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The 'when' and 'why' of motivational dynamics: A synthesis of contemporary theories.

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A thesis submitted to the Institute of Biological, Environmental and Rural Sciences (IBERS) in fulfilment of the requirements for the degree of Doctor of Philosophy.

Declaration

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Summary of Thesis

The thesis draws from two contemporary theories of human motivation: self-determination theory (SDT; Deci & Ryan, 1985, 2000) and reversal theory (Apter, 1982) to enhance our understanding of the dynamics of motivation and its effects on well-being.

The thesis tests basic psychological needs theory (a sub theory of SDT) in which well-being and psychological growth are predicated by satisfaction of needs for autonomy, competence, and relatedness. Optimum well-being is associated with a balanced satisfaction of these three needs (Sheldon & Niemiec, 2006), whilst thwarting of any need is associated with functional costs (Deci & Ryan, 2000).

These relationships are examined in conjunction with the ideas of reversal theory. This posits that an individual's motivation moves dynamically through four mutually exclusive pairs of meta-motivational states, each characterised by a certain way of interpreting some aspect of one's own motivation and associated with their own range of emotions (Apter, 1989, 2001). To be considered "psychologically healthy" people should reverse between states on a regular and frequent basis, thus experiencing a broad range of felt emotions (Apter, 2001). Currently reversal theory literature presents three reversal inducing agents: frustration, satiation, and contingent events, however, literature surrounding the reversal process lacks depth and clarity, particularly in regard to frustration and satiation-induced reversals.

Within the present thesis, I posit that examining the conceptual links between reversal theory and SDT might enhance our understanding of the dynamic nature of motivation: how people switch motivational foci, why and when this might occur, and examine ways of triggering motivational switches to enhance well-being. Specifically, the thesis proposes that the active satiation and thwarting of basic psychological needs induces satiation and frustration based reversals. The movement between meta-motivational states is argued to help regulate balanced need satisfaction; although needs cannot all be satisfied at one time, they can be satisfied over time, the purpose of the reversal.

Consisting of five chapters: a general introduction including a theoretical integration of SDT and reversal theory, three experimental chapters, and a general discussion, the thesis had four main aims. First, to advocate a movement from working in theoretical silos to examining the meaningful concordance. The advantages of this are demonstrated through the interplay between SDT and reversal theory to better understand the dynamics of motivational focus. Second, to develop and validate an implicit measure of active meta-motivational state, enabling examination of acute changes in motivational focus. Third, to test a novel framework of the antecedents of meta-motivational state changes. Finally, to test the use of meta-motivational state reversals as a mechanism by which individuals may achieve balanced need satisfaction.

Taken together the main findings of the thesis were as follows: (1) that an implicit measure of meta-motivational state capable of assessing the full spectrum of states within 90s has utility; (2) evidence that need satisfying and thwarting environments trigger meta-motivational state reversals; (3) indications that people are motivated and able to correct acute imbalance in their need satisfaction as demonstrated through attempts to recoup deprived needs; (4) the proposition that contingent reversals, historically defined as reversals induced by situational changes, might also be induced through cognitive changes; leading to a general conclusion that (5) examination of the meaningful concordance between SDT and reversal theory to understand dynamic motivation appears promising.

The thesis has made a number of novel contributions to understanding of human behaviour. For the first time the process of reversing between meta-motivational states has been empirically examined and a mechanism for inducing satiation and frustration reversals has been identified. Furthermore, an implicit measure of meta-motivational state has been developed and validated, which facilitates future research examining the reversal process (e.g., frequency, lability, and purpose). A framework for regulating balanced need satisfaction has been proposed and supported by initial self-report and behavioural data. From an applied perspective the ability to induce reversals and achieve a balance of need satisfaction may prevent maladaptive outcomes associated with both need thwarting and inhibited reversals.

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Chapter 1

General Introduction

1.1 Introduction

Motivation is a key area of investigation for researchers across a wide array of domains, for example sport (e.g., Roberts, Treasure, & Kavussanu, 1996), business (e.g., Gagné & Deci, 2005), health (e.g., Dibsdall, Lambert, Bobbin, & Frewer, 2003), and education (e.g., Harackiewicz, Rozek, Hulleman, & Hyde, 2012) due to the benefits associated with understanding "why" people initiate, maintain, and withdraw from activities. Historically, mechanistic theories dominated motivation research, viewing humans as passive and driven to regain homeostasis (e.g., Psychoanalytic Theory; Freud, 1930 and Drive Reduction Theory; Hull, 1943). Behaviour was thought to involve stimulus response contingencies, with little or no attention given to the cognitions of behavioural regulation. Contemporary theories of motivation adopt a more cognitive perspective when attempting to understand human behaviour, typically examining goals (e.g., Social Learning Theory; Rotter, 1954 and Attribution Theory; Weiner, 1985), interests (e.g., Self Determination Theory; SDT; Deci & Ryan, 2000 and Flow Theory; Csikszentmihalyi, 1979), choices (e.g., Personal Causation; deCharms, 1968), and needs (e.g., Maslow's Hierarchy of Needs;

Maslow, 1943).

Whilst numerous contemporary perspectives examining motivation exist, each is associated with limitations, for example: being restricted to a particular context (e.g., Achievement Goal Theory; Duda & Nicholls, 1992), failing to account for initiating/maintaining behaviours with no benefit/purpose or recognising that an individual's needs are constantly changing (e.g., Maslow's Hierarchy of Needs; Maslow, 1943). Numerous motivation theorists have highlighted the need to synthesise perspectives, incorporating important components from various theories in an attempt to develop a broad and robust theory of motivation (e.g., Donovan, 2001; Jesus & Lens, 2005; Locke & Latham, 2004; Steel & König, 2006; Weiner, 1996). Through theoretical integration we can seek to harmonise the contributions from comparable, comprehensive theories in an attempt to achieve a more unified theory, that is capable of explaining changes in motivation and is applicable across many domains of behaviour. One problem identified in theoretical integration is the difficulty in integrating theories with differences in their philosophies, ideas, concepts and assumptions. However, the commonalities between theories can still develop our understanding through model development.

Despite the prevalence of motivation related theory and research, one aspect of motivation that is particularly poorly understood is the way in which it fluctuates and changes. Current research examining dynamic motivation has typically involved longitudinally studies assessing changes in motivation due to maturation, or pre and post intervention (e.g., Otis, Grouzet, & Pelletier, 2005; Wallhead & Ntoumanis, 2004). There have been few studies that have been explicitly designed to examine the dynamics and altered trajectories of motivation and behaviour over numerous time points and within a short time period. Driven by our poor understanding of motivational dynamics the fundamental purpose of this thesis is to add clarity to the "why" and "when" motivation fluctuates.

In summary, the thesis aims to develop a unified model of motivation that is applicable across a variety of domains, through examining one example of concordance between contemporary theories of human motivation. Numerous candidate theories of motivation were considered, but dismissed as they did not fit the aim of the project or the key attributes considered for successful theory integration (Mayer & Sparrowe, 2013). The two theories deemed most suitable examine the same phenomenon, that is dynamic human motivation, and share points of commonality (e.g., the pursuit of needs/motives, positive associations with experiencing a range of emotions and the maladaptive behaviours associated with rigidity in behaviour) whilst also demonstrating points of meaningful opposition (to be discussed later), but might lead to a more complete understanding through developing a model based on their commonalities.

The subsequent introduction outlines each theory independently before presenting a model for their synthesis, highlighting areas of philosophical alignment and disagreement, and a discussion of how interplay between the two theories might aid understanding of motivation.

1.2 Independent Overview of Existing Theories of Dynamic Motivation

1.2.1 Self Determination Theory and Basic Psychological Needs

Self determination theory (Deci & Ryan, 1985, 2000), one of the most influential paradigms in contemporary motivational psychology, is an approach to understanding human motivation and personality, that is concerned with people's inherent growth tendencies and innate psychological needs. According to SDT, humans are

active, growth-oriented organisms who strive for opportunities to satisfy their basic psychological needs. Following the Hullian tradition (Hull, 1943), needs in SDT are defined as innate, organismic necessities, rather than acquired motives, and in line with the Murray tradition (Murray, 1938), needs are at the psychological rather than the physiological level. Thus, "in SDT, needs specify innate psychological nutriments that are essential for on going psychological growth, integrity, and well-being" (Deci & Ryan, 2000, p. 229).

According to SDT, there are three basic psychological needs: first autonomy, the degree to which the individual feels volition; the organismic desire to self organise experience and behaviour and to have activity be concordant with one's integrated sense of self (Angyal, 1965; deCharms, 1968; Deci, 1980; Ryan & Connell, 1989; Sheldon & Elliot, 1999). Second, the need for competence which concerns the degree to which individuals feel effective in their on-going interactions with the environment and experience opportunities in which to express their capabilities (Ryan & Deci, 2002). Finally, relatedness which refers to the need to feel connected to others, to love and care and to be loved and cared for (Baumeister & Leary, 1995; Bowlby, 1958; Harlow, 1958; Ryan, 1993).

The need for competence has been widely advocated within motivation literature (Sheldon, Elliot, Kim, & Kasser, 2001), with a strong historical tradition of its examination. For example, White (1959) argued that the need for competence is a basic organismic propensity that underlies self esteem and self confidence. Harter's (1981) theory of competence motivation demonstrates that individuals are motivated to achieve competence in several domains (e.g., academics, sport and relationships), and that this motivation directs behaviour. Specifically, perceived mastery in one domain is associated with continued effort, whilst a perceived lack of mastery results in avoidance of that domain. Competence motivation has also been closely linked to health outcomes. For example, Bandura (1977) demonstrated that self efficacy, the

feeling that one can bring about desired outcomes, is an important determinant of psychological health. Similarly, Carver and Scheier (1990) evidenced that progressing and having optimism towards goals resulted in psychological health benefits.

Similarly well-established within psychology literature is the need for relatedness (Reis & Patrick, 1996). Foundational theorists discussed the need for attachment and interpersonal contact through the drive for sex and/or a filial bond (e.g., Bowlby, 1969; Freud, 1930). The need to belong, feel connected or related has also been discussed by Maslow (1968), whose hierarchy of needs placed belonging in the middle layer of the hierarchy, after the need for safety (security, stability and freedom from fear) and physiological needs. More recently, Baumeister and Leary (1995) reviewed the need for belonging, the drive humans have to form and maintain lasting, positive, and significant relationships. It was concluded that frequent interactions with the same individual would be most beneficial, whilst deprivation of belongingness, either through frequent changing in partners or due to infrequent interactions might result in stress, immune system dysfunction and mental illnesses, for example eating disorders.

Some debate and misunderstanding has surrounded the need for autonomy as it has been portrayed as being antagonistic to relatedness or a sense of community (Ryan & Deci, 2000). Some theorists have equated autonomy with concepts such as individualism and independence (Steinberg & Silverberg, 1986), which would imply low relatedness. However, SDT does not associate autonomy with being independent, detached or selfish (Chirkov, Ryan, Kim, & Kaplan, 2003; Ryan & Lynch, 1989), but with the degree to which the individual feels volition and behave in ways concordant with one's integrated sense of self. DeCharms (1968) asserted that people have a primary motivational propensity to feel like causal agents with respect to their own actions and in this sense are classed as 'origins'. In contrast, 'pawns' have little sense of personal causation, are not fully engaged in or choosing their actions,

thus they are lacking the sense of being the initiator of their own behaviour. As such, pawns may feel less satisfaction and greater frustration. The need for autonomy, therefore, is conceptualised as the need for volition; the organismic desire to self organise experience and behaviour and to have activity be concordant with one's integrated sense of self (Angyal, 1965; deCharms, 1968; Deci, 1980; Ryan & Connell, 1989; Sheldon & Elliot, 1999).

In line with SDT all three needs are essential and of equal importance for psychological health, well-being, and intrinsic motivation (Deci & Ryan, 1985). This proposition is supported by Sheldon, Elliot, Kim, and Kasser (2001) who repeatedly demonstrated that the needs discussed in SDT are important determinants of life satisfaction. Sheldon et al. (2001) compared 10 psychological needs drawn from prominent theories including Maslow's hierarchy (1968), Epstein's cognitive-experiential self-theory (1990), and Derber's (1979) 'American dream' assumption in an attempt to determine which needs are indeed fundamental for humans. The needs for autonomy, competence, and relatedness consistently emerged in the top four needs in both salience and their association with event related affect. Esteem, the fourth consistently salient need, was discussed in line with Maslow's (1943) conception and refers to a global evaluation of the self. Kowal and Fortier (2000) similarly support the importance of the needs outlined in SDT, highlighting the interplay between the needs; whilst optimal challenges surround us, only those that can be autonomously engaged in and, ideally, connect us to others are likely to be pursued and provide intrinsic motivation.

1.2.2 Need Satisfaction and Well-being

According to Basic Psychological Needs Theory (BPNT), a sub theory of SDT, humans are active, growth-oriented organisms who strive for opportunities to satisfy their need for autonomy, competence and relatedness. As such, contexts that satisfy

the basic psychological needs are associated with positive outcomes including: more self determined behaviour, growth, and well-being (Deci & Ryan, 2000). In contrast, contexts that do not satisfy the needs are associated with distinct functional costs, for example ill-being and the pursuit of need substitutes.

Within SDT literature an important differentiation is made between low need satisfaction and need thwarting. According to Bartholomew, Ntoumanis, Ryan, and Thøgersen-Ntoumani (2011) low need satisfaction, or dissatisfaction, indicates that something is not as good as it could be, whereas need thwarting involves actively preventing something from happening. As such, low need satisfaction may show that an individual is not wholly satisfied with the extent that their needs are being met, but it does not indicate that the individual feels their needs are being actively thwarted. For example, need dissatisfaction may include "I do not feel autonomous" whereas need thwarting would include "I feel controlled", and so, low need satisfaction and need thwarting should be considered as separate constructs (Bartholomew et al., 2011). Nevertheless, both are likely to have costs in terms of reductions in well-being.

Both low need satisfaction and need thwarting can additionally lead to individuals developing need substitutes or compensatory motives, which do not satisfy the basic need, but provide some collateral satisfaction (Deci, 1980). For example, if the need for relatedness is thwarted during childhood, one may compensate by attempting to gain approval or a sense of worth through pursuing image-oriented outcomes, such as accumulating money or material possessions (e.g., Kasser, Ryan, Zax, & Sameroff, 1995). Although compensatory motives go some way to provide some collateral satisfaction, they can continue to interfere with the attainment of the basic needs, and as such they never adequately compensate for the decrements in well-being (Deci & Ryan, 2000).

1.2.3 Dynamic Motivation and Balanced Need Satisfaction

Self determination theory emphasises that individuals behave differently and have changeable well-being due to their varying motivational regulation. Within organismic integration theory, a sub-theory of SDT, changes in motivation are discussed through the internalisation of extrinsic motivation; ranging on a continuum from extrinsic motivation, classified in four distinct forms: external regulation, introjection, identification, and integration, to intrinsic motivation. An individual can transform socially accepted norms/customs into personally endorsed values and self-regulations (Ryan, Connell, & Deci, 1985), a process labelled internalisation and evidenced by movement along the continuum towards intrinsic motivation. Thus, motivational regulation, or the 'why' of our action/behaviour, can be seen as dynamic over time. Dynamic motivation is also discussed in terms of response to the psychological environment, with the direction of dynamic change predictably determined by conditions. Specifically the level of need satisfaction provided by the environment is a mechanism that can energise and direct peoples' behaviour, and which facilitates internalisation. The more an environment satisfies basic needs, the more likely internalisation, and thus behavioural engagement, is to occur.

Within SDT it is argued that each of the three basic psychological needs plays a necessary part in optimal development, and so people should be motivated to satisfy any deprived need (Deci & Ryan, 2000). Some support for this is generated by recent findings that achieving balanced need satisfaction is associated with greater well-being than achieving a similar level of need satisfaction but with a greater variability (Sheldon & Niemiec, 2006). Achieving a balance in need satisfaction is posited to reflect eudaemonic conceptions of thriving, that is harmony and temperance. In contrast, psychological research has demonstrated that ill-being is associated with internal variability (e.g., unstable self-esteem; Paradise & Kernis, 2002, self-other discrepancies; Campbell, Assanand, & Paula, 2003, and the scarcity hypothesis;

Chapman, Ingersoll-Dayton, & Neal 1994) leading the Sheldon and Niemiec's (2006) proposition that "imbalance among the satisfaction of the psychological needs reflects an inappropriate allocations of resources across the different domains of life, which may induce stress and conflicts that ultimately detract from well-being" (p. 332).

Whilst balanced need satisfaction is associated with optimum well-being, few environments and situations allow the three basic psychological needs to be satisfied simultaneously, and so, in most situations needs cannot all be satisfied at one time. For example, the school environment may provide ample opportunity for a student to satisfy their need for competence and relatedness through achievement in lessons and interactions with their peers. However, the compulsory, structured, and regulated nature of attending school (e.g., set timetable, uniform, and abiding by school rules) may result in deprivation of the need for autonomy. Self determination theorists posit that individuals will be motivated to ensure that all needs can be satisfied over time; thus, if need deprivation is experienced, we would expect individuals to turn their attention to less satisfied needs and, to some extent, unmet needs should have precedence over met needs (Deci & Ryan, 2000), orienting towards achieving balance. Whilst it is believed that individuals will be motivated to satisfy unmet needs, we know little of how individuals 'turn their attention' to unmet needs, nor how they identify these, and adjust the precedence of seeking need satisfaction.

In summary, SDT is a dynamic theory of human motivation that maintains the satisfaction of three basic psychological needs is associated with growth, well-being and optimal functioning (Deci & Ryan, 2000). In contrast, contexts that do not satisfy the basic needs will result in maladaptive behaviours, compensatory motives and reduced well-being (Deci, 1980). Although research has examined the dynamics of motivation resulting from exposure to need satisfying or thwarting environmental conditions over time, the cognitive processes involved in individuals' acute experi-

ence of and response to these conditions are under examined. Specifically, although achieving a balance in need satisfaction is associated with the most effective functioning (Sheldon & Niemiec, 2006) we know little of how individuals regulate or achieve this balance. It is proposed that a second contemporary theory, with specific focus on motivational dynamics, may aid our understanding of how balanced need satisfaction is regulated, and will be considered overleaf.

1.2.4 Reversal Theory

Reversal theory is a structural phenomenological theory of motivation, emotion and personality (Apter, 1982). Typically phenomenological theories make reference to subjective experiences and meaning, however reversal theory attempts to systemically provide structure to the way that individuals experience their own motivation. And so, "structural phenomenology focuses on the different ways in which the contents of experience are interpreted by the individual, rather than on the contents themselves" (Apter, 1982, p .16).

