researchers own epistemic beliefs are clearly highlighted.

3.2 Methodological Background

This study is an exploration of the self-determining characteristics of high performance golfers across three different career stages (i.e. college golf, elite amateur, elite professional). The theoretical frameworks guiding this study are: SDT, whose area of investigation is people's inherent growth tendencies (see Ryan & Deci, 2000), and ED which addresses the relationship between living things and their environments (Swenson, 1997).

Whilst this study is 'comparative' in nature it is tentatively hypothesised that the long intensive hours of practice needed to reach elite levels of performance (see Ericsson et al., 1993), is sustained by high levels of intrinsic motivation. The study is operationalised using the SMS-6 which measures the effect of the independent variable of 'career stage' on the six dependant variables of SDT (Intrinsic Motivation, Integrated Regulation, Identified Regulation, Introjected Regulation, Extrinsic Motivation and Amotivation). Secondary analysis of the data is conducted using a quasi-qualitative approach, commonly associated with psychometric tests (see Henn et

al., 2006), allowing an interpretation of the data to include an analysis of the individual subscales in relation to their significance in the lives of the various populations under investigation.

Given the researchers own beliefs about the indeterminate nature of the organism/environment system (Glimcher, 2005), and the self-organising and emergent propensity of biological organisms (Stephen et al., 2009), the data is interpreted through the lenses of a 'functionalist' narrative woven together with insights from the complexity sciences (Radford, 2008), ecological psychology and dynamical systems theory. With this in mind the broad term of ED is invoked throughout and the rationale for adopting such a perspective is outlined in the next part of this chapter.

The most prominent contemporary meaning of functionalism "...entails a commitment to defining all psychological phenomena and states in terms of causes and effects" (Overton, 1998, p. 170). With this in mind the results from the Relative Autonomy Index (RAI) are interpreted to speak of the prevailing, cause and effect, culture within certain performance environments and the potential role that 'habitus' (see Bourdieu, 1990) has on the production of specific types of self-determined motivation. In this approach, rather than idealising certain types of motivation, greater attention is given to the effect of a specific performance environment and its role in eliciting certain 'functional' orientations (Paris & Turner, 1986).

3.3 Theoretical rationale

According to Bush and Silk (2010), due to monological, one dimensional and overly reductionist methods, the ontological core of sports coaching research is narrow, blinkered and not fit for purpose. In addressing these obvious limitations a deliberate, perhaps ambitious, attempt is made in this project to move away from 'reductionist' traditions (Davids et al., 2006)

that are manifest in the linear, measurable processes associated with behaviourist philosophical thinking (Jess et al., 2011). In doing so an ED interpretation is invoked in an attempt to position human behaviour within a comprehensive worldview and consistent epistemology (Butler et al., 2012).

It is argued that the study of complex, emergent, dynamic, and self-organising systems are irreducible to elementary laws (Urry, 2005) and behavioural reductionist traditions (Ennis, 2013). Increasingly, in the behaviour and brain sciences, reductionist thinking is being replaced by descriptions of the indeterminate nature of physical phenomena (see Glimcher, 2005). If physical phenomena behave in a fundamentally indeterminate manner then they are, by their very nature, non-algorithmic, non-computational (see Hanford, 1997; Kondepudi 2012; Turvey & Carello, 2012) and non-representational within one dimensional linear thinking that views error or noise as unscientific (Davids et al., 2007). Instead, from an ED perspective, supported by current thinking in biology and psychology (see Lickliter, 2009), noise or non-normality in data may well represent the actual phenomena of interest (Helton, 2011). Any investigation insensitive to this may fail to fully capture the multiplicative, nonlinear, adaptive, nature of the human system and its movement in time and space. Framing human development in this manner is associated with the powerful influence of 'functionalist' philosophical thinking (see Davids et al., 2007). A functionalist perspective is embedded in a relational ontological/epistemological worldview, defined by the organism/environment relationship, and the adaptive propensity of open systems (see Overton, 1998). It is hoped that by positioning self-determined motivation within an ED's theoretical framework, will provide an appropriate frame of reference to analyse and interpret the underlying mechanisms that characterises the transition from one career stage to the next.

3.4 Pilot Study

Prior to proceeding with the main study a pilot study was conducted. The study had several objectives: firstly a review of the literature was carried out to establish if any problems relating to the theoretical concept and instruments of measure could be found; secondly the measurement instrument, the Sport Motivation Scale (SMS; Pelletier et al., 1995) was distributed to elite level performers (n=3) to ‘trial run’ the procedures; and high profile industry stakeholders (n=2) were utilised to seek expert consensus on the questionnaire and the usefulness of the research project.

As recommended by Kumar (1996) the pilot study employed purposeful sampling to ensure a high level of credible feedback was received. The participants were contacted directly and asked to participate in the pilot study. All participants were given a pilot study pack that consisted of a covering letter (outlining the background to the study), the SMS questionnaire, a copy of the thesis proposal document, the pilot study feedback form and a stamped addressed envelope.

The participants selected for the pilot study represent a cross section of domain related experts; the elite performers were 1 male and 1 female golfer between the ages of 25 – 35. The male golfer was a former British Amateur Champion, Walker Cup Player and Great Britain and Ireland Internationalist. The female golfer was a multiple Scottish national champion, Curtis Cup player and could claim to be one of Scotland’s most successful female players over the past decade. The sub elite player was a former Scottish boy’s internationalist and a product of the American collegiate system. The domain related experts were chosen because of their expertise and because they were deemed to be high profile stakeholders in the field of TID. At the time of

the study, one of the participants held the highest position in PGA coach education in Scotland and was involved in the strategic development of national strategy for junior golf (Clubgolf). The other participant was in charge of high performance golf in Scotland and was the driving force behind Scotland's strategy for the development of world class players.

Results were collected from the sample groups which gave the researcher a valuable opportunity to become familiar with data reduction measures and potential uses of the SMS. The data was reduced to form an RAI by giving each subscale a weight according to its place on the self-determination continuum, multiplying the score on the scale by its weight, and then adding the weighted scores on the subscale to obtain a single score (see Pelletier & Sarrazin, 2007). As such the amotivation subscale was weighted -3, the external subscale weighted -2, the introjected subscale weighted -1, the identified subscale weighted +1, the integrated subscale weighted +2 and the intrinsic subscale weighted +3. Forming the index in this way yields high levels of validity and reliability (Vallerand, 2007).

It was not the intention of the pilot study to make any generalisations in respect to the findings from such a small scale project. Instead the researcher was more interested in the consensus from the participants as to any problems they had experienced when completing the SMS and they reported no problems. Finally the researcher became aware through the literature review that a consensus existed that the construct of 'integrated regulation', thought to be directly related to intensity of participation and persistence of effort in elite performers, (Martins & Webber, 2002), was not measured in the original SMS. As such in the main study the decision to use Mallett et al's SMS-6 was taken as it responds directly to the need for items measuring integrated regulation in elite sport (see Mallett et al., 2007). It was not deemed necessary to pilot

the SMS-6 because the structure and layout of the document and the methods for data reduction were consistent with the original SMS.