Reversal theory proposes four mutually exclusive pairs of meta-motivational states, which people move between on a regular and frequent basis; movement between the pairs of states is known as 'reversal' and it is from this that the name of the theory is derived. Meta-motivational states within reversal theory are defined as phenomenological states, each characterised by a certain way of interpreting some aspect of one's own motivation (Apter, 2001). Each state is associated with a desire or 'value' that should be satisfied whilst in that state. Briefly, the pairs of mutually exclusive states and their associated values are: telic (achievement)/paratelic (fun), conformist (fitting in)/negativistic (freedom), mastery (power)/sympathy (love) and autic (individuation)/alloic (transcendence). The telic state is primarily serious, goal oriented and arousal avoiding, whilst the contrasting paratelic state is spontaneous, playful and arousal seeking. The conformist state is compliant and agreeable, whilst

the negativistic state is rebellious, unconventional and defiant. The mastery state is described as competitive and dominating whilst the sympathy state is defined as having a desire for harmony, unity and is cooperative. Finally the autic state is primarily concerned with the self, whilst the alloic state is primarily concerned with others.

Within reversal theory dominance is discussed, which refers to an innate bias underlying the tendency to spend more time in one meta-motivational state than the other. An example of this might be a businessman who is telic dominant, yet reverses to a paratelic state during the evenings. The majority of reversal theory research has focused on dominance, most likely due to the ease associated with assessing dominance by treating it as a conventional trait (Apter, 2013). However, dominance focused research misses the essence and uniqueness of reversal theory - the propensity for individuals to fluctuate between states from moment-to-moment. Research focusing on either the ways states change, or the role of individuals' ease of changing states, is limited due to difficulty in assessing active meta-motivational states, typically involving qualitative methods and retrospective assessments. However, this preliminary research has provided evidence for the changeability in individuals' motivational focus and in support of the three inducing agents proposed by reversal theory: satiation, frustration, and contingent events (to be discussed later; e.g., Bellew & Thatcher, 2002; Hudson & Walker, 2002).

1.2.5 Meta-motivational State Reversals and Psychological Health

Although individuals will have a tendency to spend time in a dominant meta-motivational state, reversal theory maintains that individuals should reverse on a regular and frequent basis to be considered psychologically healthy (Lafreniere, Ledgerwood, & Murgatroyd, 2001). Being motivationally versatile, a term used by

Dixon (1994), allows people to experience a range of motivations and emotions, and allows reversal to a state optimum for the current situation. In contrast, individuals who have difficulty reversing may suffer from rigid behaviour patterns and be considered 'psychologically unhealthy' (Apter, 2001; Lafreniere et al., 2001). Associated with psychologically unhealthy individuals are 'structural disturbances in experience' (Murgatroyd & Apter, 1984, 1986), which encompass inhibited reversals, defined as the inability to reverse to alternative states, and inappropriate reversals.

Two forms of inappropriate reversals are discussed within reversal theory, socially inappropriate and temporally inappropriate reversals. Socially inappropriate reversals occur when a person's behaviour satisfies their own needs, but the behaviour may be considered as socially inappropriate or unacceptable. For example, an athlete in a paratelic-negativistic state who has become bored during a competition might purposefully break rules to satisfy their own needs for excitement. Temporally inappropriate reversals detrimentally affect future reversals: the immediate gratification available from such activities satisfies the needs of the person in one particular meta-motivational state, but may over a longer time period be damaging to the person's ability to reverse or achieve satisfaction in the same or alternative state. Kerr (2001) provides the example of an individual who satisfies their needs through the immediate gratification that comes from activities such as gambling, drug and alcohol abuse. Here the states involved are likely to be the paratelic and negativistic meta-motivational states, if the paratelic-negativistic oriented activity continues, over a long period of time it may develop into a more serious problem, for example, an inability to reverse to other states and addiction.

Both inhibited and inappropriate reversals are associated with: ill health, as the individual is unable to experience a range of emotions as they are 'stuck' in one meta-motivational state; maladaptive behaviours (e.g., rule breaking); and reduced experience, when the meta-motivational state is not preferable for the individual or

the task at that time. For example, an athlete who is used to performing under conditions of high arousal with the paratelic state operative, but finds him/herself in the telic state and thus less able to deal with the levels of arousal (Apter, 1982). Given these associations between psychological health and frequent reversals it is important to understand the process by which reversals occur.

1.2.6 Reversal Process

Currently reversal theory literature presents three agents that induce a reversal from one meta-motivational state to another: frustration, when an individual's needs are not satisfied; satiation, as reversals are increasingly likely with the passage of time, and contingent events, a change in the surroundings (Apter, 2001). Concerns have been raised by the theory's founder regarding the limited exploration of the reversal process, an oversight in the literature given that this is the fundamental aspect of reversal theory (cf. Apter, 2013). To date empirical research of the reversal process has taken the form of retrospective measures (e.g., Bellew & Thatcher, 2002) or qualitative assessments of state (e.g., Hudson & Walker, 2002), that indicate reversals in meta-motivational states were attributable to the three inducing agents proposed by reversal theory.

Literature surrounding frustration and satiation-induced reversals is particularly limited. To date it is unclear how and at what level of frustration/satiation reversals might occur (e.g., they may occur once there is complete satiation of a particular need; Apter, 2013). We also do not know if these triggers would be consistent across the four pairs of states, or whether different inducing agents are more likely to be influential when experiencing certain states. Although all meta-motivational states are theorised to be susceptible to satiation-induced reversals, it is plausible that frustration-induced reversals are more likely when in certain meta-motivational states. Rooted within contemporary frustration models that contend the emotional

and cognitive processes of the frustrated individual influence frustration (Barron & Richardson, 1994), it is argued that individuals in a telic, mastery, negativistic, or autic state may be more prone to experiencing frustration-induced reversals. The characteristics associated with these states (goal oriented, power and control motive, freedom motive and unpleasant emotions associated with loss, respectively) increase the likelihood and amplitude of frustration when contingent events block or thwart progress, or, when internal locus of control beliefs are undermined. Conversely, the characteristics of the opposing states (playful, desire for harmony, compliant, and altruism) may reduce the likelihood of a frustration-induced reversal as goal inhibition or thwarted personal attainment are less of a focus in these meta-motivational states.

Further to this, it is unclear what form of reversal will take place following different triggers, and whether or not it is possible to predict the direction and type of reversal an individual is likely to experience at any given time. It is evident, though not previously considered in reversal theory discourse, that more than one type of reversal is possible. First, a "within pair shift" may occur, in which a reversal to the opposite state of the mutually exclusive pair takes place (e.g., conformist to negativistic). Second, a "between pair shift" may occur, involving a change in salience of meta-motivational state pair (e.g., conformist-negativistic to telic-paratelic). Finally a "dominant state shift", involving a reversal to the individual's dominant state (the state in which the individual spends the majority of their time) could take place. However, within reversal theory only the movement between a pair of mutually exclusive states, that is a "within pair shift", is considered a reversal. A "dominant state shift" is aligned with reversal theory's interpretation of a reversal if it is between the two states in any pair (e.g., a person reversing from the negativistic state to their dominant conformist state). Moreover, a "between pair shift" would not be considered as a reversal, but a change in salience that brings particu-

lar states or state combinations to the forefront (or background) in any particular situation. I argue that the traditional reversal theory understanding of what constitutes a reversal lacks specificity, and as such means multiple 'state movements' could be regarded as a reversal. Exploring the triggers associated with each of these reversal types may enhance our understanding of the purpose of the reversal and aid prediction of resulting meta-motivational states.

In summary, reversal theory is a phenomenological theory of motivation, emotion and personality that maintains that people are inconsistent and changeable. Fluctuations in motivation are explained through meta-motivational state reversals between eight states, of which four can be operative at any one time. Individuals should reverse on a regular and frequent basis to be considered psychologically healthy (Lafreniere et al., 2001), in contrast individuals who have difficulty reversing or suffer from rigid behaviour patterns are considered 'psychologically unhealthy' (Murgatroyd & Apter 1984, 1986). Three reversal inducing agents are discussed: satiation, frustration and contingent events, however they have received limited empirical examination, most likely due to the difficulty in assessing active meta-motivational states. It is currently unclear how, and at what levels frustration and satiation based reversal occur, if this is consistent across states, and if certain states are more prone to different inducing agents.

1.2.7 Summary

The introduction has outlined two independent theories of dynamic motivation: SDT and reversal theory, detailing our current understanding and highlighting areas that lack clarity or empirical examination. Specifically, pertinent questions that to date have not been examined are how individuals regulate balanced need satisfaction, and how and at what level of frustration/satiation reversals in meta-motivational focus occur. The subsequent section discusses how these two previously independent

theories of motivation are philosophically aligned and differ, and how their commonalities might aid understanding of key psychological phenomena, most notably dynamic motivational states. Specifically, the section will: outline links between the basic psychological needs identified in SDT and motives associated with meta-motivational states, and, between satisfaction and thwarting of basic psychological needs and reversals induced by satiation and frustration. In so doing, I offer an explanation of how balanced satisfaction of SDT's needs may be regulated. Finally, commonalities in maladaptive behaviours associated with a lack of need satisfaction and inhibited reversals are highlighted.

1.3 Commonalities of two Contemporary Theories of Motivation

1.3.1 Philosophical Alignment

At the most fundamental level the philosophical underpinning of SDT and reversal differ. Self determination theory takes an organismic dialectical approach to the study of motivation. It begins with the assumption that people are active organisms with evolved tendencies toward growth, mastery, and integrating new experiences into a coherent sense of self. In contrast, reversal theory seeks to utilise constructs from phenomenology, cybernetics and structuralism to understand motivation. Reversal theory considers people to be active agents who initiate their own action and monitor their performance, the theory attempts to explain the way individuals experience their own motivation and the implications this has for behaviour (Apter, 1982).

Despite this difference in philosophy SDT and reversal theory share some underpinning ideas, concepts and assumptions. Both SDT and reversal theory highlight

the importance of the dialect between the individual and the social context on behaviour, experience, and development. Specifically, SDT posits that social contexts that satisfy our innate psychological needs promote internalisation, integration of the self, and healthy psychological development. Conversely, social contexts that thwart basic need satisfaction are considered antagonistic to the internalisation and integration processes and psychological growth (Ryan & Deci, 2000). Within reversal theory the individual is seen to interact with the environment in such a way as to use it for his or her own purpose, as such one's personality/motivation is not a permanent asset but is changeable in accordance to the environment.

It is through the dialect with the environment that both theories propose that motivation is changeable. In reversal theory changeability in motivation is created through reversals between the four mutually exclusive pairs of meta-motivational states which produce significant changes in a persons motivational experiences (Apter, 1989). Whilst changeability in SDT is discussed through the internalisation of extrinsic motivations and in terms of responses to different psychosocial environments.

There is considerable overlap in the conceptual terminology within SDT and reversal theory. Discussed in detail below are the numerous similarities between the motives/descriptors of meta-motivational states and the basic psychological needs in SDT (e.g., Autonomy: fun, freedom, and independence; Competence: achievement, egotistic, and mastery; Relatedness: affectionate, caring, and cooperation; see Section 1.3.2). However, the overlap in terminology is not restricted to motives and needs. There are a myriad of terms which relate to the underlying premise of SDT (e.g., spontaneous, growth, and stimulation), intrinsic motivation (e.g., fun, interesting, and challenging), and extrinsic motivation (e.g., rules, competition, and obedient; see Table 2.1).

Whilst the difference between SDT and reversal theory at the most fundamental level of philosophical underpinning makes integration between these two theories dif-

ficult, our understanding of human activity and motivation can be enhanced through their conceptual links.

1.3.2 Concordance Between Psychological Needs and Meta-motivational States

Reversal theory discusses desires or 'values' that are associated with each meta-motivational state. However, these values would not be classified as needs within SDT, but as acquired motives as they are not innate, organismic necessities, required for ongoing psychological growth, integrity, and well-being (Deci & Ryan, 2000). An example of this is the need for achievement experienced when in the telic state. Although achievement, defined as the desire to accomplish something significant and surpass others, is conceptually linked to competence (Koestner & McCelland, 1990) achievement includes attempts to gain substitute or derivative fulfillments. Therefore, achievement would be considered a motive rather than a need that "stems more or less directly from needs and will accordingly lead more or less effectively to need fulfillment" (Deci & Ryan, 2000, p. 250). For this reason the values associated with meta-motivational states will be termed 'motives' throughout this thesis. In line with the SDT conception, the motives attached to each meta-motivational state may satisfy the basic needs, but can be detrimental to well-being (Ryan & Deci, 2002). The pursuit of such motives may be peripheral to satisfaction of the basic psychological needs, thus detract/interfer with need satisfaction, or act as need substitutes.

Despite this difference in terminology there are clear commonalities between the needs discussed in SDT and the motives associated with each meta-motivational state in reversal theory. It is suggested that meta-motivational state motives might feed into the higher order needs outlined in SDT. Each higher order need and its connection to the motives within reversal theory are discussed below.

Autonomy in SDT terms is the degree to which the individual feels volition; the organismic desire to self-organise experience and behaviour, and to engage in activities in line with one's integrated sense of self (Angyal, 1965; deCharms, 1968; Deci, 1980; Ryan & Connell, 1989; Sheldon & Elliot, 1999). Motives from reversal theory that may act to fulfill the need for autonomy include *fun* whilst in the paratelic state (partaking in the activity for its own sake, similar to intrinsic forms of behavioural regulation), and *freedom* whilst in the negativistic state (breaking free from rules which are considered restricting and controlling, if this is done volitionally and not reactively). The association between freedom and autonomy has previously been discussed in SDT literature, which states autonomy concerns the experience of both integration and freedom (Deci & Ryan, 2000). However, reversal theory's motive for freedom lacks the concordance to self that is encompassed in the SDT conceptualisation of autonomy. Finally, the *individuation* motive (being individual, separate and independent) pursued in the autic state may satisfy the need for autonomy, but simultaneously thwart the higher order need of relatedness within SDT if separation and individualism undermine the formation or enjoyment of meaningful interpersonal relationships.

Competence in SDT concerns the degree to which individuals feel effective in their ongoing interactions with the environment and experience opportunities in which to express their capabilities (Ryan & Deci, 2002). Apter (2001) describes *achievement* itself, or progress towards achievement, as a motive when in a telic state. The connection between competence and achievement has been highlighted previously, stating that the achievement motive is, to a substantial degree, based on the innate need for competence (Koestner & McCelland, 1990), but also encompasses behaviours or ideations based in ego involvement or approval motives and is

therefore not truly innate in SDT terms.

Relatedness is the desire to feel connected to others, to love and care and to be loved and cared for (Baumeister & Leary, 1995; Bowlby, 1958; Harlow, 1958; Ryan, 1993). Motives from reversal theory that may satisfy the need for relatedness include *fitting in* whilst in the conformist state (if by fitting in this means feeling close/connected to others), *transcendence* whilst in the alloic state; feeling part of, and identifying with others, and *love* whilst in the sympathy state, described as feelings of sensitivity, tenderness and caring, which would typify meaningful interpersonal connections associated with relatedness.

The motive for *power* whilst in the mastery state is more difficult to clearly link to the higher order needs outlined in SDT. Power in reversal theory is described as the need to feel tough, hardy and resilient (Apter, 2001), therefore does not directly relate to any SDT needs, nor does it appear to correspond well with SDT's conceptualisation of power as an extrinsic motive or compensatory reaction to need thwarting. With hardiness and resilience defined as a capability for enduring difficult conditions and recovering quickly from setbacks (e.g., Collins, 1995) an argument can be made that such capabilities perhaps reflect a robust or durable sense of competence, hence, pursuit of reversal theory's 'power' motive might function to satisfy competence needs.

1.3.3 The Reversal Process as a Mechanism Enabling Balanced Need Satisfaction

The current thesis argues that the conceptual links between SDT and reversal theory add clarity to the "when" and "how" of the reversal process, by proposing that attempts to regulate and balance need satisfaction dictate the type of reversal that

occurs and the resulting meta-motivational state (see Figure 1.1). Specifically, conditions that thwart any of the basic psychological needs may act to induce a reversal to a meta-motivational state that targets satisfaction of this state, or, compensation for its absence if this is not possible. In addition, when a meta-motivational state provides a high level of need satisfaction, a reversal may switch from this satiated state to one which provides satisfaction of a different need. Thus, lability and frequency of an individual's reversals may contribute to well-being through enabling a balanced satisfaction of one's needs. Examination of these theorised links will be an important addition to current reversal theory literature, as Apter (2013) highlights a deficit in the understanding of frustration and satiation-induced reversals, and, to SDT discourse through proposing a mechanism by which acute regulation of need satisfaction is achieved.

Thwarting of Needs and Frustration-induced Reversals. Research examining deprivation of needs in SDT literature discusses low need satisfaction (or dissatisfaction; when something is not as good as it could be), and need thwarting (when something is actively prevented from happening; Bartholomew et al., 2011). Low need satisfaction may indicate that an individual is not wholly satisfied with the extent to which their needs are being met; however, it does not indicate that the individual feels their needs are being actively thwarted. Reversal theory suggests that frustration-induced reversals occur when the individual's needs are not satisfied, for example, an employee may reverse from a telic-conformist to a telic-negativistic state combination as they become frustrated by work policies that prevent them from working effectively. It is proposed that thwarting of the basic psychological needs outlined in SDT underpins frustration-induced reversals (see Figure 1.1); in contrast to need dissatisfaction, active and ongoing thwarting of a need will simultaneously prevent the satisfaction of the motives associated with each state and

identify to the individual that a change in motivational focus is required.

The previous example in which the employee's need for competence was thwarted is a useful illustration of the potential outcomes of frustration as they are prevented from progressing towards achievement. In such a situation, three processes could occur. First, the individual could reverse between meta-motivational states, in an attempt to seek alternative need satisfaction (e.g., thwarting an individual's need for autonomy may cause the individual to reverse from a paratelic to a telic state, to focus on satisfying the alternative need of competence). Second, the individual may continue to attempt to satisfy the thwarted need in a different context (e.g., if the individual is prevented from satisfying their need for competence in an occupational setting they may seek out activities, such as sport, in an attempt to satisfy the need for competence). Finally in the long term, the individual may seek out compensatory motives (e.g., the individual may seek out fame, popularity or wealth, which will not satisfy the basic need but might provide some collateral satisfaction; Deci & Ryan, 2000). It is posited that the two reversals described above might help to overcome the maladaptive behaviours associated with need thwarting, however it is currently unclear which, if any, of these reversals occur and if they are associated with enhanced well-being.

Satisfaction of Needs and Satiation-induced Reversals. Self determination theory literature demonstrates positive outcomes of need satisfaction (e.g., Deci & Ryan, 2000) however, it may be that in time the continued satisfaction of a need results in satiation, occurring when an individual's needs are felt to be fully satisfied within that context. Continued satisfaction of one specific need may be associated with the individual "surviving" as opposed to "thriving" in their environment; thus, although need satisfaction is related to adaptive outcomes, including well-being, it is unclear whether continued or over-satisfaction of a particular need

can on occasion be at the expense of focusing on attempted satisfaction of other needs. If this contributes to an imbalance in need satisfaction, this may result in maladaptive outcomes, for example, boredom or reduced growth. The thesis suggests therefore that satiation-induced reversals in reversal theory in fact operate to enable a balance of need satisfaction, through reversing from a state associated with a satisfied need to a state associated with an alternative, less satisfied, need (see Figure 1.1). This accords with Deci and Ryan (2000) who stated that individuals low in satisfaction of any of the basic needs in SDT should be motivated to correct this imbalance.

Similarly, research has demonstrated that an individual should turn their attention to less satisfied needs, and, to some extent unmet needs should have precedence over met needs, to allow an overall level of need satisfaction or balance of need satisfaction, which has been shown to result in optimal well-being (Sheldon & Gunz, 2009; Sheldon & Niemiec, 2006). The diametrically opposed meta-motivational state pairs in reversal theory may compliment the balance of needs as discussed in SDT; needs cannot all be satisfied at one time, however needs can be satisfied over time and this could be considered a feasible reason for reversals, enabling individuals to experience every type of psychological satisfaction (Apter, 2001).

1.3.4 Maladaptive Behaviours

Both reversal theory and SDT discuss maladaptive behaviours associated with a lack of motive/need satisfaction, either as a result of low need satisfaction and need thwarting within SDT, or through inhibited lability and difficulty in reversing within reversal theory. Current literature within SDT demonstrates that persistent deprivation of needs can result in rigid behaviour patterns and controlling regulatory styles, resulting in maladaptive outcomes including depression, disordered eating and burnout (Bartholomew et al., 2011; Deci & Ryan, 2000). Inhibited reversals

are similarly associated with psychological ill health and a restricted range of negative emotions (e.g., anxiety if stuck in the telic state or depression if stuck in the paratelic state in a low arousal environment; Apter, 1989). The rigidity in behaviour and controlling regulatory styles outlined by SDT as a result of need thwarting reflect the outcomes of individuals suffering from inhibited reversals; the individual's behaviour is more rigid due to an inability to reverse and experience alternative states and emotions, thus he/she experiences fewer state-motives and an inhibited spectrum of need satisfaction.

A lack of need satisfaction or need thwarting can also lead to individuals developing need substitutes or compensatory motives, which do not satisfy the basic need, however, they provide some collateral satisfaction (Deci, 1980). For example, if the need for relatedness is thwarted during childhood, one may compensate by attempting to gain approval or a sense of worth through the pursuit of image-oriented outcomes, such as accumulating money or material possessions (e.g., Kasser et al., 1995). Although compensatory motives go some way to provide some collateral satisfaction they can continue to interfere with the attainment of basic need satisfaction and as such they never adequately compensate for the decrements in well-being (Deci & Ryan, 2000). This has similarities with temporally inappropriate reversals outlined in reversal theory, in which current inappropriate behaviour detrimentally affects future reversals; the immediate gratification available from such activities satisfies the needs of the person in one particular meta-motivational state, but may over a longer time period be damaging to the person's ability to reverse or achieve satisfaction in the same or alternative state (Kerr, 1993). Given similarities between responses to a lack of need satisfaction and an inability to reverse appropriately between states, exploring whether interventions that facilitate meta-motivational state shifts increase balanced needs satisfaction and reduce maladaptive responses is of clear applied and theoretical interest.

1.3.5 Conclusion

The chapter has highlighted areas of conceptual alignment in two complimentary theories of motivation, advocating that the interplay of core theoretical concepts will enhance understanding of motivation, growth and well-being. The need for research into the reversal process, a fundamental aspect of reversal theory, has been highlighted by Apter (2013) stating that an understanding is needed of the processes involved in state reversals, especially regarding satiation and frustration induced reversals, is needed "if the theory is to have chance of fulfilling its full potential" (p. 7).

The core postulate of this thesis is that meta-motivational state reversals provide a mechanism by which a broad spectrum of emotions are experienced, and balanced satisfaction of an individual's innate psychological needs is achieved. Specifically, conditions that actively thwart one or more of SDT's basic needs for autonomy, competence, and relatedness will induce a frustration based reversal to an appropriate meta-motivational state to attempt to satisfying that need or compensate for its absence. Conditions that satiate a basic need will induce a satiation based reversal to an alternative meta-motivational state to attempt to satisfy other psychological needs, that is, to facilitate balanced need satisfaction.

1.4 Overview of Studies

In order to test the propositions above, this programme of research first developed and validated an implicit measure of meta-motivational state. To date research examining the reversal process has been limited and has taken the form of retrospective measures (e.g., Bellew & Thatcher, 2002) or qualitative assessments of state (e.g., Hudson & Walker, 2002). The lack of research regarding the reversal process is attributable to the difficulty of measuring an individual's meta-motivational state.

Although a number of measurement tools exist, these are problematic for several reasons, either limited to assessing one pair of states, lacking content validity, using single items to assess multi-dimensional constructs, or being context specific. Thus, Chapter 2 describes the development of an adapted Stroop protocol designed to assess the active meta-motivational state followed by two validation studies; an important initial step for advancing both reversal theory and for testing the thesis propositions.

Utilising the adapted Stroop task as a measure of active meta-motivational state, Chapters 3 and 4 examined changes in active meta-motivational state in response to varied need satisfying environments. Environmental manipulation techniques were employed to create need satisfying, thwarting and imbalanced environments (Deci, Eghrari, Patrick, & Leone, 1994; Sheldon & Filak, 2008). Chapter 3 examined the proposition that actively thwarting or satiating one or more of SDT's basic needs would induce a reversal to an alternative meta-motivational state. It was proposed that thwarting needs would induce a reversal to seek ways of satisfying that need or to attempt to compensate for its absence, whilst satiating needs would induce a reversal to attempt to satisfy other psychological needs, that is, to provide balanced need satisfaction. Chapter 4 examined whether need prioritisation occurred prior to periods of need deprivation and which meta-motivational states were most salient when prioritising different psychological need satisfaction.

In summary, the thesis had four main aims. First, to advocate a movement from working in theoretical silos to examining the meaningful concordance between two complimentary theories of dynamic motivation. Second, to develop and validate an implicit measure of active meta-motivational state, enabling examination of acute changes in motivational focus. Third, to test a novel framework of the antecedents of meta-motivational state changes. Finally, to test the use of meta-motivational state reversals as a mechanism by which individuals might achieve balanced need

satisfaction. To achieve these aims an adapted Stroop task was developed to assess active meta-motivational state, and environmental manipulation techniques were implemented to create need satisfying (satiation), thwarting (frustration), and imbalanced environments.

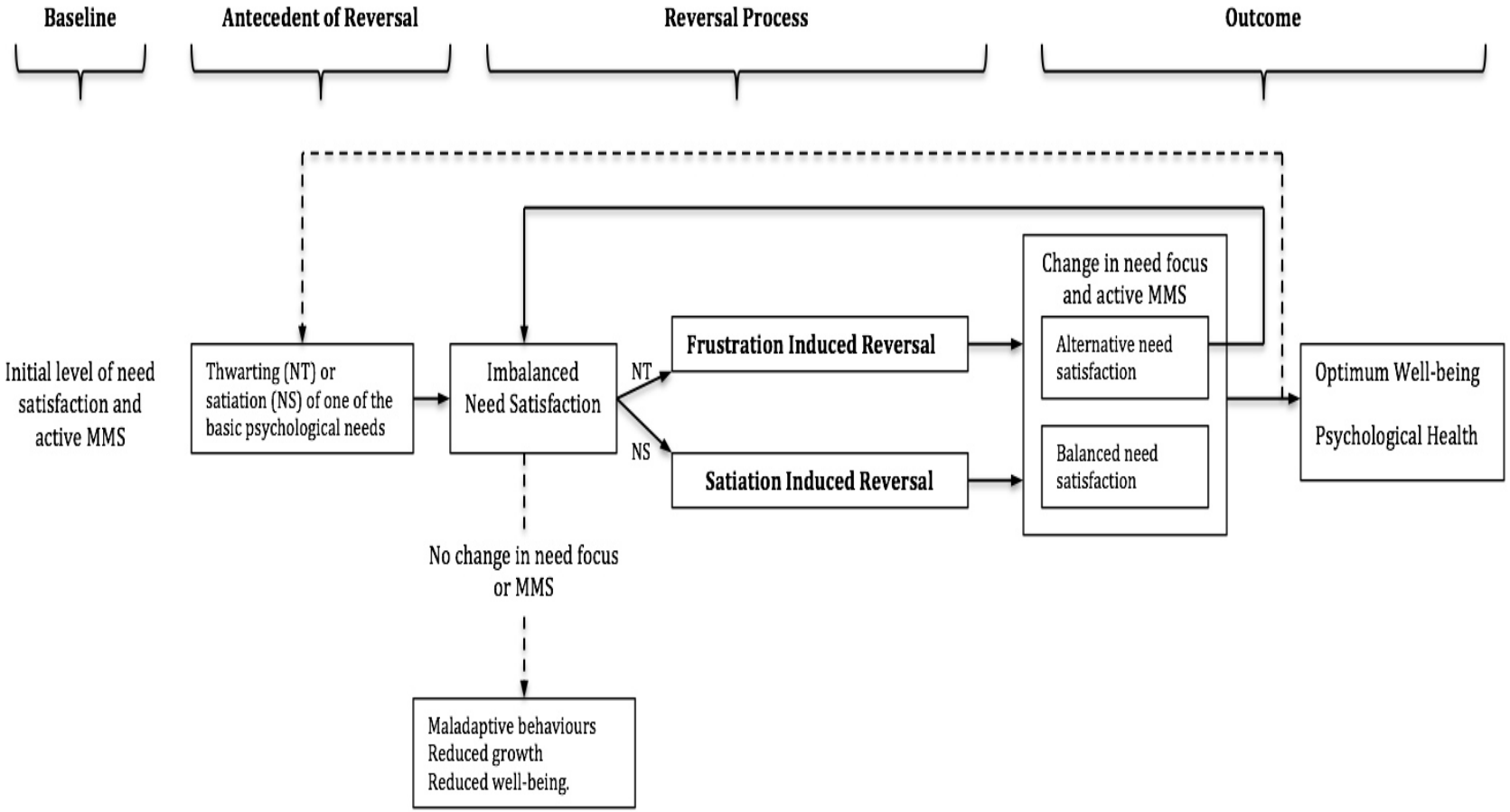

Figure 1.1: Model displaying the dynamic interplay between SDT and RT. The model illustrates the proposed framework of the antecedents of meta-motivational state changes, and the reversal mechanism by which individuals might achieve balanced need satisfaction.

Chapter 2

Development and Validation of a Measure of Active Meta-motivational State

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2.1 Introduction

In an attempt to understand why individuals behave differently in similar situations on different occasions, Apter's (1982) reversal theory focuses on the role of one's meta-motivational state. Aligned with ideographic and state-focused approaches to personality, Apter (2003) suggests that a person may perceive situations, emotions, and cognitions differently depending on which of four pairs of mutually exclusive meta motivational states they are in (telic-paratelic, mastery-sympathy, conformist-negativistic, alloic-autic). Each state is characterised by a distinctive way of interpreting aspects of one's motivation (e.g., serious when in a telic state vs. playful when in a paratelic state, or, compliant when in a conformist state vs. rebellious when in a negativistic state). Crucially, reversal theory maintains that it is important for individuals to reverse between states on a regular and frequent basis to be considered psychologically healthy; individuals who have difficulty reversing or who have low lability (inhibited reversals) may suffer from rigid behaviour patterns and experience poor psychological health (Apter, 2001). Thus, an understanding of how, when, and why people reverse is a key element of the development of interventions aimed at assessing lack of lability, and monitoring or preventing inappropriate reversals.

Concerns regarding limited exploration in the literature of such a fundamental aspect of reversal theory have been recently raised by the theory's founder (cf. Apter, 2013). To date research examining the reversal process has been limited and has taken the form of retrospective measures (e.g., Bellew & Thatcher, 2002) or qualitative assessments of state (e.g., Hudson & Walker, 2002). The lack of research regarding the reversal process may be attributable to the difficulty of measuring an individual's meta-motivational state. Although a number of measurement tools exist, these are problematic for several reasons. First, the Telic State Measure (TSM; Svebak & Murgatroyd, 1985) and the Telic/Paratelic State Instrument (T/PSI;

O'Connell & Calhoun, 2001) only assess the telic/paratelic pair; highlighting a bias in reversal theory research towards these states. Second, although an alternative tool, the State of Mind Indicator for Athletes (SOMIFA; Kerr & Apter, 1999), does measure all four state pairs, it lacks content validity, using single items to assess multi-dimensional constructs. Further, its use may be context specific given the nature of its development (competitive sport). More importantly, we argue that a common problem with these measures is their explicit nature, leaving them susceptible to a number of criticisms as explicated below.

Explicit measures typically reference a target object in the participant's personal history (Jacoby, Lindsay, & Toth, 1992), and thus assume that the participant has already formed an opinion or is able to construct one in situ (Schwarz & Bohner, 2001), is aware of/has access to his/her attitude (Fazio, 1986), and is willing to share it accurately with the researcher (e.g., LaPiere, 1934). Consequently, explicit measures can be unreliable when respondents are either unwilling or unable to report accurately (Greenwald et al., 2002). The former is a problem for any measure requiring explicit reporting of behaviours, attitudes, or emotions attached to pro or anti-social values. For example, in terms of reversal theory, individuals may not honestly report motivations or moods typically seen as socially undesirable (e.g., feeling rebellious whilst in the negativistic state or feeling selfish whilst in an autic state). The second influencing factor, accuracy, is of particular importance when attempting to measure meta-motivational state, as it requires individuals to have an awareness of their current state in order to accurately self report. In line with reversal theory, respondents may not be consciously aware of their current state; states become observable in conscious experience once ones attention has been suitably drawn to them, however this requires the individual to have some awareness of the terminology and conceptualisation of meta-motivational states (Apter, 1982). Thus, individuals may struggle to relate their current feelings to the theoretically-derived

terms of reference used (e.g., a parent may not associate needing time away from the family environment with an autic-sympathy state).

In contrast, implicit actions or judgments are under the control of automatically activated evaluation, without the performer's awareness of that causation (Greenwald & Banaji, 1995). Thus, implicit measures do not require the participant to be aware of their current meta-motivational state, or accurately and honestly share this with the researcher, and so might be a more suitable measure of current meta-motivational state than explicit measures. However, evidence concerning the influence of affective motivational states on the automatic processing of affectively congruent and incongruent valence, using implicit measures is unclear (Rothermund, 2003).

One approach (e.g., Kunde & Mauer, 2008) posits that greater cognitive effort is required to process incongruent stimuli; thus, attending to words of opposite valence to the current motivational state would exert greater disruption and interference, increasing response latency. The theorised 'confusion' or enhanced processing that results from an incongruent stimulus is somewhat consistent with paradigms advocating that threatening stimuli affect attentional disengagement, effectively 'capturing' an individual's attention for longer before they can attend to a secondary stimulus (e.g., Fox, Russo, & Bowles, 2001). If an incongruent stimulus functions as a threat to the status quo, one might expect longer response latencies for these than contingent stimuli.

Conversely, a second approach posits that emotionally congruent stimuli momentarily "grab" or capture participants' attention, slowing response latencies. These findings have been widely demonstrated using a Stroop (colour recognition) task in areas including public speaking apprehension (e.g., Ayres & Sonandre, 2002), phobias (e.g., Matthews & Sebastian, 1993), and mental health (e.g., Williams, Watts, & MacLeod, 1996). Adopting an emotion-focused approach would lead to the as-

sumption that congruent stimuli would have increased emotional significance and response latencies relative to incongruent stimuli. Given reversal theory's focus on the emotional outcomes of different states, and the rationale for implicit techniques partly relating to reducing the need for conscious processing, we proposed that meta-motivational states would function in a similar way to mood/emotional states, and that confusion (which requires comparison and hence higher level cognitive processing) was less likely than the more subtle interference presented by emotional resonance with the stimulus.

Drawing from this previous literature highlighting the use of implicit measures for indicating emotional states, we suggest that an adapted Stroop protocol, using non-colour words, may be a useful measure of an individual's meta-motivational state. The structural phenomenological nature of reversal theory allows systemic interpretation of experiences through the mutually exclusive nature of meta-motivational states and so only one state from each pair can be operative at any time, but the operative state can change over time. Consistent with previous emotional Stroop research and the interference effect described earlier, it is posited that words associated with the individual's current meta-motivational state (e.g., "fun" whilst in a paratelic state) have greater emotional significance and relevance to the individual's current concerns (Williams et al., 1996), than words relating to the opposing state at that instance. Hence, we hypothesised that individuals would present a greater response latency for state-congruent than state-incongruent stimuli.

Although not the focus of the present research, testing responses to MMS-related stimuli using a Stroop paradigm also enables an exploration of the ways in which individuals' cognitive processing operates in different states. For example, whilst in a telic state an individual may successfully orientate towards congruent stimuli, effectively blocking those that might distract from the current task. Conversely, whilst in a negativistic state incongruent stimuli may attract and excite the individual.

Further, processing efficiency might alter depending upon one's meta-motivational state, with some more conducive to attentional focus than others. These ideas move beyond the initial exploration presented by this study, however, the emergent questions highlight the broader utility of a Stroop-based measure of cognitive responses within the field of reversal theory.

In sum, the purpose of the present research was to develop and validate an implicit measure of meta-motivational states using an adapted Stroop protocol. Study one presents Meta-Motivational Stroop (MMS) development, tests of internal robustness, and assessments of its convergent validity with explicit measures of state, the TPSI and the SOMIFA. It was expected that all three measures would demonstrate convergence in identifying active states, however, the explicit measures were anticipated to have greater alignment with each other than with the MMS. Study two manipulated state, through expressive writing and imagery, to assess the ability of the Stroop task to detect changes in state.

2.2 Study 1 Method

2.2.1 Meta-motivational Stroop Development

The development of the MMS initially required the primary researchers (including an author with several reversal theory publications and expertise in measurement development) to generate a word pool for each state. Selected stimuli included characteristics and positive aspects related to being within a particular state that were drawn from a review of reversal theory literature. Words relating to the negative connotations of not achieving motivational goals whilst within that state (e.g., 'bored' whilst in a paratelic state) were excluded as it was posited that they may fail to grab the participant's attention to the same extent as the characteristics and positive connotations associated with being in a state. This initial phase resulted in

a total of 160 stimuli, ranging from 14 to 28 words per meta-motivational state.