3.4 Research Design

3.4.1 Participants

The participants in this study were: 18 elite level professionals (M age = 37.63, SD = 5.67); 17 elite amateurs (M age = 21.25, SD = 1.53) and 14 college students (M age = 18.27, SD = 0.61). All participants were 'male', and whilst the EA and CS group were all born in Scotland, the EP group was made up of the following: two from Scotland, two from Spain, two from Australia, three from England, two from Sweden; four from France and one each from Northern Ireland, Singapore and Argentina. The groups were selected to represent the motivation profiles of performance golfers across 'typical' stages on a continuum towards world class performance. As Treasure et al. (2007) suggest, elite performers represent a very small segment of the population and this segment can quickly shrink depending on how strict or literal a definition of elite one chooses to invoke. A useful benchmark in defining a population is Jones et al's. (2007) distinction that super elite performers are those who are officially recognised as the best in the world. As such the official world golf rankings, at the time of the study, indicated that only one of the professionals sampled was ranked inside the top forty players in the world (Official Golf World Ranking 2008). This suggests that the sample group of professionals could not be defined as super elite professionals. Therefore whilst the group of professional golfers sampled was not part of the super elite, they are defined as elite by virtue of the fact that collectively they have won over 70 professional tournaments worldwide including the, The Open; European Open;

International Open and British Masters championships. Between them they had made seven Ryder Cup appearances and ten of the players featured in the top one hundred money winners of all time on the European Tour with accumulative earnings in excess of fifty million euros.

The elite level amateurs were Scottish internationalists who were accessed through Scottish Golf Union (SGU). Elite amateurs, in Scotland, represent the best known players in the country; the performers in this group had either competed successfully in or in some instances had won national championships and had represented Scotland at International events. Their national playing handicaps, at this level, typically range from between +2 and +4. The college students, whilst not at the performance level of the EA or EP groups, all held a national handicap of 5 or better and were at the time of the study involved in a vocational qualification aimed at establishing a career as a professional golfer. Internal competitions and qualifying events are a regular feature of college golf as it potentially leads to participation in regional and national events against other Colleges throughout the UK.

3.4.2 Data Collection

Ethical approval for the study was granted by the University of Birmingham ethics board before any research commenced. All participants were given a covering letter briefly introducing them to the study and informing them of their rights to withdraw from the study, data confidentiality and a consent form (see appendix B & C). The data from the EA group was collected during the week of the Scottish Amateur Stroke Play Championship at the Dukes Course, nr St Andrews. As was the case with the entire sample, the participants were asked to fill in the SMS-6 as honestly as possible and that in all cases there was no correct or incorrect answers. No information was explained about the perceived benefits, or otherwise, of intrinsic

motivation. The same process was followed when administering the collection of data from the college students, although it should be noted that the college students were known to the researcher as they attend the college that is also the researcher's place of work.

Gaining access to the elite level professionals' was to prove much harder. Elites by their very nature are difficult access, and although they are often visible, they form barriers around themselves (Douglas & Carless, 2006). The difficulty in accessing a sufficiently high number of elite professionals was overcome by using a known 'gatekeeper' (see Gratton & Jones, 2004) who personally collected data during the BMW championship at Wentworth Golf Club, England, on the 22nd of May. The management companies were contacted and alerted to the fact that the questionnaires would be on the practice ground during the practice days to the event and were encouraged to direct their players to the area in which the data was being held.

3.4.3 Instrumentation - The Sport Motivation Scale 6

The SMS-6 is a revised version of Pelletier et al's. (1995) original Sports Motivation Scale. Devised by Mallett et al. (2007), the revised scale responds to three central issues concerning the original scale. (1) the need for items measuring integrated regulation, (2) revision of the wording of problematic items to improve the factorial validity of the original SMS, and (3) a resolution to the lack of discriminant validity of the three most intrinsic subscales. The decision to use the SMS-6 was taken in response to the growing consensus that integrated regulation is a regulatory style worthy of further investigation in relation to elite level sport (see Treasure et al., 2007).

The questionnaire contains six motivation constructs that measures the most non-self-determined form of motivation (amotivation), the most self-determined type of motivation

(intrinsic motivation) and the four different types of extrinsic regulations (external regulation, introjected regulation, identified regulation, and integrated regulation) each suggesting a different level of self-determination. Participants are asked to respond to items addressing “Why do you practice your sport?” on a seven point likert scale ranging from (1) “Does not correspond at all” to (7) “corresponds exactly”. For example, participants’ are asked to rate statements corresponding to the various forms of motivation, such as: “Because I feel a lot of personal satisfaction while mastering certain difficult training techniques” (intrinsic motivation); “Because it’s part of the way in which I’ve chosen to live my life” (integrated regulation); “Because it is one of the best ways to maintain good relationships with my friends” (identified regulation); “Because I would feel bad if I was not taking time to do it” (introjected regulation); “For the material and/or social benefits of being an athlete” (external regulation) and “It is not clear to me anymore; I don’t really think my place is in sport” (amotivation).

According to Mallet et al. (2007) the SMS-6 has an adequate factorial structure and internal consistency.

3.4.4 Data Analysis

In order to analyse and interpret the findings the data was reduced to form a RAI or self-determination index (see Pelletier & Sarrazins, 2007). The RAI is formed by giving each subscale a weight according to its place on the self-determination continuum, multiplying the score on the scale by its weight, and then adding the weighted scores on the subscale to obtain a single score. The RAI correlates positively with scales of intrinsic motivation and there is multi-method evidence supporting the construct validity of the index (see Gronlick & Ryan, 1987; Gronlick & Ryan, 1989). The external subscale was weighted -3, the introjected subscale was weighted -2,

the identified subscale was weighted +1, the integrated subscale was weighted +2 and the intrinsic subscale was weighted +3. According to Pelletier and Sarrazin (2007), a positive score implies that a participant has more self-determined forms of motivation for practicing an activity, whereas a negative score implies the opposite. The maximum possible score when applying this formula to the SMS-6 is 148 and the minimum is -116. It is worth noting when viewing the results from the RAI (see section 4.2.2) that, according to (Mallet & Hanrahan, 2004), elite sport is conducive to producing lower levels of intrinsic motivation and as such lower levels of self-determination.

The reduced data was analysed using SPSS 21.0, internal reliability of the individual subscales were calculated using Cronbach's alpha coefficient (see Cronbach, 1951). ANOVA was performed on the RAI. Pearson's correlations for the individual subscales suggested meaningful pattern of correlation was observed across most of the dependant variables suggesting the appropriateness of a MANOVA. A statistically significant MANOVA was obtained, ahead of conducting follow up ANOVA's the homogeneity of covariance assumption was tested across the six subscales using a series of Levene's *F* tests. Post hoc comparisons were carried out using Fishers LSD.

3.5 Chapter Conclusion

The aim of this chapter was to detail the systematic process that was followed as the project progressed from a pilot study to the eventual data collection and subsequent procedures for data analysis. As well outlining the procedural and methodological aspects of the study this chapter detailed the researcher rationale for invoking a functionalist philosophical perspective in

the study of human motivation and TD. The next chapter will presents the results from the study, followed by a discussion in relation to their potential relevance to the field of TID.

Chapter 4.0: RESULTS AND DISCUSSION

4.1 Introduction to chapter

The first part of this chapter discusses the reliability and validity of the data and then goes on to present the data analysis procedures and subsequent outputs. The next section of the chapter outlines the interpretation of the results and begins with a ‘discussion’ regarding the individual subscales of the self-determination continuum.

The results of the RAI are then interpreted and discussed from a ‘functionalist’ perspective in relation to the cause and effect relationship between the individual and the unique demands of different performance contexts. In this part of the chapter it is argued that the ‘environment’ exerts selection pressure (Reed, 1991) that gives rise to organisms that are equipped with functional action systems. In this approach, rather than idealising certain types of motivation, greater attention is given to the effect of a specific performance environment and its role in eliciting ‘functional’ behaviour (Paris & Turner, 1986).