Once the initial word pool had been generated, five reversal theory experts (members of the reversal theory society and authors of numerous reversal theory publications) rated each item on a Likert scale from 1 (*very poor match*) to 5 (*excellent match*) in relation to how appropriate each item was for its intended meta-motivational state. An average score for each item was calculated; items with an average below 3.5 (adequate or below) were removed from the pool resulting in the removal of 45 items. Items that included hyphenated words or short phrases (e.g., 'risk-taking' and 'easy going') were removed as reviewer feedback highlighted that they may affect response latency due to blank spaces reducing lateral masking of the beginning and end letters of words, thus making them easier to see (Bouma, 1973). Similarly, items using a negative prefix (e.g., 'unconventional') were removed, as they may be more difficult to process, thus increasing colour-naming latency (Hutchison & Bosco, 2007). This resulted in a further 12 items being removed from the word pool. The remaining 103 items were then matched, by word length and linguistic complexity, across the meta-motivational state pairs, resulting in a final pool of 8 items per meta-motivational state (see Table 2.1).

2.2.2 Meta-motivational Stroop Validation

2.2.3 Participants

An opportunistic sample of 68 participants (M age = 29.87 years, SD = 12.30; n = 39 males, n = 29 females) volunteered to take part in the study. Participants were all fluent in written and spoken English, which was the first language for 64 of the participants.

Table 2.1: Stroop Task Word Pool

Telic	Paratelic	Conformist	Negativistic	Symapthy	Mastery	Alloic	Autic
Goal	Risks	Conform*	Defiant*	Affectionate*	Competition*	Altruistic	Individual
Serious	Thrills	Obedient*	Stubborn	Love	Resilience*	Supporting	Egotistic*
Future	Playful*	Compliant*	Rebellious	Sympathetic	Resilience	Supporting	Independence*
Accomplishment	Spontaneous*	Respectful	Innovative	Tenderness	Supremacy	Collective	Individuality
Purpose*	Present	Rules*	Rebel	Caring*	Control*	Selfless	Myself
Meaning*	Carefree	Cooperation*	Provocative	Harmony	Contest	Empathy*	Selfish
Cautious	Immediate	Norms	Angry	Kindness	Dominance	Give	Self
Calm	Humour	Agreeable	Contradict	Sensitivity	Aggressive	Unity	Ego*
Attainment	Excitement*	Adaptable	Restrictions	Cooperation	Status	Selfless	Independence
Success	Impulsive	Dutiful	Ill-behaved	Team-work	Toughness	Giving*	Myself
Growth*	Unstructured	Respectful	Rules*	Unity	Admiration	Unity	Ego*
Development	Risk-taking	Expectations	Unconventional	Considerate	Strength	Groups	Attention
Focus	Buzzing	Etiquette	Challenging*	Compassionate*	Esteem	Team	Me
Structure*	Stimulation*	Structure*	Freedom*	Warm*	Importance*	Losing	I
Monitor	Free	Traditions	Mischievous	Tenderness	Superior	You	
Achievement*	High Arousal	Fitting in*	Non-compliant*	Nurture	Ranking	Us	
Placid	Pleasure*		Antagonistic	Giving	Winning	Give	
Relaxed	Fun*		Non-conformist	Placid	Confident*	Collective	
Functional	Easy going				Hardiness	Self-sacrificing	
Anxious	Short-term				Completion		
End	Intensity						
Sensible	Now						
Progress	Adventurous*						
Future	Excited*						
Means	Meaningless						
Tranquil	Enjoyment*						
Low Arousal	Sensation seeking						

* demonstrate the overlap in the conceptual terminology within both SDT and reversal theory

2.2.4 Measures

Meta-motivational Stroop Task. Participants received standardised instructions informing them of the task, which took approximately 45 seconds to read. Participants then responded to 160 stimuli, consistent in length with previously administered Stroop tasks (e.g., McKenna & Sharam, 2004). Thus, the MMS consisted of 20 stimuli per meta-motivational state, separated by a pre trial period lasting 200 ms. It was determined through pilot testing that participants took approximately 140 seconds to complete the task. During the task the eight items for each meta-motivational state were randomly presented in Arial font, at 1cm in height (font size 22), against a white background. The font colour in which the words were presented was randomly set to one of the following: red, green, blue or black. Participants were instructed to indicate the colour of the word, as quickly as possible, whilst making as few errors as possible, by pressing an assigned keyboard key for the specific colour. An incorrect response resulted in a red "X" flashing on the screen and a pause of 400 ms prior to the next stimulus. Average response times for each meta-motivational state were produced; state pair ratios were also calculated (e.g., Mean telic latency / Mean paratelic latency; ratio > 1.00 indicates a telic state whilst a ratio < 1.00 indicates a paratelic state).

State of Mind Indicator for Athletes (SOMIFA; Kerr & Apter, 1999; see Appendix 5.A). The SOMIFA identifies active meta-motivational states from the four mutually exclusive state pairs in a sporting context. Items 1-4 consist of pairs of statements, each reflecting one meta-motivational state, for example, "achieve something important to me" to depict a telic state, or, "simply enjoy the fun of participating" to indicate a paratelic state. For the purpose of the present study the stem for items 1 to 4 was modified to be pertinent to the experimental situation as opposed to performing in a sporting context. For example, "be tough and dominating during

my performance" was modified to read "to feel superior and confident during the task". Participants were required to choose the statement that best corresponded with their motivation during the task.

Telic/Paratelic State Inventory (T/PSI; O'Connell & Calhoun, 2001; see Appendix 5.B). The T/PSI is a 12-item measure of current meta-motivational state consisting of seven serious/playful items and five arousal avoiding/arousal seeking items. The T/PSI was used instead of the TSM due to low inter-correlations between the four items of the TSM (Cook, Gerkovich, Potocky, & O'Connell, 1993). For the purpose of this study the T/PSI stem was amended for parity with the SOMIFA to relate to how the participant felt while completing the task as opposed to how they were feeling in the last few minutes. Each item consists of pairs of opposite meta-motivational states, located either side of a 6 point rating scale (e.g., ranging from "feeling playful to feeling serious minded"). Participants were required to select the number which best described how they felt during the task, with low scores representing a telic state whilst a high score represents a paratelic state. The T/PSI has adequate internal consistency (Cronbach's alpha = .89) for the inventory as a whole however during the measure's development its component sub-scales demonstrated weaker reliability. Its authors have concluded that due to the high correlation between the factors (r = .58), the inventory is acceptable for use in its entirety (O'Connell & Calhoun, 2001).

2.2.5 Procedure

On arrival at the laboratory participants were required to read the participant information sheet (Appendix 5.C), and had the opportunity to ask the principal researcher questions regarding the study. If willing, participants completed a questionnaire pack consisting of a consent form (Appendix 5.D) and demographic information

(Appendix 5.E). Participants then read the standardised Stroop instructions and began the task when ready. On completion of the MMS participants completed the explicit measures before being thanked and debriefed.

2.2.6 Data Analysis

Questionnaire reliability was inspected through examination of the Cronbach's alpha coefficient for the T/PSI to examine the internal consistency of the measures. Exploratory factor analysis was performed on the T/PSI to examine the structure of the measures. Bivariate correlations were performed to assess the relationship between the Stroop latency difference and participants' current meta-motivational state inline with the T/PSI. Further to this, frequency analysis were performed between the Stroop latency, T/PSI and SOMIFA to assess the number of cases which were inline between the three measures of current meta-motivational state.

2.3 Study 1 Results

2.3.1 Initial Data Screening

Univariate outliers from the Stroop latency were identified using casewise diagnostics, highlighting cases two standard deviations from the residual mean. Nine cases were identified as outliers: two participants appeared as outliers on multiple sub-scales (six and seven, respectively), demonstrating consistently long response latencies (greater than 1200 ms) which may be considered as approximating explicit responses (Dasgupta, McGhee, Greenwald, & Mahzarin, 2000; Mendoza, Gollwitzer, & Amodio, 2010; Nier, 2005). These participants were removed from further analysis. A further four outliers with response latencies greater than 1200 ms were removed from analysis concerning the problematic meta-motivational states (Mastery, Negativistic, Alloic and Autic). Data screening revealed acceptable levels of

skewness and kurtosis (Raw/SE values were in the acceptable range of -2 to 2) for all sub-scales on removal of the six outliers.

2.3.2 Meta-motivational Stroop Descriptive Statistics

Data screening of the MMS revealed that each word stimulus was shown on average 163.77 (SD = 8.97) times throughout the study with an average response latency of 750.23 milliseconds (SD = 330.14). There were no significant differences in response latency between meta-motivational states, $F_{(7,10473)} = 1.031$, $p = .407$, or between response latency to stimuli within meta-motivational states, with the exception of the paratelic sub-scale, in which participants responded significantly quicker, $p = .015$, to the stimuli "Present" ($M = 688.25$, SD = 15.21) than "Playful" ($M = 790.91$, SD = 26.65; $F_{(7,143)} = 2.14$, $p < .05$, $g = 4.70$, 95% CI [4.02, 5.39]). This was not felt to be overly potentiate; given the number of differences tested, the emergence of so few significant differences was considered an excellent outcome. These data were therefore taken to assume equality of lexical complexity and processing time for each stimulus, as required to ensure standardisation between test stimuli.

Participants' data from the MMS were coded, for each meta-motivational state pair, for the active state (longest response latency) and the non-active state (smallest response latency). Eight one way repeated measures ANOVAs were conducted; all revealed significant differences between response latencies of the meta-motivational states (n.b., a Greenhouse- Geisser correction factor was used due to violation of sphericity assumptions). Bonferonni follow up tests revealed significant differences between response latency of meta-motivational state pairs (within state pair), supporting the mutually exclusive nature of reversal theory; significant differences emerged for out of state pairs for four paired states (see Table 2.2).

Table 2.2: Number of participants and mean response latencies of active (longest response latency) and non active states (smallest response latency)

Active State	Mean	*SD*	Non Active	Mean	*SD*	*p*	*n*	*g*	95% CI
Within State Pair									
Telic	814.52	(129.11)	Paratelic	742.01	(113.69)	.000	36	0.59	0.12, 1.06
Paratelic	738.70	(114.18)	Telic	680.10	(100.13)	.000	30	0.54	0.02, 1.05
Mastery	781.55	(161.03)	Sympathy	712.74	(119.97)	.000	33	0.48	-0.01, 0.97
Sympathy	817.47	(135.56)	Mastery	729.54	(109.97)	.000	33	0.70	0.21, 1.20
Conformist	769.90	(114.15)	Negativistic	706.32	(98.65)	.000	32	0.59	0.09, 1.09
Negativistic	796.02	(169.80)	Conformist	720.95	(122.32)	.000	34	0.50	0.02, 0.98
Alloic	793.79	(140.33)	Autic	727.17	(111.03)	.000	39	0.50	0.02, 0.98
Out of State Pair									
Telic	814.52	(129.11)	Conformist	766.37	(118.21)	.038	36	0.38	-0.08, 0.85
Sympathy	817.47	(135.56)	Paratelic	753.39	(108.19)	.009	33	0.52	0.03, 1.01
Sympathy	817.47	(135.56)	Alloic	757.01	(115.35)	.030	33	0.47	-0.01, 0.96
Sympathy	817.47	(135.56)	Autic	732.56	(104.81)	.000	33	0.69	0.20, 1.19

2.3.3 Questionnaire Reliability

Examination of the Cronbach's alpha levels of the T/PSI revealed acceptable reliability for the thw sub-scales of the T/PSI and the measure as a whole (.600 to .781). The avoiding/arousal seeking sub-scale revealed a Cronbach's alpha of .600, increasing to .740 with the removal of item 7 "concerned about the future effects of my current activity/not concerned about the future effects of my current activity". The inter-item correlations showed that item 7 was negatively correlated with items 9 and 12 (r = -.091 and -.119, respectively) and weakly correlated to items 2 and 5 (r = .050 and .164, respectively). Inspection of the content of item 7 indicated greater connection to the serious/playful sub-scale as opposed to the arousal avoiding/arousal seeking sub-scale. This was supported by the Cronbach's alpha of the serious/playful sub-scale increasing to .796 with the addition of item 7.

Due to the low inter item reliability of the AA/AS sub scale and the structure differences discussed by O'Connell and Calhoun (2001) factor analysis was conducted to examine the structure of the T/PSI; the extraction method used was principal axis factoring with oblique rotations. The KMO = .671 and all KMO values for individual

items were above the acceptable limit of .5 (Field, 2009, p. 659). Bartlett's test of sphericity $\chi^2(66) = 277.051$, $p < .001$, indicated that correlations between items were sufficiently large for factor analysis, determinant value was greater than .001, and so there was no multicollinerarity (Field, 2009, p. 657). An initial analysis was computed to obtain eigenvalues for each component of the data. Three components had an eigenvalue meeting the Kaiser criterion of 1 and in combination explained 61.47% of the variance, this was supported by the scree plot showing inflexion at component 3; thus three components were retained in the final analysis.

Table 2.3 shows the factor loadings after rotation. The items that cluster on the same components suggest that component 1 represented a sub-scale concerned with being in the moment (paratelic) or with the future effects of the activity (telic) consisting of items 7, 4, and 10. A second component of AA/AS consisting of items 9, 2, 5, 12, 11; finally component 3 shows a sub-scale of items relating to SM/P (items 3, 8 and 1). The three sub scale structure of spontaneity, SM/P and AA/AS is unsurprising given the characteristics of the telic-paratelic state pair discussed within the literature and measures including the telic and paratelic dominance measures (Murgatroyd, Rushton, Apter, & Ray, 1978; Cook & Gerovich, 1993) and the telic state measure (Svebak & Murgatroyd, 1985). Item 6 appears to be cross loading with the adventure/arousal dimension and future/in the moment scale, however the correlation is weak ($r = .306$ and .331, respectively). Cronbach's alpha revealed that the three sub-scale inventory appeared reliable, with alphas of .777 for the adventure/arousal dimension, .715 for the future scale and .750 for the fun/serious dimension. Taken together, the analysis of the reliability and structure of the T/PSI would suggest that further validation of the T/PSI is required. The results obtained in this study do not support the two dimensions of AA/AS and SM/P.

Table 2.3: Summary of exploratory factor analysis results for the T/PSI

Item No.	Item	Subsection	Factor 1	Factor 2	Factor 3
7	**Concerned about the future effects of my current activity/Not concerned about the future effects of my current activity**	AA/AS	.766*	-.091	.050
4	**Doing the activity just for the fun of it/Doing the activity because it may affect my future**	SM/P	.715*	-.097	-.122
10	**Living for the moment/Focusing on the future**	SM/P	.562*	.110	.039
9	Wanting to feel less aroused/ Wanting to feel more aroused	AA/AS	.-.130	.751*	.222
2	**Wanting peace and quiet/ Wanting adventure**	AA/AS	.083	.739*	.023
5	Wanting to feel excitement/Wanting to feel calm	AA/AS	.241	.552*	-.083
12	**Feeling adventures/Not feeling adventurous**	AA/AS	-.194	.544*	-.266
11	Feeling serious/Feeling playful	SM/P	.280	.476*	-.349
6	Wanting to be serious/ Wanting to be playful	SM/P	.306	.331	-.214
8	Wanting to just have fun/Wanting to accomplish something	SM/P	.118	-.179	-.890*
3	Trying to accomplish something/Just having fun	SM/P	-.069	.047	-.622*
1	Feeling playful/Feeling serious-minded	SM/P	.264	.263	-.340
	Eigenvalues		4.061	2.062	1.254
	% of variance		33.84	17.18	10.45

* = Factor loadings over .40. Items that appear in bold have been excluded from further analysis due to irrelevancy or poor fit.

2.3.4 Correlational Analyses

To assess convergent validity, bivariate correlational analysis was performed between Stroop latency ratio (telic/paratelic) and the T/PSI. Results revealed a small positive correlation approaching significance ($r = .239$; $p = .053$). The positive correlation indicated that state congruent stimuli exert less interference than state incongruent stimuli.

2.3.5 Frequency Analysis

A frequency comparison between states identified by the MMS, T/PSI and SOMIFA assessed the number of cases in which the three measures were in agreement regarding participants' current meta-motivational state. Current state was shown through an increased response latency to state congruent stimuli when using the MMS and using the suggested scoring criteria for the T/PSI (< 41 indicating a telic state and > 40 indicating a paratelic state; O'Connell & Calhoun, 2001). The MMS matched meta-motivational state with the T/PSI on 39.40% of participants (47.50% telic and 34.62% paratelic), and 50.58% of participants across the full spectrum of meta-motivational states assessed through the SOMIFA. The two existing measures, the T/PSI and SOMIFA were in agreement on current meta-motivational state for 59% of participants.

2.4 Study 1 Discussion

The aim of study one was to develop and provide some initial validation for an adapted Stroop protocol as an implicit measure of meta-motivational state. When assessing concurrent validity of the MMS against the previously validated T/PSI, results demonstrated a small to moderate correlation, however this was in the opposite direction than originally theorised. That is, a decreased response latency to

state-congruent stimuli relative to non-state congruent stimuli was observed. This suggests that state congruent stimuli exert less interference than state incongruent ones. Although contrary to original expectations and emotionally focused Stroop tasks, these emergent findings are consistent with recent work by Kunde and Mauer (2008) who posited that greater cognitive effort is required to process incongruent valence stimuli, similar to the original Stroop effect, thus resulting in greater response latency (Botvinick, Braver, Barch, Carter, & Cohen, 2001; Kunde & Wuhr, 2006; Stroop, 1935). Allocating attentional resources to mood incongruent information might be functional for the regulation of emotion and action which is important for mood repair (Taylor, 1991), and, crucially in an RT context, for flexible switching of attention between opportunities for enhancing well-being to allow the individual to allocate sufficient attention to new goals (Rothermund, 2003).

Some general support for incongruent attention capture in relation to motivational state is presented by Rothermund (2003), who investigated the relationship between outcome-related motivational states and processes of automatic attention allocation in a series of four experiments. Of particular relevance, the final study examined the automatic processing of word valence in a grammatical categorisation task, demonstrating stronger interference effects for target words whose valence was opposite to the current motivational state. It was theorised that attending to the valence of incongruent valency words exerted a non-specific distraction, or 'interrupt' effect, with Rothermund suggesting that attention is automatically allocated to the valence of an affectively incongruent stimulus. Additionally, Rothermund's work identified that the incongruent effect only occurred in valence shift trials that required an attentional shift from preceding target words to the subsequent trial word as the two words differed in valence. These shifts mirror the presentation of the MMS; due to the randomisation of trials and eight meta-motivational states being measured, it is highly unlikely that stimuli from the same state would be

presented sequentially.