The chapter goes on to discuss an ED perspective in relation to non-normal data and TD. In particular Helton’s (2011) description of ‘outlier prone periods’ is invoked to characterise the transitional processes of nonlinear systems. The final section of the chapter discusses the implications of these findings in relation to the application to ‘practical’ contexts, with a particular focus on the theoretical frameworks of nonlinear pedagogy and how such insights are operationalised in a constraints-led approach to TD.

4.2 Results

4.2.1 Reliability and validity

Before statistical analysis was carried out, four out-of-range values (i.e. outliers) were removed from the data (see Ntoumanis, 2006). Reliability and validity of the SMS-6 was then tested by calculating the Cronbach's alpha for all subsets of the scale (see Table 1). The lowest reliability in the research was reported for the subscale measuring amotivation (.42); this subscale was subsequently removed from the study. The alpha for integrated regulation is reported after the removal of 'item 4' as it was particularly weak. Clearly difficulty still exists in relation to measuring this form of motivation in relation to performance athletes.

Subsequently the alpha coefficient across the 19 items that made up the scale is .71 which indicates relatively high internal consistency. The highest individual value of Cronbach's alpha was reported for the external regulation subscale (.81). The non-normal distributions reported do not suggest adequate levels of consistency, however they are consistent with the degree of accuracy, or range of error, that one can expect for a sample of this size (see Henn et al., 2006).

Table 1 - Cronbach's Alpha values for the SMS-6 subscales.

Item	Whole Sample (n=49)
Intrinsic Motivation	.72
Integrated Regulation	.66
Identified Regulation	.71
Introjected Regulation	.65
External Regulation	.81
Average	.71

4.2.2 Relative Autonomy Index

ANOVA was performed on the RAI which reported at least one difference in relative autonomy across the three groups: $F(2, 46) = 4.65, p < 0.01, \eta^2 = 0.17$. The effect size implied 17% of the variance in relative autonomy is related to career stage. Post hoc comparisons of the three groups (Table 2) indicate that the Elite Amateur group ($M=55.18, 95\% \text{ CI } [47.87, 62.47]$) reported statistically significantly higher relative autonomy than both the College group ($M = 39.21, 95\% \text{ CI } [31.16, 47.27]$) and the Elite professionals ($M= 44.61, 95\% \text{ CI } [37.51, 51.71]$). The differences in relative autonomy between the Elite Professionals and College students were not statistically significant at $p < .05$.

Table 2 - Mean Difference in Relative Autonomy

	CS vs. EA	EA vs. EP	EP vs. CS
	<i>(P < .05)</i>	<i>(P < .05)</i>	<i>(P < .05)</i>
Relative Autonomy Index	.005*	.042*	.317

*Note: Statistical significance $p < .05$. *=statistically significant*

4.2.3 Individual Sub-Scales

Pearson correlations (see Table 3) suggest a meaningful pattern of correlation was observed across most of the dependant variables suggesting the appropriateness of a one-way multivariate analysis of variance (MANOVA). The Box's M value of 81.13 was associated with a p value of .012, according to Ntoumanis (2006) Box's M is severely sensitive to departure from

normality, and as such Huberty and Petoskey's (2000) suggest that $p < .005$ can be interpreted as non-significant. As such, for the purposes of MANOVA, the covariance matrixes between groups were assumed to be equal.

Table 3 - Pearson correlations, means (M) and standard deviations (SD)

	1.	2.	3.	4.	5.	M	SD
1. Intrinsic Motivation	1.0					21.37	3.89
2. Integrated Regulation	.44	1.0				17.88	5.11
3. Identified Regulation	.48	.71	1.0			15.94	5.16
4. Introjected Regulation	.60	.50	.57	1.0		13.65	5.32
5. External Regulation	.60	.67	.80	.71	1.0	13.92	6.21

Note. N=49; correlations greater than .10 are statistically significant ($p < .01$)

A statistically significant MANOVA was obtained, Pillais' Trace = .88, $F(42, 5693) = 1.56$, $p < .012$ confirming that there would be one or more mean difference across the career stages of performance golfers (College, Elite Amateur, Elite Professional). The multivariate effect size implied that 44% of the variance could be accounted for by career stage. Ahead of conducting follow up ANOVAs the homogeneity of covariance assumption was tested across the six subscales using a series of Levene's F tests (see Table 4).

Post hoc comparisons (Fisher's LSD) of the three groups, (see Table 5), indicate that the Elite Amateur group ($M=23.12$, 95% CI [21.38, 24.85]) and the College group ($M = 22.07$, 95% CI [20.16, 23.98]) reported statistically significant higher levels of Intrinsic Motivation than the

Elite professionals (M= 19.17, 95% CI [17.48, 20.85]). The differences in Intrinsic Motivation between the Elite Amateurs and College students were not statistically significant at $p < .05$.

Table 4 - One-way ANOVA's between self-determined subscales and career stage

Levene's	ANOVA's		College		Elite AM		Elite Pro				
	F	<i>p</i>	F	<i>p</i>	<i>n2</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Intrinsic Motivation	.74	.490	5.79	<.006	.201	22.07	2.64	23.12	3.28	19.17	4.33
Integrated Regulation	1.43	.251	18.65	<.001	.448	20.79	2.94	20.18	4.19	13.44	4.20
Identified Regulation	1.40	.361	16.17	<.001	.413	19.00	5.32	17.94	4.42	11.67	2.03
Introjected Regulation	.48	.624	4.20	<.021	.154	16.79	5.10	13.12	5.31	11.72	4.59
External Regulation	2.80	.074	12.43	<.001	.351	18.00	5.16	15.41	6.32	9.33	3.58

Note. N = 49: n2 = Partial eta squared

Whilst no statistical significance was observed for Integrated Regulation subscale between the Elite Amateurs (M=20.18, CI 95% [18.28, 22.07]) and College players (M=20.79, CI 95% [18.70, 22.87]) both groups reported significantly higher levels of this type of motivation than the Elite Professionals (M=13.44, CI 95% [11.60, 15.29]). Similarly, significantly higher levels of Identified Regulation was demonstrated by the Elite Amateurs (M=17.94 CI 95%, [15.97, 19.91]) and College players (M=19.00, CI 95%, [16.83, 21.17]) in comparisons to the Elite Professionals (M=11.67, CI 95%, {9.75, 13.58}).

The College players (M=16.79, CI 95%, [14.10, 19.47]) reported statistically significant higher levels of Introjected Regulation than both the Elite Amateurs (M=13.12, CI 95%, [10.68, 15.56]) and the Elite Professionals (M=11.72, CI 95%, [9.35, 14.09]). No significant difference

was observed on this subscale between the Elite Amateurs and Professionals. Elite Amateurs (M=15.41, CI 95%, [12.92, 17.91]) and College players (M=18.00, CI 95%, [15.25, 20.75]) shared similar profiles for the External Regulation subscale reporting statistically significantly higher levels than the Elite Professionals (M=9.33 CI 95%, [6.91, 11.76]).

Table 5 - Mean difference between self-determination subscales and career stage

	CS vs. EA (<i>P</i> < .05)	EA vs. EP (<i>P</i> < .05)	EP vs. CS (<i>P</i> < .05)
Intrinsic Motivation	.420	.002*	.026*
Integrated Regulation	.666	.001*	.001*
Identified Regulation	.471	.001*	.001*
Introjected Regulation	.048*	.413	.007*
External Regulation	.167	.001*	.001*

*Note. Statistical significance $p < .05$. *=statistically significant*

4.3 Discussion

4.3.1 Individual sub-scale analysis

Internal reliability of the individual subscales (Table 1) was calculated using Cronbach's alpha coefficient. Reliability was acceptable ($\alpha < .70$) for all measures with the exception of introjected regulation ($\alpha = .65$), and integrated regulation ($\alpha = .66$). With these limitations in mind, analysing the individual subscales of SDT not only elicits a greater understanding of the different possible reasons a particular population has for practicing their sport, it provides a deeper analysis than is possible using the RAI in isolation. That is to say independent populations

could report similar levels of relative autonomy, as indicated by the RAI, but do so in a variety of manners. For example the CS group demonstrated significantly higher levels of both intrinsic and extrinsic motivation than the EP group. This occurrence can have a ‘levelling’ effect when calculating the RAI because of the positively weighted intrinsic subscales and the negatively weighted extrinsic scale. As such when viewed in isolation the RAI can present a somewhat distorted picture in relation to the particular phenomena of interest. An individual subscale analysis was deemed to be an important step because whilst CS and EP groups reported non-significantly different scores in relation to relative autonomy, it would be wrong to assume that these are homogenous populations.

Overall, post-hoc comparisons of the three groups indicate that the CS group and EA group showed significantly higher levels of the most autonomous forms of motivation (i.e. intrinsic motivation, identified regulation and integrated regulation) than the EP group. According to Wigfield and Wagner (2007), during early and middle adolescence high levels of intrinsic motivation is a common trait because competence related beliefs tend to be self-referenced, however this begins to decline during the onset of full adolescence as the individual begins to externally reference their competence by comparing themselves to others. These findings are in contrast to Sarmiento et al. (2008) who found that, when compared to amateur performers, professional and semi-professional football players demonstrated no significant difference in intrinsic motivation but significantly higher levels of identified regulation. Also, given that the elite professional golfers comprise a range of nationalities, it is worth mentioning that cross cultural differences in intrinsic motivation has also been reported by Mladenovic and Marjanovic (2011). Additionally, the findings from the current study are consistent with Cognitive Evaluation Theory (CET) a sub theory of SDT (see Ryan & Deci, 2000), in which the

amateurs would be expected to engage in the activity for less controlling reasons than elite professionals. That is to say that an individual is likely to experience diminished intrinsic motivation when their participation is controlled by external factors (Mandigo & Holt, 2000). For example an EP may have playing commitments to fulfil to satisfy the conditions of membership to a particular 'professional tour' or obligations to fulfil the conditions of their commercial agreements with companies who sponsor them. Practice therefore may be undertaken purely as a 'means to an end' and not necessarily for the inherent enjoyment of it.

Of all the subscales under analysis in this study integrated regulation was of particular interest given that it is the most autonomous form of extrinsic motivation (see Treasure et al., 2007). Integrated regulation occurs when the individual is able to internalise extrinsically driven behavioural regulations and is able to integrate them into their sense of self in order to engage autonomously in the activity (Markland & Vanstreenkiste, 2007). This may well be a crucial factor in relation to the successful adaptation from the inherently intrinsic environment of amateur sport to the inherently extrinsic environment of professional sport. Whilst previous research has identified the existence of integrated regulation in elite level performers (see Mallett & Hanrahan, 2004), it has also been unable to quantify its existence or establish its position in the hierarchy of motivational profiles. In contrast to this the results from the present study indicate that the EP group, in relation to the other two groups, do not identify strongly with this form of motivation. Our understanding of the potentially pivotal role of this particular form of motivation requires greater consideration and further research (Pelleteir, 2013) particularly as is related to elite level performers.

Of the non-self-determined subscales both the EA and CS group reported significantly higher levels of external regulation than the EP's. It was expected that, given the association of

professional sport with monetary and material reward, the elite professionals would demonstrate the highest levels of this form of motivation in relation to the other sample groups. Previous applications of self-determination theory have shown that elite performers have high levels of both intrinsic and extrinsic motivation (Chantal et al., 1996). Whilst this is observed in the data from the present study, comparative to their amateur counterparts the elite professionals reported, statistically significant, lower levels of extrinsic motivation. Interestingly, Garcia-Mas and colleagues found that, when the results from the original SMS were correlated with the results from the Sport Commitment Questionnaire, high levels extrinsic motivation correlated well with high levels of enjoyment (see Garcia-Mas et al., 2010). In reporting lower levels of extrinsic motivation the EP group could be practicing their sport purely to attain a separable outcome rather than for the inherent enjoyment of the act (see Ericsson et al., 1993; Ryan & Deci, 2000). These findings are consistent with the literature, the ‘undermining effect’ on intrinsic motivation is widely reported when participation in sports becomes increasingly focused on external reward (see Wiechman & Gurland, 2009) and affected by the impact of pressurised competitive settings. In such cases practice is motivated by an instrumental approach to achieving outcomes that are not inherent in the activity itself (Ryan & Deci, 2007).

The CS group also reported significantly higher levels of introjected regulation which, according to Ryan & Deci (2000), involves behaviour’s that are performed to avoid guilt or anxiety. In such cases people are motivated to demonstrate ability and avoid failure in order to maintain a feeling of worth. Ego involvement such as this is a classic form of introjection, (Ryan & Deci, 2000) and is popularly associated with achievement goal theories. Several achievement goal theorists (e.g. Dweck, 2006) have made the link between this type of motivation and the value that these individuals place on looking good over learning, disdain and fear of effort, and to

abandonment of effective strategies when they are needed the most. This suggests that introjected regulation would seem to have a potential buffering effect in relation to why young people do not drop out of sport. In their study of mid adolescents in sports and exercise, Gillison et al. (2009) reported similar results to the present study; young people reported high levels of both introjected regulation and self-determined motivation towards participation in their sport. According to Gillison et al., the participants' reasons for not dropping out of their sport closely reflected introjected regulation, indicating that the avoidance of guilt and social disapproval was a reason for their continued participation. As such introjected regulation may play an early, pivotal role, in the adaptation towards more internalised modes of behaviour (Vansteenkiste et al., 2005).

In conclusion it was found that whilst all groups favoured the intrinsic end of the self-determination continuum, the CS and EA group reported significantly, higher levels of this form of motivation. Items measuring intrinsic motivation infer that practice is performed for reasons of interest and enjoyment. With this in mind, despite the EP group reporting significantly lower levels of intrinsic motivation than the other two groups; it is important to note that given the high levels of competitive pressure and intense practice that characterises the lives of elite professional sports people, you might expect them to report far lower levels of the most autonomous form of motivation by comparison to adolescent amateur performers. The inability to maintain high levels of intrinsic motivation may explain why some apparently gifted performers fail to realise their full potential in sport.

4.3.2 The relative autonomy of high performance golfers

Overall, this study found that performance golfers across varying career stages had strong levels of autonomous motivation for practicing their sport. This was confirmed by all groups

returning positive scores on the RAI implying that the participants consider self-determined forms of motivation as a more important factor in relation to why they practice their sport than non-autonomous motivation (Pelletier & Sarrazin, 2007). It should be noted that the RAI was calculated using the intrinsic motivation, integrated regulation, identified regulation, introjected regulation and extrinsic motivation subscales and did not include the subscale for amotivation. The decision was taken to drop this particular subscale on the basis that it returned the lowest alpha for internal consistency (.42) and, in relation to the EP group, had severe limitations in relation to the factor structure. With this limitation in mind, the most autonomous form of behaviour was observed in EA group who reported significantly higher relative autonomy than both the CS group and the EP's, whilst the differences in relative autonomy between the EP's and the CS's was non-significant.