The emergent finding for incongruent meta-motivational stimuli to capture attention might also be explained by the nature of reversal theory itself, in that people should be motivationally versatile (Dixon, 1994) and open to change and reversals to other states in order to maintain psychological health and display a range of moods and behaviours (Apter, 1982; Apter & Carter, 2002). The pursuit of desired or alternative behaviours and moods, through the reversal process, may result in an increased response latency to stimuli associated with alternative states, as greater cognitive effort is required to process and evaluate the alternative behaviours, moods and environment. Thus, we have learnt to usefully allocate attention capture to contingent stimuli or events that might relate to states that differ from our present one. This suggestion of innate or learnt tendencies to orientate towards triggers of reversals warrants further investigation.

Due to the exploratory nature of assessing current meta-motivational state using an implicit measure and the unpredicted relationship between the MMS and the T/PSI, further validation of the MMS was essential. As such, study two aimed to manipulate meta-motivational state through inducing a reversal to the required state using two forms of contingent events: expressive writing and imagery (Desselles & Apter, 2013). Priming participants to experience a desired meta-motivational state allows the researchers to manipulate participants current meta-motivational state rather than relying on the T/PSI as a point of comparison. Writing tasks have been used successfully to prime emotions in previous studies, for example, Pavey, Greitemeyer, and Sparks (2011) primed participants into a relatedness state, whilst Hudson and Day (2012) used an expressive writing task to enable participants to recreate and switch between the different meta-motivational states.

Thus, study two used Hudson and Day (2012) protocol to prime participants to experience a desired meta-motivational state. Study two isolated the telic-paratelic

state pair to conduct a rigorous assessment of the MMS validity whilst limiting interference from the other three state pairs. It was hypothesised, in line with study 1 findings, that stimuli associated with participants' primed meta-motivational state would be associated with a reduced response latency whilst stimuli associated with the non-primed state would be associated with increased response latency. It was expected that when writing from the serious perspective participants' response latency to paratelic stimuli would be greater than that to telic stimuli. In contrast when writing from a playful perspective participants' response latency to telic words would be greater than when responding to paratelic stimuli. To compare the sensitivity of the MMS with an explicit measure, the T/PSI was also administered.

2.5 Study 2 Method

2.5.1 Participants

A second independent opportunistic sample of 35 participants (M age = 34.09 years, SD = 14.67; n = 15 males, n = 20 females) was recruited to take part in the study. Participants were all fluent in written and spoken English; which was the first language for 34 of the participants. All participants gave written informed consent to take part and completed the same measures used in study one.

2.5.2 Procedure

The procedure followed Hudson and Day (2012) protocol, in which participants attended three separate sessions. Prior to attending the laboratory participants were provided with an information sheet (see Appendix 5.P) explaining the details of involvement in the study and the content of the three sessions. Session 1 (approximately 45 minutes) requires participants to complete a consent form (see Appendix 5.D) and demographic information (see Appendix 5.E), followed by a 20-minute

writing task about a recent stressful event (see Appendix 5.G). Participants then read a reversal theory information sheet (see Appendix 5.H) and completed two short tasks to demonstrate their understanding of the theory. In session 2 (approximately 30 minutes), participants were read a guided imagery script designed to aid understanding of the telic and paratelic meta-motivational states (see Appendix 5.I). The imagery script contained both stimulus and response propositions (cf. Cumming, Olphin, & Law, 2007; see Appendix 5.I) and took on average 7 minutes to complete. The imagery script initially aimed to relax participants, prior to a 'guided' tour of a corridor containing a telic and paratelic door. Participants were asked to furnish each room with appropriate items; anything that they considered to be serious, achievement focused and looking to the future when in the telic room, and fun, playful and focused on the present when in the paratelic room. After furnishing each room participants were given the opportunity to make a few notes about what they had imaged to aid their recall in the final session. Finally, in Session 3 (approximately 60 minutes), participants completed two 10 minute writing tasks about the event chosen in session one; once from a telic and once from a paratelic perspective (see Appendix 5.J). The order of writing perspective was randomized between participants. Prior to completing the writing task participants re-imaged the appropriate meta-motivational state room, created in session two. After writing from the required perspective participants completed the MMS followed by the T/PSI.

2.6 Study 2 Results

2.6.1 Initial Data Screening

As previously recommended, responses that were deemed too fast ($<$ 300ms) or too slow ($>$ 1200 ms) were removed in order to clear the data set of accidental and

explicit responses (Dasgupta et al., 2000; Mendoza et al., 2010; Nier, 2005). Three outliers in the MMS data demonstrated consistently long response latencies (> 1200 ms), which may be considered verging on explicit responses. These participants were removed from further analysis.

2.6.2 T/PSI Structural Analysis

2.6.3 Manipulation Check - Content Analysis of Writing

The written narratives of participants were examined by two researchers using content analysis to ensure they complied with the requirements of each condition. Results revealed that all participants successfully wrote from the telic perspective; writing focused on the serious aspects of their chosen event, goals of how they wished to improve or what they had hoped to achieve, focused on the future while giving purpose to the present. However, the narratives from the paratelic condition revealed that many participants had difficulty writing regarding their event from this perspective. Participants were on occasion not able to enjoy risks, be playful, or focus on the present. For this reason any participants who had not successfully written from a paratelic perspective were removed from the data set, resulting in the exclusion of 12 participants and a final sample of 20.

To examine if the excluded participants reported a difference in their active salient state between conditions paired samples t-tests were performed on their T/PSI data. Results revealed a significant difference between participants' T/PSI scores from the serious (telic; M = 29.91, SD = 6.02) and the playful (paratelic) conditions (M = 45.55, SD = 6.23; $t(10)$ = -7.174, $p < .001$, g = -2.50, 95% CI [3.33, -1.67]), that is, those that were excluded for protocol violations nevertheless were significantly more telic in the telic condition than the paratelic condition.

2.6.4 Meta-motivational Stroop Descriptive Statistics

Telic Writing Condition. Data screening of the MMS revealed an average response latency of 630.38ms (SD = 171.92). Repeated measures ANOVAs revealed nonsignificant differences in response latency to stimuli between meta-motivational states, $\chi^2(7) = 3.76$, $p = .807$, and between response latencies to stimuli within meta- motivational states ($p = .288$ to .856).

Paratelic Writing Condition. Data screening revealed an average response latency stimuli of 670.01ms (SD = 294.95). Repeated measures ANOVAs revealed nonsignificant differences in response latencies to stimuli between meta-motivational states, $\chi^2(7) = 1.78$, $p = .971$, and between response latencies to stimuli within meta-motivational state ($p = .067$ to .973) with the exception of the paratelic state in which participants' response latency was significantly greater to the stimulus 'risks' ($M = 677.64$, SD = 194.87) than 'spontaneous' ($M = 571.71$, SD = 194.87; $p = .002$, g = -0.53, 95% CI [-0.10, 1.16]). As in study one this was not considered to be potentiate given the number of differences tested, and provided further support for the suitability of the selected MMS stimuli.

2.6.5 Changes in State Across Writing Conditions

To examine if participants' active state differed between the telic and paratelic conditions paired samples t-tests were performed. Results revealed nonsignificant difference in the telic to paratelic MMS ratio between the telic writing condition ($M = .993$, SD = .065) and paratelic writing condition ($M = .923$, SD = .217; $t(19) = 1.481$, $p = .155$, $g = .43$, 95% CI [-0.20, 1.06]). In contrast a significant difference was observed in the telic to paratelic T/PSI score between the serious writing condition ($M = 30.85$, SD = 8.24) and the playful writing condition ($M = 47.80$, SD = 12.84; $t(19)$ = -4.528, $p < .001$, g = -.1.54, 95% CI [-2.25, -0.83]).

2.6.6 Correlation Analysis

Bivariate correlation analyses revealed that in both the telic and paratelic condition, the MMS and the T/PSI were positively related; neither association was significant ($r = .348$, $p = .132$, $r = .051$, $p = .832$, respectively).

2.6.7 Frequency Analysis

Frequency comparison between the MMS and the T/PSI assessed the number of cases in which the measures were in agreement regarding participants' current meta-motivational state. As in study one, current state was shown through the MMS by an increased response latency to state incongruent stimuli, whilst the suggested scoring criteria was used for the T/PSI (< 41 indicating a telic state and > 40 indicating a paratelic state; O'Connell & Calhoun, 2001). The two measures were in agreement for 59.09% (64.71% telic and 40.00% paratelic) of participants in the telic condition and 52.17% (33.33% telic and 64.29% paratelic) in the paratelic condition.

2.7 Discussion

The results offered no support for the hypothesised differences in response latency between primed conditions, suggesting that the MMS was unable to detect changes in primed states. In contrast the explicit measure detected the expected state changes; participants were identified as significantly more telic, when writing from a telic perspective, and more paratelic when writing from a paratelic perspective, using the T/PSI. However, this difference in meta-motivational state across writing conditions should be interpreted with caution. Importantly the expected change in active state was also apparent in excluded participants who did not adhere to the priming manipulation. It is plausible, therefore, that participants responded to the T/PSI in line with what they believed the researcher wanted to see (LaPiere, 1934);

participants were aware that the researcher wanted them to feel more serious, goal orientated and focused when writing in the telic condition, and more playful, spontaneous and carefree when in the paratelic condition, and so responded accordingly on the explicit measure. There is no other reason why significant differences in state on the T/PSI should have emerged in the non-primed (non-compliant) group.

The findings from study two partly replicate those of study one revealing a moderate positive correlation between response latency and the T/PSI when writing from the telic perspective. However, no relationship was evident when writing from the paratelic perspective. Responses on the MMS demonstrated a trend for an increased response latency to paratelic compared with telic stimuli regardless of writing condition. The authors tentatively propose that this demonstrates a difference in the processing of stimuli dependent on meta-motivational state; when in a telic state attention is captured by state incongruent stimuli, illustrating an openness to reverse to an alternative states to aid achievement of future goals. In contrast, when in a paratelic state individuals are focused on the present and so attention in captured by state congruent stimuli. The suggestion that meta-motivational states may use different cognitive processes is a novel proposition and one that requires additional examination.

2.8 General Conclusions

The adapted Stroop task, successfully used in previous research assessing motivation and emotion (Ayres & Sonandre, 2002; Williams et al., 1996), revealed a pattern of results in which state-incongruent stimuli exerted an interrupt effect and extended response latency relative to state-congruent stimuli. This is similar to both the original Stroop effect and subsequent research regarding emotions (Kunde & Mauer, 2008; Stroop, 1935). Convergence between the measures was as expected;

associations between the MMS and the two current explicit measures of state was weaker than between the two explicit measures. However, convergence between the two explicit measures was weaker than expected given the similarity in measurement type. Although the MMS results presented in the present paper are inconsistent the use of an implicit measure of state has raised interesting and novel questions regarding how best to capture current state, and how stimuli might be differently processed dependent on ones meta-motivational state.

Any attempt at measuring or assessing an individual's meta-motivational state has the potential to induce a reversal, for example, through satiation, if the task is too long or repetitive, through frustration by being interrupted to measure current meta- motivational state, or through contingent events increasing the individual's awareness of being assessed or changing task to complete the measure. This highlights an issue with the use of not only the MMS but all existing measures of meta-motivational state; being seated in a laboratory, at a desk, typing at a computer and responding to the colour of stimuli as quickly and as accurately as possible may be associated more with a telic or conformist state. Administering an assessment itself may act as a contingent event causing a reversal to a state more associated with achieving goals, being focused on a task, following rules, or being focused on the self (e.g., telic, mastery, conformist, or autic state). This concern is consistent with comments made by other reversal theorists, for example Desselles and Apter (2013) note that at any given time "there will be internal processes that are concurrently having an effect on images and thoughts on the one hand and the satiation process on the other" (p. 47). An implication of this internal changeability, which Apter terms 'behavioural indeterminacy', is that it is difficult to ascertain with confidence the state a participant is experiencing. The implications of the difficulty of measuring states for the falsifiability of reversal theory further highlight the need for ongoing work in this area.

Despite the inconsistent results presented it is posited that continuing the development of an implicit measurement of meta-motivational state may be a fruitful line of research in the pursuit of robust meta-motivational state measure. Implicit measures do not require the individual to be fully conscious of their state (Asendorpf, Banse, & Mucke, 2002), be aware of the attitude being measured (Brunel, Tietje, & Greenwald, 2004), or have control over the measurement outcome (Fazio & Olson, 2003). Thus, the hurdle to overcome is the prevention/limitation of measurement-induced reversals. It is posited that the variety of implicit measures available (e.g., IAT, Stroop tasks, word association) provide scope for minimal impact of contingent events. For instance, they offer ease and accessibility of use, reduce goal directed behaviour and environmental effects (e.g., their use on mobile devices as opposed to a computer/laptop) whilst the speed of the test can reduce satiation induced reversals, which may be more associated with completing longer explicit questionnaires. Whilst it is clear how an implicit measure of state would be used for laboratory-based research, it would need careful presentation in an applied setting; validating the MMS under such conditions and seeking feedback on how best to introduce it to users would be a useful avenue for future work, and should draw from existing guidelines concerning implicit measures in applied contexts (e.g., Maio, Haddock, Watt, & Hewstone, 2008). We encourage other reversal theorist to use, critique and develop both the MMS and alternative measures to advance our field of enquiry.

Chapter 3

Examining Meta-motivational State Reversals as a Mechanism for Regulating Balanced Need Satisfaction

Elements of this research were presented at 1) the International Conference on Motivation Annual Conference, Frankfurt, Germany, August 2012; 2) the 5th International Conference on Self Determination Theory, NY, America, June, 2013; and 3) the 28th International Congress of Applied Psychology, Paris, July, 2014.

3.1 Introduction

Motivation has been widely studied within psychology due to the importance of understanding why people initiate, sustain, and direct behaviour towards an end goal. It is evident from research that motivation is changeable and dynamic; to date we have a comprehensive understanding of when and why people are motived, including the range of motives (e.g., achievement, power and acquisitiveness), goals (e.g., extrinsic rewards or personal development), and need pursuits (e.g., psychological needs: belonging, autonomy and competence; and physiological: water, food and shelter) that underpin volitional behaviour. The dynamic nature of motivation has been evidenced in a variety of settings utilising a range of methodologies, for example, longitudinal studies demonstrating that students' motivation changes over time and across academic disciplines (e.g., Gottfried, Fleming, & Gottfried, 2001); whilst a qualitative analysis have revealed that athletes report changes in motivational foci at different stages of competition in response to errors or external events (e.g., Bellew & Thatcher, 2002; Hudson & Walker, 2002; Males, Kerr, & Gerkovich, 1998).

Dynamic Motivation and Psychological Health

The relationship between psychological health and dynamic motivation has been highlighted in this thesis, focussing on the maladaptive behaviours associated with an inability to change motivational focus, through either inhibited reversals (reversal theory; Apter, 1989) and the rigidity in behaviour associated with need thwarting (self determination theory; SDT; Deci & Ryan, 2000; see Chapter 1, Section 1.3 for a full discussion). The rigidity in behaviour outlined in SDT as a result of need thwarting reflects the outcomes of individuals suffering from inhibited reversals (e.g., depression, disordered eating, and burnout). It is proposed that rigidity in

behaviour might be due to an inability to reverse and experience alternative states and emotions, thus experiencing fewer state-motives and an inhibited spectrum of need satisfaction. As such, lability and frequency of an individual's reversals contribute to well-being through enabling a balanced satisfaction of one's needs.

From an applied perspective the ability to induce reversals and achieve a balance of need satisfaction might prevent maladaptive behaviours associated with both need thwarting and inhibited reversals. Current reversal theory literature presents three agents that might induce a reversal from one meta-motivational state to another: frustration, when an individual's needs are not satisfied; satiation, as reversals are increasingly likely with the passage of time; and contingent events, a change in the surroundings (Apter, 2001). However, literature surrounding the reversal process lacks depth and clarity, particularly in regard to frustration and satiation-induced reversals.

Based on the interplay between BPNT and reversal theory it is proposed that examining tenants from within reversal theory and BPNT might provide an understanding of the mechanism by which meta-motivational state reversals occur and balanced satisfaction of the basic psychological needs is achieved, thus resulting in optimum well-being and psychological health (see Chapter 1, Section 1.3). Specifically, it is posited that thwarting the basic psychological needs outlined in SDT underpins frustration-induced reversals; the active and on going thwarting of a need will simultaneously prevent the satisfaction of the motives associated with each state and identify to the individual that a change in motivational focus is required. Similarly, satiation-induced reversals in reversal theory operate to enable a balance of need satisfaction, through reversing from a state associated with a satisfied need to a state associated with an alternative need. This accords with Deci and Ryan (2000) who stated that individuals low in satisfaction of any of the basic needs in SDT should be motivated to correct this imbalance.

Level of Frustration/Satiation

Despite the suggestion that both satiation and frustration are conceived to act as reversal triggers, it is likely that there is a difference in their potency. It is expected that frustration will induce a reversal more quickly than satiation. When contingent events thwart progress and undermine the individual's internal locus of control the emotions associated with frustration (e.g., anger and disappointment) are theorised to result in a 'reactance' reversal to minimise the discomfort and negative emotions being experienced. In contrast, theoretically, satiation induced reversals are likely to occur more slowly; initial need satisfaction will result in positive emotions and well-being, thus an initial desire to remain in the current state. However, if the satisfied need impairs the satisfaction of the other needs, a reversal is required to prioritise the other needs and achieve balanced need satisfaction (Deci & Ryan, 2000; Sheldon & Niemiec, 2006). And so, it is hypothesised that the active thwarting of one or more of the basic psychological needs will induce a reversal more quickly than the active satiation of the need.

Motivational Quality

In addition to the psychological benefits associated with experiencing a variety of motivational states and emotions, the role of reversing between meta-motivational states might serve to enhance the quality of behavioural engagement. In line with reversal theory, the process of reversing between states produces significant changes in a person's outlook, motivations and emotional experiences, allowing the individual to perceive situations, emotions and cognitions differently (Apter, 1982). The implication of this is that it might be beneficial for individuals to reverse to the most appropriate meta-motivational state for the current task, situation, or environment, resulting in maximising motivational quality. Examples of this might include improving students' learning during lectures through inducing reversals to

a telic-conformist state, or reducing the anxiety athletes experience in competition through inducing a reversal to a paratelic state. Additionally the ability to reverse between meta-motivational states frequently may serve to enhance tenents of motivational quality (e.g., commitment, effort and interest) through allowing the task to be experienced in a variety of ways, based on the motives associated with different motivational states. For example, a frequent change in meta-motivational state might maintain an employee's interest in their work; initial enjoyment in the task whilst in a paratelic state before reversing to a telic-mastery state in which the employee focusses on goals to help complete the task, completing it in an autonomous manner whilst in a negativistic-paratelic state. As such, it is hypothesised that motivational quality demonstrated through task engagement, enjoyment and interest, will increase as the number of reversals experienced increases.