With these findings in mind the data, interpreted from a functionalist perspective, can be explained as the adaptation of the biological organism to the changing demands of the environment. Under these circumstances motivation can be viewed as a process not an entity (Roberts et al., 2007), that is affected by contextual conditions (Ryan & Deci, 2000), leading to potential changes in the outcome variables (Pelletier & Sarrazin, 2007). An organismic dialectical perspective is a fundamental SDT postulate (see Deci & Ryan, 2000) that views humans as adaptive organisms naturally inclined to orientate their physical elements to their experiences in order to bring about relative unity. As such the psychological 'need' for competence, relatedness, and autonomy are viewed as neurophysiological constructs that act in a transformative manner to bring about a satisfying situation (see Deci & Ryan, 2000).

Interpreting the data in this manner makes the argument that it is an error, leading to potentially maladapted responses, to idealise certain types of motivation (e.g. intrinsic

motivation) in which “...attention is directed to enduring characteristics of the individual rather than enduring features of situations that elicit such orientations” (Paris & Turner, 1986, p. 216). As such the level of autonomy indicated by the performers in the present study is characterised as an ‘induced’ orientation to the unique extrinsic demands of the specific performance context. From this particular perspective it is through these ‘developmental adaptations’ that the performer is regulating and integrating the external demands of the specific performance context in an attempt to attain a specific outcome variable.

The lower observed levels of autonomy demonstrated by the CS’s and EP sample groups suggests the situational demands of college golf and elite professional golf requires greater interaction with extrinsic factors than environmental characteristics of elite amateur golf. Professional sport is laden with salient extrinsic rewards (Eklund & Cresswell, 2007), and reasons for practicing are inevitably motivated by an instrumental approach to achieving outcomes that are not inherent in the activity itself (Ryan & Deci, 2007). As such a clearer understanding of the ‘norms’ and ‘values’ within our elite amateur teams will allow us to understand to what extent these norms and values mediate maladapted reactions to elite level professional sport.

The successful adaptation from the inherently intrinsic environment of amateur sport to the inherently extrinsic environment of professional sport may well be the key challenge that a young professional will face. According to MacNamara et al. (2010b) the pathway to excellence is complex and different stages may require different skills, individuals will encounter less predictable micro-stages during their developmental transition towards excellence, as such an incident that facilitates the growth in one person may well forestall it in another.

It would seem that there is little disagreement that talent development is complex and that whilst we may 'know it' when we 'see it', defining it is all together more difficult. It is perhaps too simplistic to suggest that for practice to be considered developmental it only need faithfully reproduce the demands of the performance context (Renshaw et al., 2010). Clearly then this is an area that requires more consideration and research. If future research in the field of TD is to invoke a 'systems' orientated ED perspective then it may well be the case that we can design studies that, rather than compartmentalising talent into stages and phases, identifies 'thresholds of complexity' that are passed through during the talent transition process. Furthermore, from this perspective, it may be possible that the 'thresholds of complexity' can be modeled in such a way that the 'nodes' (the individual elements that comprise the system, both internal and external) of greatest influence become more apparent (see Newman, 2003; Chen et al., 2007).

4.3.3 Non-normal data in nonlinear systems

In dealing with the observed levels of non-normal distribution across the data set, and the acknowledged weaknesses of the SMS-6 (see Pelletier et al., 2013), it could be argued that the data in this study is unreliable. Whilst the non-normal distributions reported do not suggest adequate levels of consistency, in relation to the individual subscales, they are consistent with the degree of accuracy, or range of error, that one can expect for a sample of this size (see Henn et al., 2006). Similarly, even if normal distribution was reported the sample sizes are too small to infer any concrete conclusions from (see Hopkins, 2008). If we are able to put these limitations and considerations to one side, non-normal distribution provides an interesting opportunity to consider a contemporary viewpoint in relation to the study of biological open systems and may well highlight an area that requires greater consideration in relation to SDT and TID.

According to Gulbin et al. (2013) there are no standardised stages and phases during the talent development process, despite this most contemporary models have proposed between three (i.e. Bloom, 1985) and six (i.e. Balyi & Hamilton, 2004). In reducing the concept of talent to so few variables these models are insufficient in their ability to capture the non-normative phase transition's that characterise the dynamic multiplicative nature of the human system (see Alfermann & Stambulova, 2007; Lickliter, 2009). From an ED perspective, biological organisms are 'open' and as such continuously exchange energy and matter with their environment, in which case 'stasis' (system equilibrium) is not a single fixed point but instead represents the continuous and on-going order producing capacity of the human system (see Ovens et al., 2013). Order is maintained in a process of system self-organisation involving the spontaneous forming and breaking of constraints in response to the demands of environmental changes (Stephen et al., 2009).

In this respect the developing performer can be thought of as a nonlinear dynamical system because what acts to perturb reorganisation of system dynamics in one individual may not be the same in another. As such, in the study of human performance, it is necessary to consider non-normality in data as being the actual phenomena of interest (Helton, 2011). Consequently, reductionist thinking is being replaced by descriptions of the 'indeterminate' nature of physical phenomena (see Glimcher, 2005). If physical phenomena behave in a fundamentally indeterminate manner then it has been argued that they are by their very nature non-algorithmic and non-computational (see Hanford, 1997; Kondepudi, 2012; Turvey & Carello, 2012) and as such non-representational within a single unifying model of talent development.

The suggestion that non-normality in data should be an expected feature, when studying biological 'open' systems, shouldn't be taken to suggest that no optimal level of psychological

functioning exists. Instead it suggests that when studying nonlinear biological organisms, adaptation occurs at different rates for different individuals. From a nonlinear systems perspective this draws on the concept of emergence and convergence. A feature of biological 'open' systems is that the 'emergence' of functional modes of behaviour influences the performers convergence on their end directed goal (see Withagen & van Wermeskerken, 2010; David's et al., 2012). Emergence and convergence can be observed when individuals share the same end directed goal and invokes Bourdieu's analytical concept of the 'habitus' (see Bourdieu, 1990), that is to say that "...those who pass through similar fields tend to develop similar habitus that can be seen to reflect the successful negotiation of particular environments in a person's life" (Light & Evans, 2013, p408) however the transition from one stable state to another emerges in a nonlinear manner and therefore across differing timescales (see Davids et al., 2007).

The varying rates of functional adaptation to an end-directed goal when viewed in this manner could be interpreted to reflect the observed non-normal distribution in the SMS-6 data in the present study. Any investigation insensitive to this may fail to fully capture the multiplicative, nonlinear, nature of the human system and its movement in time and space. This insight suggests that as a performer is transitioning from one level of performance to another, 'far from equilibrium' and on 'the edge of chaos' (see Ovens et al., 2013), they are inherently in an 'outlier prone period' in their personal development (see Helton 2011). More research is required before it can be suggested that 'outlier prone periods' do in fact represent the very essence of the necessary conditions needed for successful talent development.

Invoking this notion it is possible that at the various stages of performance there exists an optimal level of self-determined motivation for successful functioning; and that the convergence on this 'way of being' occurs in a nonlinear, non-normal manner, during the organisms struggle

to coordinate its unique internal dynamics with the external forces and flows impinging on it. Encouragingly, SDT lends support for this notion given that it represents a continuum of human motivation that views the organism as adaptive and naturally inclined towards unity. The adaptive process is mediated by the psychological ‘need’ for competence, relatedness, and autonomy which are constructs that are considered to drive the neurophysiological transformation of the organism to bring about a satisfying situation (see Deci & Ryan, 2000). It has been previously suggested that internal differences in ‘relative autonomy’, between seemingly homogenous groups, could be used to pre-empt and then plan intervention to enhance the motivational development of athletes (see Pelletier & Sarrazen, 2007), and that nonlinear pedagogy is a framework naturally inclined to support the development of intrinsic motivation (see Renshaw et al., 2012). Clearly more consideration needs to be given to how the postulates and methodologies, common in SDT research, can be integrated/adapted to contribute to these emerging, dynamical systems, conceptualisation of human development and flourishing.

4.3.4 Theory to practice – pedagogy of emergence

According to Jones et al. (2008) coaches’ have consistently failed to make the link between theoretical concepts and application to practical contexts, a result of which they contend is that “...coaching knowledge remains rooted in implicit assumptions as opposed to explicit research and theory” (pxiii). Pankhurst and Collins (2013) suggest that the non-application of research to practice may well be the reason that our sports ‘systems’ appear unable to support young athletes in reaching their potential, they do however recognise that some research is unnecessarily complicated and fails to consider the practical application of the findings.

In ecological dynamics, nonlinear pedagogy is a scientifically principled framework that describes, explains and predicts how individual change occurs (see Chow et al., 2009). In considering the practical application of the findings of the present study, the manipulation of ‘situated motivation’ is discussed in relation to encouraging successful convergence towards an end directed goal. When the end directed goal has clear ‘situated’ criteria (e.g. The European Tour) it is important that the coach plans activities that induces the emergence of specific behavioural traits that are ‘known’ to be required for successful functioning within a specific eco-niche. If a certain type of motivation, in accordance to SDT, is known to aid the transfer from one stage to the next then this information could be used in a training context.

A key aspect of planning performance behaviour is the imposition of ‘affordances for action’, an affordance, simply put, refers to the environment and the action opportunities that it affords the individual (see Withagen & van Wermeskerken, 2010). When affordances are ‘constrained’ by the coach the number of action possibilities are reduced, inducing what Reed (1991) describes as evolutionary selectionism, in that the manipulation of ‘affordances’ exerts selection pressure that gives rise to organisms that are equipped with appropriate action systems. If a certain type of self-determined motivation is part of a functional action system then it is possible that constraints can be manipulated to induce adaptation in these specific psychological mechanisms. Manipulating constraints to induce adaptation to the demands of the performance context is commonly referred to a ‘constraints-led approach’ to coaching (see Davids et al., 2008). In a constraints-led approach the three variables that impinge on performance, and on situational motivation (see Vallerand, 2004), are the task, the environment and the individual (see Figure 1). In order to create new modes of behaviour (improved action systems), these constraints are used to ‘stress’ the biological system forcing it to the ‘edge of chaos’, ‘far from equilibrium’

(see Ovens et al., 2013) placing them in an ‘outlier prone’ state of flux. Under such conditions biological systems evolve the capacity to self-organise in an effort to establish a self-sustaining relationship with the environment (Kondepudi, 2012).

This process relies on the ‘smartness’ of the human system that has evolved to adapt to the conditions in its environment (Shaw & Kinsella-Shaw, 2012) and defines the notion of specificity in training. Conversely, and through the same biological process, if an organism is isolated from the key specifying conditions of its target context it begins to lose function (Turvey, 2009) both psychologically and physiologically. Whilst the present study has not identified the key environmental conditions present during the different stages and phases of performance, the data does tentatively make the case that ‘habitus’ influences the production of a specific ‘type’ of functional self-determined motivation.

This draws strongly on an ED postulate that the boundary conditions for learning are dynamically constrained by context (Mikulecky, 2000). With this in mind Cobley et al., (2011) suggest that training settings that do not represent the performance context, and are not designed to induce physical, psychological and performance adaptation should not be considered as talent development environments. Clearly there exists the need to investigate further the specific environmental conditions of the various stages of performance in order to understand more about, as previously suggested, the thresholds of complexity that need to be negotiated before a developmental transition is achieved.

Once this has been achieved a more precise implementation of the constraints-led coaching principle, known as representative task design (RTD), can be utilized for the purpose of TD. RTD is an evaluation of the extent to which the training environment faithfully reproduces the demands of the performance context. Its principle aim is to ‘situate’ the performer in

'recognisable' contexts in the presence of the key variables, tactical, technical, mental, that specify successful performance. According to Renshaw et al. (2010) insights such as these provide theoretical impetus for existing pedagogical approaches such Teaching Games for Understanding (TGfU). Clearly the theoretical insights from ecological dynamics, when combined with pre-existing pedagogical approaches such as TGfU, has the potential to provide coaching practitioners with a scientifically principled framework for planning the development of adaptive performance behaviours (see Richardson et al., 2013).

For example if it is demonstrated that as a result of playing on longer golf courses, in warmer climates and because of slower playing times, elite professionals experience greater levels of fatigue during performance than is experienced by elite amateurs a constraints-led approach could be used to prepare individuals for this situation, even though they do not require these competencies at their current level of performance. This process could be achieved by manipulating constraints to deliberately fatigue the performers during high intensity cardiovascular training immediately prior to the beginning of a practice session. Practice, ideally featuring RTD (e.g. the training session could last for a minimum of 5 hours, this is at least the length of time they would expect to be on the course during a professional tournament), would then take place in conditions that are more closely related to those experienced at the next level of performance level. This would provide the opportunity for the players to adapt to these conditions in advance and would provide the 'coaching team' with the opportunity to assess any associated technical, tactical or psychological issues.

In relation to the present study, EA's appear to have less external pressure imposed upon them than EP's, potentially leading to higher levels of autonomous behaviour. This may be because involvement in elite amateur 'national' squads comes with many privileges including

financial, coaching and sports science support. Such support is aimed at smoothing the pathway to elite performance; consequently the success of the athlete is regarded as a product of a systemised and controlled process of training and support (see Güllich et al., 2006). However, the process of minimising extraneous pressure on athletes, according to Collins and MacNamara (2012), may in fact ‘fail’ to provide young performers with the necessary adversity needed to hone their skills for future higher levels of performance. As such Collins and MacNamara argue that there is a need for structured trauma in talent development initiatives because adversity is associated with the psychological characteristics of developing excellence (PCDE’s; see MacNamara et al., 2010a; 2010b). Such an approach is consistent with an ED philosophical perspective that views chaos and instability as essential nutrients for growth in biological systems and is a key feature of constraints-led coaching.

When it becomes clear that an individual is planning to make the progression from an amateur to professional level of performance, developmentally appropriate ‘structured trauma’ (Collins & MacNamara, 2012) could be implemented as part of their preparation. This may be in the form of deliberately inducing PCDE’s and an orientation to a less autonomous regulatory style by reducing support and imposing greater constraints on the performers than they have previously experienced. These constraints may come in the form of dictating to the players a potentially sub-optimal playing schedule (because in the early days of their professional career it is unlikely they will be able to pick and choose their events) or to deliberately disrupt their tournament preparation cycles by imposing on them attendance at functions, charity events, junior clinics or sponsors tournaments to simulate the external demands of professional sport.