Reversal Type and Resulting Meta-motivational State

It is evident, though not clearly discussed within reversal theory discourse, that several types of reversal are possible. First a "within pair shift", in which a reversal to the opposite state of the mutually exclusive pair takes place (e.g., conformist to negativistic). Second, a "between pair shift", involving a change in salience of meta-motivational state pair (e.g., conformist-negativistic to telic-paratelic). Finally, a "dominant state shift", involving a reversal to the individual's dominant state (the state in which the individual spends the majority of their time). However, within reversal theory only the movement between a pair of mutually exclusive states, that is a "within pair shift", is considered a reversal. A "dominant state shift" is aligned with reversal theory's interpretation of a reversal if it is between the two states in any pair (e.g., a person reversing from the negativistic state to their dominant conformist state). Moreover, a "between pair shift" would not be considered as a reversal, but a change in salience that brings particular states or state combinations

to the forefront (or background) in any particular situation. I argue that the traditional reversal theory understanding of what constitutes a reversal lacks specificity, and as such means multiple 'state movements' could be regarded as a reversal.

The type of reversal that takes place, using the non-traditional interpretation of what constitutes a reversal, might have important implications for the benefits associated with the reversal and future reversal lability. Whilst all forms of reversal can be beneficial to psychological health and well-being, as they allow a range of emotions and motivations to be experienced, it is argued that reversals to the individual's dominant state have additional potential. A dominant state shift might serve to temporarily protect the individual from the negative effects associated with need thwarting.

Reversing to, or maintaining, a dominant meta-motivational state during periods of need thwarting might act as a protective frame which, in line with reversal theory, provides a feeling of safety when in potentially dangerous and thwarting situations (Apter, 1993). Currently three forms of protective frame are considered: confidence, safety-zone, and detachment frames, however the frames are only operationalised in the paratelic state to explain the interpretation of threats and dangers as sources of stimulation to be enjoyed (e.g., sky diving, driving fast, or gambling; Apter, 1993). I argue that, during a period of need thwarting a dominant state shift might work as a safety zone, acting as a psychological 'home territory' that the individual regards as safe, allowing them to feel more confident and in control, thus better able to cope with the thwarting. Thus it is hypothesised that a reversal to the individual's dominant state is more likely when need thwarting is experienced than when needs are satisfied.

In cases of severe and extended thwarting, dominant state reversals might be damaging to the person's ability to reverse or achieve satisfaction. The feeling of safety that is posited to be associated with the dominant meta-motivational state

might prevent the individual from reversing and experiencing the full spectrum of states. The inability to experience a range of states reduces the resources that the individual has available for future interactions. For example, a student stuck in their dominant meta-motivational state of mastery, and so unable to experience the sympathy state, might suffer from impoverished relationships. As such, while potentially useful in the short term, dominant state reversals might be damaging towards health and lability in the long term.

Role of Dominance

The thesis has considered conditions that might prompt meta-motivational state reversals and why, but it is also possible that individual differences occur in reversal lability. One reason for this might be the individual's dominance and their subsequent susceptibility to certain types of reversal. Conceptually although all meta-motivational state dominances might be susceptible to satiation-induced reversals, it is posited that frustration-induced reversals are theoretically more likely for those dominant in certain meta-motivational states. Grounded within contemporary frustration models that argue the emotional and cognitive processes of the frustrated individual influence frustration (Barron & Richardson, 1994), it is posited that individuals who are telic, mastery, negativistic, or autic dominant might be more prone to experiencing frustration-induced reversals. The characteristics associated with these states (goal oriented, power, control and freedom motives), and unpleasant emotions associated with loss increase the likelihood and amplitude of frustration experienced. Whilst in these states, when contingent events block or thwart progress, or, when internal locus of control beliefs are undermined, frustration and associated emotions are likely to occur (e.g., anger at a pressurising or controlling other in the negativistic state; disappointment at a thwarted goal in the telic state). Conversely, the characteristics of the opposing states (playful, desire for harmony, compliant,

and altruism) might reduce the likelihood of a frustration-induced reversal as goal inhibition or thwarted personal attainment are less of a focus.

Empirical Examination of a Reversal Inducing Mechanism

It is established that meta-motivational state reversals occur, we see these happen in everyday tasks (e.g., Svebak & Apter, 1987; Gore, 2006; Kerr & Tacon, 2000), and are beginning to observe and measure these more accurately (e.g., Desselles, Murphy, & Theys, 2014; Thomas, Hudson, & Oliver, 2015). The next step is to gain a clear understanding of the processes behind the reversal. I propose that examining the mechanism and propositions presented in this thesis utilising simple laboratory based protocols might be a fruitful line of enquiry.

The present study replicated the environmental manipulations of need satisfaction developed by Deci et al. (1994) and Sheldon and Filak (2008) to observe the effects of forced need thwarting and satiation on meta-motivational state reversals. As in Sheldon and Filak's (2008) study, each need was manipulated independently, thus allowing for greater experimental control and ensuring that the subtle need manipulation was not diluted by attempts to manipulate multiple needs. It was posited that simultaneous need manipulation would be associated with difficulties in controlling the level of satisfaction or thwarting of each individual need, thus providing a different experience to each individual despite being randomly assigned to the same condition. In addition, it was posited that independent need manipulation was more reflective of a natural environment; in daily activities it is unlikely that all needs would be satisfied at one time.

In conclusion, the purpose of the present research was to examine the novel proposition that meta-motivational state reversals provide a mechanism by which balanced satisfaction of an individual's innate psychological needs is achieved. It is posited that the active thwarting and satiation of an individual's innate psycholog-

ical needs will induce meta-motivational state reversals, the frequency of which will enable balanced need satisfaction. Specifically it is hypothesised that:

- conditions that actively thwart or satiate one or more of SDT's basic needs for autonomy, competence, and relatedness will induce a reversal to an alternative meta-motivational state resulting in significantly more reversals than the natural satiation condition;
- conditions that actively thwart one or more of the basic psychological needs will induce a reversal more quickly than conditions that satiate a basic need;
- conditions that actively thwart a psychological need will be associated with increased time spent in the individual's dominant state than conditions that satiate psychological needs;
- task commitment, interest, and disengagement will be predicted by the number of reversals experienced.

3.2 Method

3.2.1 Participants

Seventy one participants were recruited to take part in the research as part of a second year undergraduate psychology module practical activity; no course credit was received for participation (M age = 20.06 years, SD = 2.15; 53 males, 18 females). Participants were fluent in written and spoken English, which was the first language for 63 of the participants. Following departmental ethical approval all participants provided informed consent prior to the commencement of the study.

3.2.2 Measures

Pre task-Measure

Motivational Style Profile (MSP; Apter, Mallows, & Williams, 1998; see Appendix 5.K). The 40 item MSP measures meta-motivational state dominance of the four mutually exclusive pairs of meta-motivational states. Each item was rated on a 6 point Likert scale from 1 (*Never*) to 6 (*Always*). An individual's dominant state was calculated by subtracting the scores for each of the pairs: telic-paratelic, conforming-negativistic, mastery-sympathy and autic-alloic. A resultant positive score (>0) within each combination indicated a dominance of either telic, conformist, mastery or autic respectively, whereas a negative score (<0) indicated a dominance of paratelic, negativistic, sympathy or alloic. The scale has demonstrated satisfactory concurrent validity with good test-retest reliability for all sub-scales, ranging from .53 to .84 (Apter et al., 1998) and acceptable levels of internal consistency ($\alpha > .60$; Lafreniere, Menna, & Cramer, 2013).

Task-based Measures

Adapted Stroop Task (Thomas et al., 2015; see Chapter 2). The adapted protocol consisted of 80 stimuli taking on average 110s to complete. Participants' response time to each stimulus was recorded and average response times per state computed. Participants' active state was classified as the state with the shortest response latency, in line with the incongruencey effect demonstrated in the development of the measure (see Chapter 2). Count data of the rate of change in participants' active state within each meta-motivational state pair was calculated to assess reversal frequency.

Goal Disengagement and Goal Reengagement (GDGR; Wrosch, Scheier, Miller, Schulz,

& Carver, 2003; see Appendix 5.L). The eight-item goal disengagement and reengagement measure was adapted to assess motivational quality though task engagement (e.g., dis-engagement; "I'm reducing my effort toward the task" and task commitment; "I'm staying committed to the task; I can't let it go"). Each item was rated on a 1 (*Not at all True*) to 5 (*Very True*) point Likert scale; higher scores indicated greater task disengagement and reengagement in the task. Both scales have previously been shown to have high internal consistency (α = .84 and .86, respectively).

Post task-Measures

Intrinsic Motivation Inventory (IMI; see Appendix 5.M). The seven-item interest/enjoyment sub-scale of the IMI was adapted to assess motivational quality through interest in completing the task (e.g., "The task was fun to do"). Responses were provided on a 7-point Likert scale ranging from 1 (*Not at all true*) to 7 (*Very true*); higher scores demonstrate greater interest and enjoyment in the task. Asif (2011) has demonstrated that the sub-scale has good internal reliability (α = .85).

Manipulation Check

Basic Psychological Needs Scale-General (BPNS-G; Deci & Ryan, 2000; Appendix 5.N). The BPNS-G was adapted to measure satisfaction of the basic psychological needs of autonomy, competence, and relatedness during the study. The BPNS includes 21 items; seven items relating to autonomy (e.g., "During the study I felt free to express my ideas and opinions"), six items relating to competence (e.g., "I felt a sense of accomplishment from completing the study") and eight items assessing relatedness (e.g., "I got along with the researcher"). Participants responded to each item on a 1 (*Not at all true*) to 7 (*Very true*) point Likert scale; higher scores indicate a higher level of need satisfaction. Gagné (2003) reported coefficient

alphas of .69, .71 and .86 for the autonomy, competence and relatedness subscales, respectively.

Psychological Need Thwarting Scale (PNTS; Bartholomew et al., 2011; Appendix 5.O). The PNTS was adapted to measure need thwarting during the study. The PNTS consists of 12 items assessing three sub-scales: autonomy thwarting (e.g., "I felt pushed to behave in certain ways"), competence thwarting (e.g., "During the study I was made to feel incapable"), and relatedness thwarting (e.g., " I felt rejected by the researcher"). Responses for all three sub-scales were provided on a 7-point Likert scale ranging from 1 (*Not at all true*) to 7 (*Very true*); higher scores indicate a higher level of need thwarting. Each of the need thwarting subscales demonstrated satisfactory internal reliability in the measures development (autonomy = .84; competence = .88; relatedness = .84; Bartholomew et al., 2011).

3.2.3 Procedure

On arrival at the laboratory participants were required to read the participant information sheet (see Appendix 5.P) and had the opportunity to ask the researcher questions regarding participation in the study. If willing to participate, they completed a questionnaire pack consisting of a consent form (see Appendix 5.D), demographic information (see Appendix 5.E), and the MSP (see Appendix 5.K). Participants were initially randomly assigned to one of seven environmental conditions: autonomy thwarting ($n = 12$), autonomy satiation ($n = 14$), competence thwarting ($n = 9$), competence satiation ($n = 5$), relatedness thwarting ($n = 9$), relatedness satiation ($n = 13$) or natural satiation ($n = 9$) using randomiser software. Participants' data were then collapsed across conditions forming three environmental conditions: forced need satiation ($n = 32$), need thwarting ($n = 30$) and natural satiation ($n = 9$).

Participants read the standardised instruction sheet corresponding with their environmental condition (see Appendix 5.Q) and had the opportunity to ask questions regarding the testing session. Once ready participants completed the BTS computer package. The automated simulated BTS consisted of 10 cognitive tasks, each two minutes in duration, displayed in a randomised order. Standardised performance feedback was provided, in line with the environmental condition, on completion of each cognitive task. After receiving feedback participants completed the task-based measures; on completion of the BTS participants completed the post task measures before being thanked and debriefed.

Environmental Conditions

The initial seven environmental conditions were created through environmental manipulation of the independent forced satiation and thwarting of the basic psychological needs for autonomy, competence, and relatedness resulting in six experimental conditions; the seventh condition, natural satiation, was created as a comparison that involved the partial satisfaction of the three needs. Prior to data analysis conditions were collapsed to form three environmental conditions: forced need satiation, need thwarting and natural satiation. Environmental manipulations followed previously validated protocols (c.f. Deci et al., 1994; Sheldon & Filak, 2008) in which interactions with the researcher, phrasing of standardised instruction sheets (see Appendix 5.Q), and performance feedback received were dependent on condition. A detailed description of each condition is provided below.

Autonomy Satiation. In line with Deci et al. (1994) three contextual factors were manipulated to create an autonomy supportive environment: rationale, acknowledgement, and language. Participants were provided with a meaningful rationale for engaging in the activity, thus facilitating internalisation and boosting autonomous

motivation. The researcher acknowledged the participant's perspective, for example, recognising that participants might not find the activity interesting or enjoyable. Finally, the language used by the primary researcher and in the standardised instruction sheets conveyed choice (e.g., "might" and "could" as opposed to "have to" and "must"). In addition participants were given opportunities to express internal locus of control throughout the testing session, for example, the opportunity to have regular breaks and to alter their environment: adjust the height of their chair, open the window etcetera.

Autonomy Thwarting. The contextual factors outlined by Deci et al. (1994) were similarly manipulated to create the autonomy thwarting condition; participants were not given a meaningful rationale to engage in the activity, the participant's perspective was not acknowledged during the activity, and autonomy thwarting language was used (e.g., "have" and "must" as opposed to "might" and "could"). In addition participants were repeatedly reminded of the 'rules' regarding engagement in the task, which were displayed visually throughout the testing session.

Competence Satiation. In line with Sheldon and Filak (2008) competence supporting language was used to create a need-supportive environment (e.g., "Let's see how well you do"). In addition to this, participants were given standardised competence satisfying performance feedback, in the form of verbal and visual feedback after each trial (e.g., "Well done! You are in the top 10% of participants") expressing high levels of task mastery.

Competence Thwarting. In contrast, competence thwarting language was used to create the competence thwarting condition (e.g., "A sense of how poorly you do in the beginning") and standardised competence thwarting performance feedback in the form of verbal and visual feedback (e.g., "Maybe you will do better next time as currently, you are in the bottom 10% of participants") expressing low levels of task

mastery.

Relatedness Satiation. In line with Sheldon and Filak (2008) relatedness supporting statements such as "I care about your learning style" and "I have confidence in you" were presented to participants, in both verbal and written instructional sets, prior to and post task engagement. The primary researcher took time to get to know the participant prior to participation, offered refreshments, and the opportunity to have breaks throughout the testing session.

Relatedness Thwarting. In contrast, in the relatedness thwarting condition the primary researcher used relatedness thwarting statements such as "I am only concerned with your performance in the task, please keep your opinions to yourself". The primary researcher appeared disinterested in the participant, used an incorrect name to address them, appeared busy with other tasks, and left the participant waiting with no instruction.

Natural Satiation-Control. Participants' needs were partially satisfied, however this was not to the same extent as the forced satiation condition. Participants were informed of the task to be completed and their progress throughout the session (e.g., "You have completed 5 puzzles, you are half way through"). Participants received standardised visual and verbal feedback informing them of a consistently average level of performance (e.g., "You are in the top 60%").

3.2.4 Data Analysis

Preliminary analyses were conducted to assess the distribution of the data, reliability of the measures used and as a manipulation check of the environmental conditions. A one-way ANOVA was performed to assess the effectiveness of the environmental manipulation using Bonferonni post hoc tests to determine differences in perceived

need satisfaction and thwarting between conditions.

Multilevel modelling was utilised to examine group and intrapersonal changes in participants' meta-motivational state, task engagement, and interest. Multilevel techniques were used to overcome the errors associated with data nested within environmental conditions and over time. Such dependencies are associated with compromised standard methods of statistical analysis', thus resulting in underestimation of the standard error thus increasing the likelihood of a false significant result (Hox, 2010). Multilevel models offer the possibility to include a hierarchical structure into the model of analysis and allow random variation at each level of the model.

To analyse between group differences, a two level model, in which individual participants are level one units (i) and environmental conditions are level two units (j), was utilised. A third level, time (k), was added to the model to examine group and intrapersonal changes over time (see Figure 3.2.4).

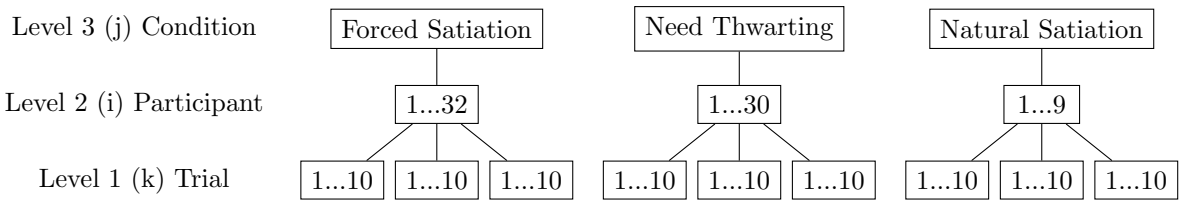

Figure 3.2.4 Multilevel structure of repeated measurements of individuals over time across environmental conditions. The number of participants in each environmental condition is shown at Level 2.

3.3 Results

Initial Data Screening

As recommended, responses that were too fast (< 300ms) or too slow (> 1200 ms) were removed in order to clear the data set of accidental and explicit re-

sponses (Dasgupta, McGhee, Greenwald, & Mahzarin, 2000; Mendoza, Gollwitzer, & Amodio, 2010; Nier, 2005). Examination of the Cronbach's alphas revealed acceptable reliability for all measures in the study with the exception of two sub-scales of the AMSP. Data screening revealed acceptable levels of skewness and kurtosis (all z scores within -2 to 2 range) for the MSP and Stroop task (see Table 3.1) and for the GDGR, IMI, BPNS-G, and PNTS, when assessing responses from environmental conditions independently.

Table 3.1: Motivational Style Profile and Stroop task descriptive information

Sub-scale	Mean	SD	Skewness	Kurtosis	α
Stroop Task					
Telic	563.93	159.05	1.21	1.68	
Paratelic	568.02	162.11	1.21	1.67	
Conformist	562.74	164.26	1.26	1.72	
Negativistic	566.31	162.93	1.20	1.57	
Sympathy	565.54	161.14	1.22	1.71	
Mastery	564.30	160.38	1.25	1.82	
Alloic	565.02	158.58	1.16	1.58	
Autic	570.21	163.19	1.17	1.43	
MSP					
Telic	19.69	4.71	-0.09	-1.21	.831
Paratelic	20.69	2.84	-0.24	0.20	.586
Conformist	19.64	2.92	-0.18	-0.67	.487
Negativistic	13.60	2.99	2.05	2.70	.707
Alloic Mastery	21.95	3.45	-0.31	0.05	.865
Alloic Sympathy	22.87	2.88	0.09	-0.03	.620
Autic Mastery	19.23	3.47	0.38	-0.76	.662
Autic Sympathy	19.72	4.19	0.74	-1.11	.727

3.3.1 Stroop Task-Descriptive Statistics

Given the relative novelty of the adapted Stroop task as a measure of meta-motivational state, descriptive statistics were assessed to examine the frequency and response latency of presented stimuli. Data screening of the Stroop task revealed that each stimulus was shown on average 496.23 (SD = 10.82) times throughout the study

with an average response latency of 565.81ms (SD = 6.16). Nonsignificant differences in response latency between meta-motivational states ($F_{(1,50191)}$ = 1.50, p = .221) were evident. Nonsignificant differences in response latency to stimuli within meta-motivational states were evident, with the exception of the paratelic and negativistic subscales ($F_{(1,6326)}$ = 6.51, p = .011; $F_{(1,6291)}$ = 4.15, p = .040, respectively). Participants responded more quickly to the paratelic stimulus "Present" (M = 559.18) than "Thrills" (M = 581.15) and to the negativistic stimulus "Rebel" (M = 554.90) than "Defiant" (M = 573.01). This was not felt to be overly potentiate; given the number of differences tested, the emergence of so few significant differences was considered an excellent outcome.

3.3.2 Manipulation Check

To assess the overall effectiveness of the environmental manipulation a one way ANOVA was conducted revealing a significant difference in total need satisfaction between the forced satiation, need thwarting and natural satiation conditions ($F_{(2,64)}$ = 16.74, $p < .001$). Follow up tests revealed that participants in the forced satiation (M = 116.65, SD = 14.56 g = 1.44, 95% CI [0.88, 2.00]) and natural satiation conditions (M = 116.14, SD = 16.32, g = 1.40, 95% CI [0.60, 2.21]) were significantly more satisfied than participants in the thwarting condition (M = 96.55, SD = 12.84). A significant difference was also evident in total need thwarting ($F_{(2,68)}$ = 5.87, p = .004) with participants in the need thwarting condition (M = 25.23, SD = 9.94, g = .83, 95% CI [0.32, 1.35]) feeling significantly more thwarted than participants in the forced satiation condition (M = 18.09, SD = 6.75) but not the natural satiation condition.

Independent samples t-tests were performed between the individual need satisfaction and thwarting conditions on the relevant sub-scales of the BPNS-G and PNTS. Results show support for the environmental manipulations (see Table 3.2).

Table 3.2: Mean responses to measures of perceived need satisfaction and thwarting

Sub-scale	Satiation Condition		Thwarting Condition		p	g	CI
	Mean	SD	Mean	SD			
Autonomy Satiation	36.93	5.30	27.42	4.87	.000	1.80	0.89, 2.7
Autonomy Thwarting	7.64	2.84	12.67	6.88	.033	-0.95	-1.77, -0
Competence Satiation	33.40	8.62	20.33	8.28	.016	1.45	0.23, 2.6
Competence Thwarting	6.40	5.37	11.33	6.02	.154	-0.79	-1.92, 0.
Relatedness Satiation	47.31	9.25	38.00	4.24	.011	1.17	0.25
2.09							
Relatedness Thwarting	4.31	1.11	6.00	1.87	.032	-1.11	-2.02, -0

3.3.3 Hypothesis Testing

Continuous Multilevel Model: Between Environmental Condition Difference in Reversal Frequency

Hypothesis 1: Conditions that actively thwart or satiate one or more of SDT's basic needs will induce a reversal to an alternative meta-motivational state resulting in significantly more reversals than a natural satiation condition

To allow for dependency in reversal frequency within environmental conditions and to examine the extent of between environmental variation in reversal frequency the following multilevel model was run:

$$y_{ij} = \beta_0 + u_j + e_{ij} \tag{3.1}$$

where y_{ij} was reversal frequency [(total n reversals/potential pair reversals)*100] of participant i in condition j, β_0 is the overall mean across environmental conditions, u_j is the effect of condition j on the dependent variable, and e_{ij} is a participant level residual. The condition effects, u_j, are assumed to follow a normal distribution with mean zero and variance σ_u^2.

The overall mean reversal frequency (across conditions) was estimated as 48.58.

The between condition (level 2) variance in reversal frequency was estimated as σ_u^2 = 6.62, and the within environmental condition (level 1) variance was estimated as $\sigma_e^2 = 60.58$. Thus the total variance was 67.20. The variance partition or interclass correlation (VPC/ICC; between group variance (σ_{uo}^2) / Total variance) demonstrates similarity between individuals in the same group. A high VPC implies the between group variance dominates the within group variance, thus most of the differences across participants are stemming from group differences. Conversely a small VPC suggests that the variance in observed response stems from individual differences within groups (level 2 units). The variance partition is .09 indicating that 10% of the variance in reversal frequency can be attributed to differences between environmental conditions, reinforcing the need to continue to model the hierarchical data structure.

Environmental condition differences in reversal frequency. To examine the difference in mean number of reversals between the environmental conditions model 3.2 was run with the natural satiation condition acting as the reference category.

$$\begin{aligned} y_{ij} &= NaturalSatiation + ForcedSatiation + NeedThwarting + e_{ij} \\ y_{ij} &= 42.560(2.560) + 8.166(2.868) + 7.772(2.902) + e_{ij} \\ e_{ij} &\sim N(0, \sigma_e^2)\sigma_e^2 = 57.372(9.839) \end{aligned} \tag{3.2}$$

A one way ANOVA revealed a significant difference in the number of reversals between the environmental conditions ($F_{(2,65)} = 249.72$, $p = .020$; observed power .753); participants in the need satiation and thwarting conditions experienced significantly more reversals than participants in the natural satiation condition (g = -2.87, 95% CI [-3.82, -1.89]; g = -2.69, 95% CI [-3.64, -1.73], respectively). Thus showing support for hypothesis one which was therefore accepted.

Discrete Repeated Measures Multilevel Model: Between Environmental Condition Difference in Reversal Frequency

Hypothesis 2: Conditions that actively thwart one or more of the basic psychological needs will induce a reversal more quickly than conditions that satiate a basic need

A three level model in which trial number was treated as the repetition at level 1 nested within participants (level 2), while participants were nested within environmental conditions (level 3) was utilised to examine the effect of time and group on the frequency of reversals. The model utilises a poisson model examining count data assessing the number of reversals between the pairs of mutually exclusive states between testing blocks; scores between 0 (no reversals) and four (reversed between all four pairs of states) across nine time points were calculated as the dependent variable (y). The first model (3.3) examined the main effect of time:

$$\begin{aligned} y_{ij} &= \beta_0 + \text{Time}_{xi} + e_{ij} \\ y_{ij} &= .417(.078) + .033(.011) + e_{ij} \end{aligned} \tag{3.3}$$

$$[v_{0k}] \sim N(0, \Omega_v) : \Omega_v = .019(.025)$$
$$[u_{0jk}] \sim N(0, \Omega_v) : \Omega_v = .070(.031)$$

Results demonstrate a main effect for time with the number of reversals experienced by participants significantly increasing over time. Significant variation between participants within environmental conditions (u_{0jk}) was also evident, but there was no significant variation in reversal frequency between environmental conditions (v_{0k}). The model was extended to examine the main effect of environmental condition (see 3.4).

$$
\begin{aligned}
y_{ij} &= \beta_0 + \text{Time}_{xi} + \text{Environmental Condition}_{xi} + e_{ij} \\
y_{ij} &= .368(.142) + .033(.011) + .029(.071) + e_{ij}
\end{aligned}
\tag{3.4}
$$

$$[v_{0k}] \sim N(0, \Omega_v) : \Omega_v = .017(.025)$$
$$[u_{0jk}] \sim N(0, \Omega_v) : \Omega_v = .072(.031)$$

Results demonstrate no main effect for environmental condition. Thus, this variable was removed and replaced with a factor examining the interaction between time and environmental condition (see model 3.5).

$$
\begin{aligned}
y_{ij} &= \beta_0 \text{Time}_{xi} + \text{Time*Environmental Condition}_{xi} + e_{ij} \\
y_{ij} &= .417(.078) + .031(.021) + .001(.011) + e_{ij}
\end{aligned}
\tag{3.5}
$$

$$[v_{0k}] \sim N(0, \Omega_v) : \Omega_v = .018(.025)$$
$$[u_{0jk}] \sim N(0, \Omega_v) : \Omega_v = .071(.031)$$

Results demonstrate no significant interaction between time and environmental condition suggesting that the frequency of meta-motivational state reversals over time is consistent across environmental conditions. However, significant variation between participants within environmental conditions (u_{0jk}) was evident. One way ANOVAs revealed nonsignificant differences in reversal frequency at each time point ($p = .090$ to $.950$). On the basis of this, hypothesis two was rejected.

Discrete Multilevel Model: Environmental Condition Differences in Dominant State Occupancy

Hypothesis 3: Conditions that actively thwart a psychological need will be associated with increased time spent in the individual's dominant state compared with conditions that satiate psychological needs

A two level poisson model in which participants (level 1) are nested within envi-

ronmental conditions (level 2) was utilised to examine the duration of time in the participant's dominant state. Data were coded at each time point when the participant's active state, according to the adapted Stroop task, and dominant state, according to the MSP, were aligned. From the coded data the duration of time in the participant's dominant state within the mutually exclusive state pairs was calculated (0 *not at all* to 9 *always*).

Duration of Time in Dominant Meta-motivational State. A null model was executed examining duration of time spent in dominant state for each pair of mutually exclusive meta-motivational states and as a total across the four pairs:

$$y_{ij} = \beta_0 + u_j + e_{ij} \tag{3.6}$$

The model was extended to examine the effect of environmental condition:

$$y_{ij} = \beta_0 + EnvironmentalCondition + u_j + e_{ij} \tag{3.7}$$

And finally with environmental factor as a categorical variable, with the natural satiation condition acting as a reference category:

$$y_{ij} = NaturalSatiation + ForcedSatiation + NeedThwarting + u_j + e_{ij} \tag{3.8}$$

The results of models 3.6, 3.7, and 3.8 are presented in Table 3.3. The second model demonstrates no significant effect of environmental condition on duration of time spent in the participant's dominant state. In the third model, in which an individual term for each environmental condition was created, there was a nonsignificant relationship for participants in the need thwarting environment to spend more time in their dominant state in comparison to participants in a forced or natural satiation condition. The exception to this was the alloic-autic state in which participants in the need thwarting condition spent significantly less time in their dominant state.

Table 3.3: Parameter estimates and standard deviations for model assessing the duration of time spent in dominant state

Model	T-P	C-N	M-S	A-A	Total
Model 1					
β_0	1.626 (.075)	1.606 (.062)	1.662 (.060)	1.628 (.061)	3.020 (.036)
Model 2					
β_0	1.521 (.156)	1.560 (.157)	1.566 (.153)	1.459 (.156)	2.913 (.078)
Env Con	.063 (.086)	.028 (.087)	.058 (.084)	.102 (.085)	.063 (.043)
Model 3					
Natural Satiation	1.520 (.177)	1.520 (.177)	1.665 (.164)	1.883 (.147)	3.045 (.082)
Forced Satiation	.010 (.199)	.034 (.198)	-.063 (.186)	-.281 (.172)	-.086 (.094)
Need Thwarting	.254 (.200)	.180 (.202)	.073 (.190)	-.327 (.181)*	.037 (.096)

T-P = Telic-Paratelic, C-N = Conformist-Negativistic, S-M = Sympathy-Mastery, A-A = Alloic-Autic; Env Con = Environmental Condition; * $p < .05$

A one way ANOVA revealed a significant difference between environmental conditions in time spent in dominant state of the alloic-autic state pair ($F_{(2,49)} = 3.36$, $p = .042$; observed power .783); participants in the natural satiation condition spent significantly more time in their dominant state ($M = 6.57$, SD = 1.51) in relation to the need thwarting condition($M = 4.74$, SD = 1.85, $g = 1.01$, 95% CI [0.23, 1.78]), a similar relationship was evident with the forced satiation condition ($M = 4.96$, SD = 1.51, $g = 1.05$, 95% CI [0.21, 1.82]). On the basis of this, hypothesis three was rejected.

Polynominal Regression: Quadratic Model

Hypothesis 4: Facets of motivational quality will increase as the number of reversals experienced increases

Examination of the GDGR measure demonstrate that item three was weak-moderately correlated with the other sub-scale items (.232 - .314), with its removal improving the internal consistency of the scale from .750 to .913. It is posited that the lack

of consistency in response to the sub-scale items is related to the reversed nature of item 3, as such the item was removed from further analysis. Inspection of the regression diagnostic plots (residual plot and quartile-quartile plot) revealed that the relationships between the facets of motivational quality (interest/enjoyment, task commitment, and dis-engagement) and reversal frequency were non-linear. As such, simple quadratic regression was used to examine if reversal frequency predicted task commitment and dis-engagement after each trial and if reversal frequency throughout the ten trials significantly predicted participants' interest, task commitment and disengagement throughout the ten trials. Regression analyses revealed a statistically significant linear relationship between reversal frequency and task commitment at trial 3 and a significant quadratic relationship between total reversal frequency and task commitment. Results suggest that an increase in reversal frequency at trial three was related to an increase in commitment to the present task. A quadratic relationship was evident between total reversal frequency and task commitment throughout the ten trials, specifically reduced task commitment is associated with a moderate reversal frequency. On the basis of this hypothesis 4 was rejected. Table 3.4 provides a summary of the significant regression analysis.

Table 3.4: Results of quadratic regression analysis assessing the ability of reversal frequency to predict participants' disengagement, task commitment, and enjoyment.

Regression Equation	Overall Regression		Linear Effect		Quadratic Effect	
$y = a_0 + a_1x + a_2x^2 + e$	r^2	p	r^2 change	p	r^2 change	p
Total Re-engagement						
= -139.119 + 27.488 -.819	.075	.132	.002	.768	.073	.048
Re-engagement Trial 3						
= 9.058 - .336 -.128	.098	.037	.094	.012	.003	.620

An exploratory analysis of active meta-motivational state using discrete multilevel models for repeated measures data was also conducted to examine participants' active meta-motivational state throughout the testing session. The results from these analysis can be found in Appendix 5.R.

3.4 Discussion

This study sought to examine the novel proposition that the active thwarting and satiation of an individual's innate psychological needs will induce meta-motivational state reversals thus allowing a broad spectrum of motivations to be experienced, and a mechanism by which balanced satisfaction of an individual's innate psychological needs is achieved. The research aimed to induce frustration and satiation based reversals through the environmental manipulation of need satisfaction utilising previously validated protocols (c.f. Deci et al., 1994; Sheldon & Filak, 2008).

As predicted, conditions that actively thwarted or satiated the basic psychological needs resulted in significantly increased reversal frequency relative to a natural satiation condition. It is posited that the increased reversal frequency associated with the forced satiation and need thwarting conditions provides some initial support for the proposed theoretical framework for understanding meta-motivational state reversals; manipulation of need satisfaction provides a mechanism for the 'when' and 'how' of the reversal process. Specifically, it is thought that need thwarting underpins frustration-based reversals as the active thwarting of a need prevents the satisfaction of the motives associated with the experienced motivational state and identifies that a change in motivational focus is required. In line with Apter's (2013) proposition, the results provide support that satiation based reversals might be induced by the amount of satisfaction experienced by the individual and not necessarily solely due to the passage of time. This is an important finding for reversal theory discourse, as it provides evidence that another form of reversal inducing agent might be present, which has been termed 'plentitude' by Apter, but also "allows us to explain why happiness is so ephemeral" (Apter, 2013, p. 2).

It was hypothesised that frustration based reversals would induce a reversal more quickly than satiation reversals most likely due to the emotions associated with frustration (e.g., anger and disappointment; Barron & Richardson, 1994), however, con-

trary to expectations, no significant difference in the onset of reversal frequency was evident between the three environmental conditions. This might indicate that the thwarting experienced by participants was not severe enough to produce the emotions of anger and disappointment, or that in line with the frustration-aggression model these emotions are not instant, but take time to build (Dollard, Doob, Miller, Mowrer, & Sears, 1939). In addition, the similarity in the onset of reversals might suggest that other factors, such as the novelty of the task, might account for early reversals prior to the development of frustration or satiation. Any attempts to thwart or satiate needs might initially have been disregarded as participants become interested in and familiar with that task, as such the onset of reversals might have been similar.

Despite no environmental condition differences in reversal onset, results did demonstrate a significant increase in reversal frequency over time regardless of environmental condition suggesting that, in line with reversal theory, the likelihood of a reversal increases over time (Apter, 1982). I posit that participants' reversal frequency increases over time to overcome the boredom associated with completing a repetitive task and the restiveness of being confined to the same setting. Reversals between meta-motivational states allow participants to recoup interest through experiencing the task and setting differently, shaped by the alternative ways of interpreting the environment based on the fundamental motives associated with each meta-motivational state. For example, participants might initially experience enjoyment (paratelic state) due to the excitement and interest of completing a novel task. Once the novelty of the task is lost participants might become goal focused (telic-mastery state) attempting to improve on their personal performance to maintain interest. When interest in attaining personal improvements is satiated, participants might change their motivational focus to a rebellious enjoyment in the task (negativistic-paratelic state), an example of which might be trying to find humorous

words in the boggle puzzle.

In contrast to predictions, environmental condition had no significant effect on the likelihood of the dominant meta-motivational state being active, thus providing no support for the proposition that a dominant state might provide some comfort when undergoing a period of need thwarting. In addition, results revealed that participants in the need thwarting condition spent significantly less time in their dominant state than participants in the satiation conditions of the alloic-autic state pair; as such the majority of need thwarting participants were autic state dominant during the testing session. This suggests that the thwarting environment is associated with the individual evaluating the outcome of actions in terms of how they aid themselves as apposed to how they benefit others. The focus on self, as opposed to others, might be an attempt to self improve and protect; evaluating any benefits or positives that can be taken from the current situation and from that able to focus on possible ways to improve or 'frame' the negative situation.

Regression analysis revealed a quadratic relationship between reversal frequency and task commitment, specifically task commitment was reduced when reversal frequency was moderate. Greater task commitment when reversal frequency is low might reflect participants reversing to and maintaining a state that was most appropriate for the task in the early stages of the session, and so, have no need for frequent reversals. In contrast, frequent state reversals might demonstrate that the participant was searching for the most appropriate state for the task, or required a frequent change in state to remain focused due to the repetitive and tedious nature of the task. However, these findings should be taken with caution due to the questionable reliability of the data. It is argued that the accuracy and honesty of response to the GDGR was reduced due to a desire to appear engaged in the task and repeated completion of the GDGR which resulted in participants failing to read items and give thoughtful consideration to their responses.