In conclusion only when more is known about the particular demands of specific ‘situated contexts’, and the forms of motivation that are conducive to functional behaviour in these

environments, can a nonlinear pedagogy and constraints-led approach be utilised to stimulate the emergence of an appropriate action system in relation to an individual's end directed goal.

4.3.5 Limitations and future directions

As has been previously outlined, questions regarding the external validity (see Pelletier et al., 2013) and construct validity of the SMS-6 (see Vallerand et al., 2012) draw into question the ability of the SMS-6 to accurately discriminate between the theoretical constructs of SDT. Furthermore the lack of external validity draws into question the scales ability to measure the construct of motivation in the context of performance sport. Another limitation of this study is that collecting data from elite professionals on the practice ground at a tournament may be problematic. Consequently the 'amotivation' subscale was removed from all aspects of the study as it is now somewhat obvious that during a tournament elite professionals, in relation to why they practice their sport, are unlikely to associate with questions such as "I don't know anymore; I have the impression of being incapable of succeeding in this sport" and "I don't know if I want to continue to invest my time and effort as much in my sport anymore". There is no way of telling to what extent the other subscales were affected similarly by this process of data collection. Finally, and despite the argument that 'non-normal data' may well be the phenomena of interest when studying human development, a more traditional viewpoint is that by using a relatively small sample size presents a greater risk of making a large error in estimating a parameter of a given population (Frankfort-Nachmias & Nachmias, 1996). Due to the time constraints involved in this study, and difficulties in accessing elite level performers', it was not possible to sample a larger section of these populations.

With these limitations in mind it is important to consider possible future directions for this line of enquiry. Clearly in the period since data was first collected in 2007, attempts have been made to improve the psychometric properties of the SMS, such as Pelleteir et al's. (2013) Sports Motivation Scale II. According to Pelleteir et al. (2013), further research is needed before the stability of such structures can be confirmed across differences in age, gender, nationality, sport and level of performance. Another potential issue with the properties of measurement scales, from an ED perspective, is the concept of specificity. In ED, the relationship between variables hold only in the eco-niche (the specific context) of the organism under investigation (Beek et al., 2003), as such you would expect 'external validity' to be hard to ascertain.

By natural extension of this viewpoint instead of attempting to model performance within stages and phases or attempting to idealise intuitively appealing, 'ways of being', future research in the area of participant and performance development should focus more closely on the 'eco-niches' of specific 'subjects' of interest. Theoretical frameworks such as Bronfenbrenner's bio-ecological model (see Bronfenbrenner & Morris, 2006) have already proved useful in this type of research (see Araujo et al., 2010). In isolating the variables of time, process, person and context Bronfenbrenner's bio-ecological model may be useful in adding theoretical impetus to the belief that in order to understand 'situated motivation' you must understand the interaction the individual experiences in the specific sporting context (Roberts et al., 2007). Furthermore it may be necessary to undertake this type of research at various stages of the performance pathway in order to understand to a greater extent the environmental role of player development in the UK. Until such work is established it will remain unknown to what extent successive generations of seemingly talented UK performers' have entered into flawed 'eco-niches' of structured talent

development initiatives and have subsequently become maladapted to successful functioning as a result.

4.3.6 Chapter conclusion

Motivation is dynamic and changeable and affected by situational contexts, furthermore as the situational context changes so it would seem must the individual's motivational orientation change with it. As such, dynamic motivation, as a neurophysiological construct (see Deci & Ryan, 2000) capable of spontaneous reorganisation in the face of changing constraints is an area in need of further investigation. Once more is known about the prevailing cultures and demands of specific performance contexts more can be done to help prepare those who intend on transitioning from one level of performance to the next.

Chapter 5: CONCLUSION

5.1 Introduction to the chapter

This chapter will revisit the main findings of the research and talk about potential implications to the field of TID. In doing so it is hoped that the implications of the research can be established and recommendations for future research justified.

5.2 Summary of research findings

This study sought to explore the self-determining characteristics, and relative autonomy, of high performance golfers across typical career stages on the TD continuum. The different career stages are used to represent different points in time, and situations, in three distinct performance environments. As such the independent variable of ‘career stage’ and the six dependent variables of SDT were isolated to examine the relationship between these collective variables and what, if any, inferences could be drawn from the data.

Unsurprisingly, and as expected, all groups in this study reported high levels of ‘autonomous motivation’ as reflected in their positive scores on the RAI. However, the most distinguishing feature of the study was the lower levels of relative autonomy demonstrated by the EP and CS groups in comparison to the EA group. The lower levels of relative autonomy demonstrated by the EP and CS groups, it is argued, speaks of the prevailing cultures of the externally imposed conditions experienced in further education and elite professional golf. In further education students comply with timetables, attendance monitoring and assessment, all of which impacts on the students involvement in college golf activities. Elite professional golf is laden with salient extrinsic rewards that often involve outcomes that are separable to the activity

itself; such as obligations to sponsors, playing stipulations imposed by the various golf tours and other commercial commitments.

EA's on the other hand appear to have less external pressure imposed upon them by comparison to that experienced by the EP's and CS's. As such they may be able to operate in a manner that is more self-directed leading to higher levels of autonomous behaviour. On the face of it this situation would appear to be healthy. Elite professional golf by its very nature mediates against high levels of autonomous motivation. As such it is argued that the research findings strongly suggest that involvement in high level amateur golf potentially produces maladapted system dynamics, particularly if the end directed goal is to play high level professional golf (see Chatzisarantis & Hagger, 2007).

As such the findings in this study strongly imply that, when the subjects of your study inhabit a clearly defined externally regulated context, they are changed by the interactions that they encounter there because successful functioning in sporting contexts require this. This can be viewed as the 'performance' environment exerting selection pressure (see Reed, 1991) that gives rise to organisms that are equipped with functional systems. This supports Bourdieu's analytical concept of the 'habitus' (see Bourdieu, 1990), that suggests that those who are involved in similar 'interactions' are inevitably changed by these interaction for the benefit of successfully inhabiting a specific environment. However the non-normal data in this study is interpreted to suggest that as we converge on a 'habitus', we do so in a nonlinear manner and as such the talent development process can be characterised as an 'outlier prone' period in an individual's life. That is to say that non-normally distributed data should be a feature of nonlinear systems that behave in fundamentally indeterminate manners. In positioning nonlinear systems as non-algorithmic and

non-computational we must also accept the error and noise in our data may well reflect the very essence of human development.

These findings strongly support Paris and Turners belief that in situated learning contexts it is an error to idealise certain types of motivation because this wrongly focuses the attention on the individual instead of the environment (see Paris & Turner, 1986). As motivational theorists suggest (see Roberts et al., 2007), concentrating on the interactions that a performer experiences in ‘situated’ contexts may well be a far stronger predictor of behaviour. This concurs with the ED viewpoint that if you want to understand behaviour you ignore the component parts of the system and focus on the interactions instead (Zohar & Marshall, 1994).

5.3 Implications

Several implications can be considered from the findings in this study. First, it is important to emphasise that in characterising the talent development process as representing an ‘outlier prone’ period in the performers life, the researcher does so to deliberately encourage reflection set against the ‘reductionist’ traditions that are manifest in the linear, measurable processes associated with behaviourist (see Jess et al., 2011) coaching strategies. As such it is hoped that this thesis has clearly articulated why contemporary thinking into human performance is increasingly shifting away from such strategies and is increasingly becoming aligned to a more dynamic, nonlinear and emergent conceptualisation of the talent development process. In articulating this viewpoint the researcher has carefully tried to support his arguments, and interpretation of the data, within a comprehensive worldview and consistent epistemology (Butler et al., 2012). Whilst not everyone who reads this thesis will agree with the assumptions made, it is hoped however that they will be encouraged to reflect upon their own ‘worldview’ and how

this impacts upon their own ‘coaching’ philosophies and practices. For those who do find themselves aligning to the ED’s theoretical perspective it is hoped that they will feel better equipped to be part of an active ‘community’, willing to engage, argue, educate and contribute to the development of better player development opportunities in the future.

For this to happen, however, it is recognised that the transfer of theory into practice must not be obfuscated by researchers’ and academics’ presenting information that is inaccessible and not demonstrated within a practical context (Pankhurst & Collins, 2013). As such this ‘thesis’ demonstrates how a scientifically principled viewpoint with regards to human development (i.e. ecological dynamics) can be positioned within the practical context (i.e. TGfU). The researcher does this in a deliberate attempt to encourage other practitioners to do the same in relation to the theories, ideas and hunches they have about player development. Perhaps only when this practice is the ‘standard’ in sports coaching, will we see the field progress from one in which practitioners move away from arguing about ‘what’ people should be taught and instead are able to rationalise their ideas within a principled ‘scientific’ framework of ‘how’ people learn.

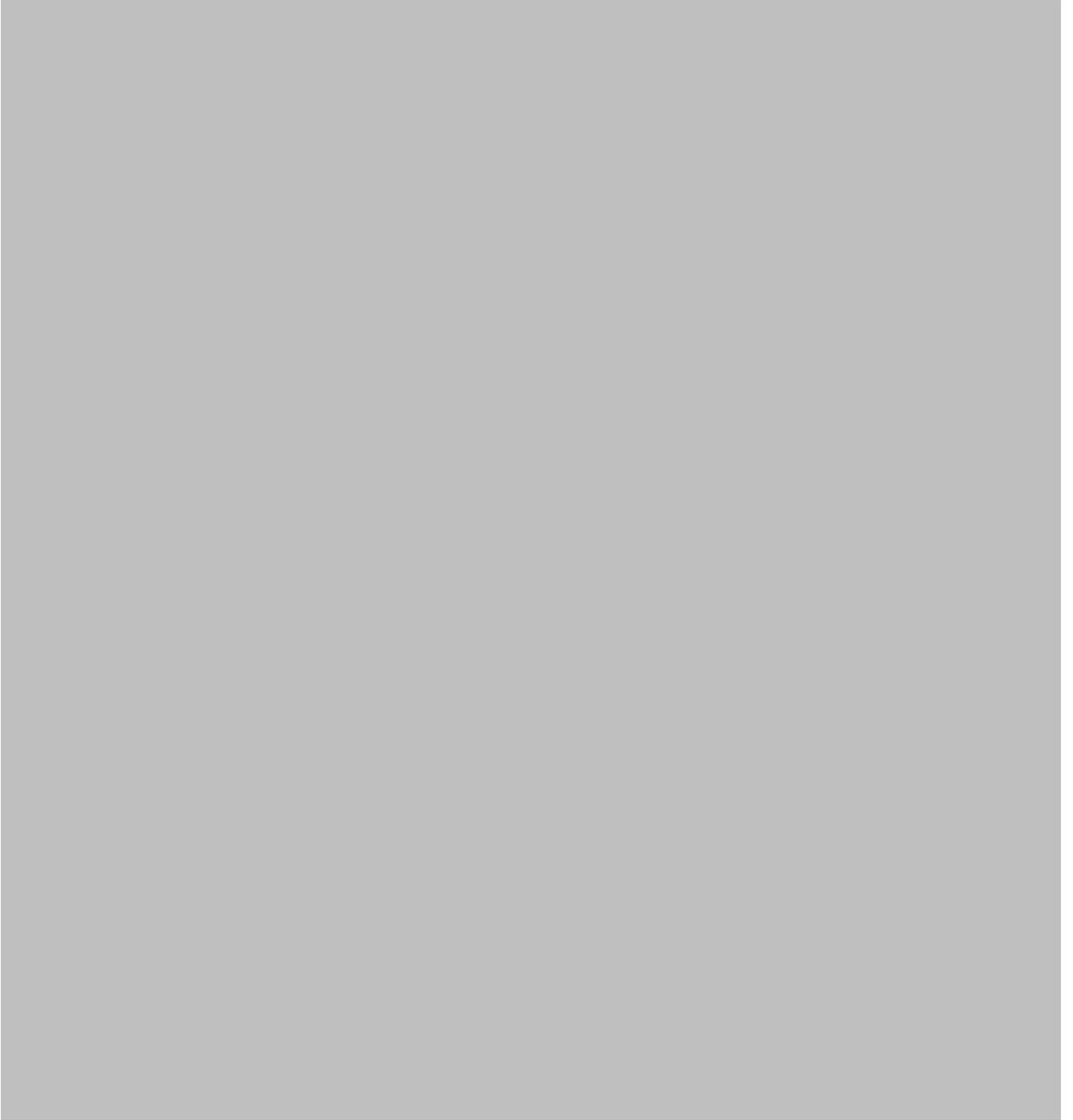
5.4 Final thoughts

The aim of this study was to explore the motivational characteristics of performance golfers across typical stages on the TD continuum. The argument put forward, and strongly supported by the ED literature, is that ‘motivation’ orientates itself to information in the environment in an attempt to function successfully. In this sense a functional motivational orientation, as a construct of successful TD, is an example of the end-directed striving that characterises the organism/environment relationship (Swenson, 1997). Whilst many eminent scholars are already well on their way to positioning the field of ED firmly on the TD agenda; it

is hoped that any practitioner who decides to take a look at this research project will find it to be a useful 'introductory' text in relation to the theoretical concepts with which it was guided by and how they relate to performance sport.

Chapter 6: APPENDICES

6.1 Appendix A – The SMS-6



6.2 Appendix B – Participant information letter



UNIVERSITY OF
BIRMINGHAM

Participant Information

Investigation: Motivation in Sport

Investigator: Graeme McDowall

Supervisors: Matt Bridge, PhD

Before proceeding to the questionnaire, please could you read the following information and sign the consent form.

Thank you for agreeing to take part in my thesis on talent development in golf, this study is part of my MPhil with the University of Birmingham. The aim of this study is to find out more about the motivational characteristics of elite level golfers. The findings from this research will hopefully be used in the future to better inform the processes of Talent Identification and Development in junior golfers.

There is no risk of breach of confidentiality as real names are not used in the final research paper and all information will only be used for the purpose of this paper and not passed to a third party. You are free to withdraw from this study at any time. If you withdraw from the project your information will be removed from the study upon your request.

Details of the researcher are as follows:

Graeme McDowall



6.3 Appendix C – Participant consent



UNIVERSITY OF
BIRMINGHAM

Participant Consent

Investigation: Motivation in Sport

Investigator: Graeme McDowall

Supervisors: Matt Bridge, PhD

I have read the Participant Information sheet and I am willing to undergo the investigation, I understand that I am free to withdraw at any time without having to give an explanation.

Name _____

Signed _____

Date _____

If you have any questions please feel free to contact us; contacts are below:

Investigator:

Graeme McDowall



Supervisor:

Dr Matt Bridge



Chapter 7: LIST OF REFERENCES

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