In summary, the present investigation demonstrated that the active thwarting and satiation of the basic psychological needs resulted in an increased reversal frequency in comparison to a control condition. Evidence of increased reversal frequency as a result of need thwarting/satiation provides initial support for the proposed framework for understanding the reversal process and that satiation based reversals might be induced by the amount of satisfaction experienced by the individual and not necessarily solely due to the passage of time. These are important advancements for reversal theory discourse due to the limited understanding and empirical examination of the reversal inducing agents (Apter, 2013). More broadly, the results of the present investigation suggest that examination of the meaningful concordance between BPNT and reversal theory to aid our understanding of motivation appears promising.

It is important to note several limitations of the present study: first, the sample size was small for the use of multilevel modelling, as such all results should be interpreted with caution. The present study is limited by the low average cluster size (level 2) and so was unable to test random slope variances at the condition level, that is, between condition variances of effects of participant or trial-level variables (Snijders, 2005). However, the use of multilevel modelling and acknowledgement of nesting within the data is a strength of the study. Although the sample size of the study is not sufficient to adequately test hypotheses regarding interpersonal changes in reversal frequency a large variance partition was evident demonstrating that the hierarchical data structure should not be ignored.

A second limitation is the prior lecturer−student relationship participants had with the primary researcher, potentially resulting in biased responses to explicit measures and reduced effectiveness of the environmental manipulation. Participants might have altered responses to explicit measures to conform with how they, as a student, want to be perceived by the teaching assistant/researcher. Attempts to

overcome this limitation were taken through providing anonymity to explicit measures; participants were asked to put their anonymous completed questionnaire pack in a sealed box filled with other packs. The previous perceptions of the primary researcher held by the participants have potential to reduce the effectiveness of the environmental manipulation, for example, participants might believe that they have a good relationship with the researcher, and so, attempts to thwart relatedness might be reduced. However, results demonstrated successful environmental manipulation of the basic psychological needs, and so, this limitation was not considered to be overly pertinent in the current sample.

It is important to note that levels of frustration were not measured in the study but inferred through active need thwarting. Frustration is associated with need thwarting when the need or goal being thwarted is valued by the individual (e.g., Maslow & Murphy, 1954), as such if participants did not value interactions with the researcher, achievement on the BTS, or having choice during the experiment then it is possible they might have reversed for reasons other than frustration. In contrast, it is possible that participants in the natural and forced satiation conditions experienced competing goal frustration, for example, a participant in the autonomy satiation condition might have valued competence at the task, and so become frustrated at consistently average performance feedback despite satisfaction of the need for autonomy, and so reversed through frustration as opposed to need satiation.

The present study does not take into account factors that might affect the ability and likelihood of a meta-motivational state reversal, for example, an individual's reversal lability, resilience, and tolerance will impact their response to manipulation of need satisfaction and their reversal frequency. Significant variation in reversal frequency between participants within environmental conditions was evident suggesting that these factors might have been relevant in the sample tested, however, as participants were randomised to environmental conditions it is expected that

these factors will have been equally spread amongst them; future research might want to measure these confounding variables as a covariate.

Despite these limitations there are a number of strengths of the study, not least the innovative nature of the research. Through drawing upon reversal theory and BPNT the study examines a novel framework for understanding meta-motivational state reversals which, despite being central to reversal theory, currently has limited empirical examination. The study provides some initial support for the framework (see Chapter 1, Section 1.3); satisfaction and thwarting of SDT's basic psychological needs inducing meta-motivational state reversals, which theoretically might contribute to well-being through enabling a balanced satisfaction of needs. This is a vital step in reversal theory research, one which I encourage other reversal theorists to use, critique and develop to further advance our understanding of such a central process of the theory. I propose that progression of this initial research might examine the type of reversals that occur, the purpose of dominant state shifts under need thwarting conditions, and the role of lability and its effects on well-being. Further to this the present research provides further support and confidence for the use of the adapted Stroop task (Thomas et al., 2015) as a measure of meta-motivational state. The present research has demonstrated that the meta-motivational Stroop task is sensitive to meta-motivational state reversals, identifies a pattern of increased change over time which is expected in line with reversal theory (Apter, 1982) and shows a predominant active state that is in line with the context of the experiment.

In conclusion the present study provides initial support for a reversal inducing mechanism, specifically that the active thwarting and satiation of the basic psychological needs may serve to induce frustration and satiation based reversals. From an applied perspective the ability to induce state reversals might have important implications in terms of increasing lability and preventing rigid behaviour patterns. An example of which might include embedding into counselling services aimed at

preventing rigid behaviours such as eating disorders, obsessive-compulsive disorder or burn out. In addition to increasing lability, the ability to prompt a reversal to a state most appropriate to the situation might enhance behavioural engagement and performance in a given task. The ability to induce a reversal to an optimum state might be beneficial in a variety of settings, examples of which include: improving students' learning during lectures through reversals to a telic-conformist state, reducing the anxiety athletes experience in competition through inducing a reversal to a paratelic state or increasing staff productivity through encouraging reversals to a telic state. However the ability to induce state reversals, both in terms of frequency and to a specific state, requires further empirical examination prior to its use in any applied settings.

Chapter 4

Testing a Mechanism for Regulating Balanced Need Satisfaction: The Effect of Actual and Anticipated Need Thwarting on Meta-motivational State Reversals

4.1 Introduction

The contributors to day-to-day happiness and well-being have been widely examined in positive psychology discourse due to the importance of understanding how individuals flourish and grow. Well-being is a broad, multifaceted construct encompassing living a complete human life: the realisation of human potential, defined as eudaimonia (Ryan & Deci, 2002), or the hedonic approach defining well-being as the occurrence of positive affect (e.g., joy, pride and interest) and the absence of negative affect (Kahneman, Diener, & Schwarz, 1999). Initial research concerning individual differences in well-being focused on the relationship between well-being and personality traits including optimism (Sceier & Carver, 1993), agreeableness (DeNeve & Cooper, 1998) and self-esteem (Rosenberg, 1965). However, trait views have since been considered over-simplistic as they are unable to explain why, regardless of who one is, some days are more satisfying than others. A person may perceive situations, emotions and cognitions differently each day, or even during the same day; in this respect our personalities are shifting and inconsistent (Apter, 2003).

Consequently, research has begun to consider fluctuations in well-being relative to one's own baseline in relation to transient situational qualities. The focus of daily fluctuations research was initially on what made a 'bad' day, for example experiencing mood disturbances, anxiety, and stress. In line with expectations, results demonstrated that daily mood and well-being are negatively affected by contextual factors such as unpleasant events, stressors, and daily hassles (e.g., Affleck, Tennen, Urrows, & Higgins, 1994; Rehm, 1978; Rowlison & Felner, 1988).

Sheldon, Ryan, and Reis (1996) extended this field of research by examining 'what makes a good day' and enhances well-being. Guided by self determination theory (SDT; Deci & Ryan, 1985, 2000) it was hypothesised that daily well-being and optimal experience would be a direct function of the satisfaction of the basic psychological needs for autonomy, competence, and relatedness. As predicted, results

demonstrated that within-person daily fluctuations in need satisfaction predicted within-person fluctuations in mood, vitality, physical symptoms, and self-esteem.

In addition to the association between basic need satisfaction and positive mood, results demonstrated that participants experienced greater positive mood and vitality at the weekend in comparison to weekdays. Sheldon et al. (1996) argued, providing some tentative support, that the weekend offers greater opportunity for people to engage in autonomous and competence satisfying activities, thus promoting greater well-being. I posit that of equal importance to the increased need satisfaction provided during the weekend is the opportunity to achieve balanced need satisfaction. Not only can the individual engage in volitional and competence satisfying activities, but the weekend offers greater opportunity to interact with close and significant others, thus satisfying the need for relatedness (Ryan, Bernstein, & Brown, 2010). As such, the weekend offers the opportunity to direct activity towards satisfying any need. It is therefore more likely at the weekend that individuals can achieve both a high level, but also a balance, of satisfaction of all three basic psychological needs.

Subsequent research has similarly demonstrated that within-person fluctuations in need satisfaction predict within-person fluctuations in well-being, but with the important inclusion of the need for relatedness (Reis, Sheldon, Gable, Roscoe, & Ryan, 2000; Ryan et al., 2010). The findings suggest that it is not just that weekends involve more desirable activities (Kennedy-Moore, Greenberg, Newman, & Stone, 1992), but also fewer obligatory, scheduled activities and allow greater opportunity for rewarding social interactions (Reis et al., 2000; Ryan et al., 2010).

Achieving Balanced Need Satisfaction

Balanced need satisfaction has been associated with optimum well-being relative to individuals with a similar overall level of satisfaction but with greater variability (Sheldon & Niemiec, 2006). Grounded within psychological research which has

demonstrated the ill-being associated with internal variability (e.g., unstable self-esteem; Paradise & Kernis, 2002, self-other discrepancies; Campbell, Assanand, & Paula, 2003, and the scarcity hypothesis; Chapman, Ingersoll-Dayton, & Neal, 1994), Sheldon and Niemiec (2006) proposed that "imbalance among the satisfaction of the psychological needs reflects an inappropriate allocations of resources across the different domains of life, which may induce stress and conflicts that ultimately detract from well-being" (p. 332). However, it is currently unclear how an individual can achieve or regulate this balance. Few environments and situations allow the three basic psychological needs to be satisfied simultaneously, and so, in most situations needs cannot all be satisfied at one time. For example, the school environment may provide ample opportunity for a student to satisfy their need for competence and relatedness through achievement in lessons and interactions with their peers. However, the compulsory, structured, and regulated nature of attending school (e.g., set timetable, uniform, and abiding by school rules) may result in deprivation of the need for autonomy. Self determination theorists posit that individuals will be motivated to ensure that all needs can be satisfied over time; thus, individuals must turn their attention to less satisfied needs and, to some extent, unmet needs should have precedence over met needs (Deci & Ryan, 2000), orienting towards achieving balance. Whilst it is believed that individuals will be motivated to satisfy unmet needs, we know little of how individuals 'turn their attention' to unmet needs, nor how they identify and adjust precedence.

Through examining the conceptual links between SDT and reversal theory in Chapter 1, this thesis presents a possible explanation by which balanced need satisfaction may be achieved. Initial evidence (see Chapter 3) shows that need satisfying or thwarting environments induce reversals between meta-motivational states. I argue that the observed reversals between meta-motivational states allow the individual to experience a range of psychological emotions and achieve balanced need

satisfaction.

Despite these initial promising findings, it is still unclear (i) whether the change in meta-motivational state changed subsequent levels of need satisfaction, and (ii) whether a change in meta-motivational state influences levels of need satisfaction over a longer period. This would evidently require a more structured and strategic approach by the individual, considering task selection, optimal duration of engagement in any given activity or context, and monitoring of alternatives as well as future events. To this end, individuals may plan around upcoming events, potentially prioritising needs that they anticipate will be deprived by cultivating satisfying experiences prior to these. An example of such planning may be students approaching exams, and facing an extended period of reduced relatedness satisfaction while revising. To achieve long-term balance students may prioritise relatedness satisfaction through cultivating relatedness-satisfying experiences in anticipation of need deprivation (e.g., a pre revision social) and/or through allocating time to satisfy the prioritised need during the period of need deprivation (e.g., group revision sessions). Fundamental to this theorising is the idea that an experience of need satisfaction has some permanence, either in itself or in its effects, thus the individual is able to in essence 'store' or 'bank' need satisfaction thus increasing resilience to subsequent thwarting.

Storing need satisfaction is not a new concept within SDT or positive psychology research. It has been argued that interactions that satisfy needs separately may provide the same overall level of daily well-being as interactions that satisfy needs simultaneously. Downie, Mageau, and Koestner (2008) argue that providing no need is neglected, or actively thwarted, individual need-satisfying experiences can be stored over the course of a day, allowing the individual to reap the benefits at the end of the day. In the field of positive psychology the Broaden and Build Theory (BABT; Fredrickson, 1998) posits that positive emotions not only make people feel

good at a particular time, but an accumulation of positive emotions can build a store of positive resources that can be drawn on later to improve the odds of successful coping and survival (Fredrickson, 1998, 2001).

Research has demonstrated that people orientate towards environments to try and attain more satisfaction, however we have yet to observe if people alter their environment/behaviour not for the immediate improved well-being, but in anticipation of future deprivation. As such, the first objective of the current study is to examine whether participants prioritise need satisfaction in anticipation of periods of expected need deprivation, building a store of need satisfaction. It is hypothesised that when presented with an anticipated period of need deprivation participants will cultivate activities to satisfy the prioritised need and build a 'store' of need satisfaction. Evidence of storing need satisfaction might be indicated in numerous ways, for example: building a store surpassing that experienced in general or increasing the deprived need to a greater amount that satisfied needs; as such, individuals might seek temporary imbalance by inflating one need to manage a period of future deprivation. Individuals who successfully 'store' need satisfaction should benefit from enhanced well-being in comparison to participants who do not store need satisfaction.

Need Priority and Meta-Motivational State

Previously in this thesis I have presented the argument that satisfying the basic psychological needs will require different motivational foci, due to the unique nature of each need (independent and providing different psychological rewards; Sheldon et al., 1996). I have argued that the eight distinct meta-motivational states, discussed in reversal theory, may contribute to satisfying the higher order needs of autonomy, competence, and relatedness. For example, the reversal theory motive 'fun' whilst in the paratelic state, referring to partaking in an activity for its own sake, may

contribute to satisfaction of the need for autonomy. In contrast the motive for love, whilst in a sympathy state, associated with feelings of sensitivity, tenderness and caring may help satisfy the need for relatedness. As such, a change in need priority would be associated with a change in meta-motivational state, to one that is congruent with the satisfaction of the prioritised need.

It is proposed that the recognition of a need to reverse, to help cultivate activities to satisfy prioritised needs, may prompt a purposeful reversal. This proposal is antagonistic to reversal theory discourse which considers the reversal process to be unconscious; individuals cannot consciously, directly, or voluntarily induce a reversal on demand (Apter, 1982). However, in line with more recent developments in reversal theory, meta-motivational state reversals can be induced indirectly through manipulation of the three reversal inducing mechanisms: waiting for satiation to occur, deliberate use of frustration, and contingent events (e.g., a deliberate change in the environment; see Desselles & Apter, 2013 for a full discussion). Historically, contingent events have been described as a change in situation or physical environment that trigger a reversal for example, experiencing the effect of a drug, tripping during an enjoyable mountain climb, or entering a church. However, Apter (2013) highlights that contingent events should include more than the externally observable changes in the environment. In line with the phenomenological nature of reversal theory, the "situation" should consider how the situation is perceived by the individual, for example, changes in memories, imagination, and what the person attends to. As such, it is argued that the recognition of a need to cultivate a climate or activity to satisfy an unmet need may act as a contingent event, inducing a meta-motivational state reversal. A conscious decision to change focus, and attend to something new, may induce a reversal to a state congruent with satisfying the prioritised need.

Specifically, it is theorised that prioritising the need for autonomy will be associated with the paratelic, negativistic and autic states being active. When an

individual is experiencing an autonomy congruent state they are likely to be focused on *fun* a desire to take part in an activity for its own sake (paratelic), *freedom* to be free from restriction or control (negativistic) or *individuation*, being individual, separate and independent (autic). Individuation pursued in the autic state relates to the need for autonomy when it reflects acting in accordance with one's beliefs and values as opposed to conforming or submitting or even purposefully rebelling against, another or a group's will.

When the need for competence is prioritised it is hypothesised that the individual will reverse to a telic or mastery state, and so satisfying *achievement* and *power* motives. Apter (2001) describes achievement itself, or progress towards achievement, as a motive when in a telic state. The connection between competence and achievement has been highlighted previously, stating that the achievement motive is, to a substantial degree, based on the innate need for competence (Koestner & McCelland, 1990). The motive for power whilst in the mastery state characterised by hardiness and resilience relates more to capability for enduring difficult conditions and recovering quickly from setbacks (e.g., Collins, 1995). An argument can be made that such capabilities reflect a robust or durable sense of competence; hence, pursuit of reversal theory's power motive might function to satisfy competence needs.

Finally, prioritising the need for relatedness is anticipated to result in the conformist, sympathy, or alloic states being active. The conformist state is associated with a motive to *fit in*, adopting group norms and behaviours which assists with the development of relationship bonds. The motive of *transcendence*, whilst in the alloic state, may impact relatedness as the individual is motivated to feel part of, and identify with others. In addition, *love* whilst in the sympathy state, may serve the need for relatedness as the individual is motivated by feelings of sensitivity, tenderness, and caring (see Chapter 1).

As such the second objective of the current study was to examine which meta-

motivational states individuals gravitate towards when attempting to satisfy prioritised needs. Specifically it was hypothesised that:

- paratelic, negativistic and autic states will be active when autonomy deprivation is reported;
- conformist, alloic, and sympathy states will be active when relatedness deprivation is reported;
- telic and mastery states will be active when competence deprivation is reported.

Assessing Need Priority

Assessing need priority may be relatively simple; collecting practical and convenient self-report data. However, the use of self-report data has been associated with several limitations widely discussed in psychology discourse (c.f. Baumeister, Vohs, & Funder, 2007) and in this thesis (see Chapter 2). It has been argued that self-report measures are not always helpful as they require the individual to be aware of or have access to their attitudes and be willing to share this accurately and honestly with the researcher. Factors that drive behaviour can be invisible to the people who perform it. Thus, reports of past or hypothetical causes of behaviour are not always accurate (Nisbett & Wilson, 1977).

Some have therefore argued that the most obvious way to assess what people will or would do, what they think, how they feel, and why they do what they do is to "see how they act" (Furr & Funder, 2007, p. 273); however, the use of behavioural observations is similarly associated with limitations. An individual's feelings may not always match the behaviour they exhibit, for example, when an individual holds two contradictory beliefs at the same time, or is confronted with new information that conflicts with existing beliefs, and so, the individual can not act in a way that

matches both beliefs.

It is posited that a multiple method approach, utilising behavioural assessments and self-reported data, might be beneficial when assessing need priority. Using a combination of assessment techniques is associated with a number of benefits including: overcoming the limitations associated with the methods individually, demonstrating construct validity (Campbell & Fiske, 1959), obtaining richer data, and giving value to self report data. As such, the present study will employ behavioural and self-reported measures of need priority assessed throughout, and on completion of, a free choice period, respectively. The free choice period will be framed as a break to participants to overcome issues associated with participants, being in an artificial setting, responding to potential social desirability cues of being watched, and problems associated with assessing behaviours retrospectively (Henry, Moffitt, Caspi, Langley, & Silva, 1994).

In summary, the objective of the present study is twofold: to examine whether need prioritisation occurs prior to periods of expected need thwarting, and to examine which meta-motivational states are orientated towards when prioritising the satisfaction of different psychological needs. It is hypothesised that:

- when approaching a period of basic psychological need imbalance threatened needs will take priority; individuals will actively cultivate experiences in which to 'store' need satisfaction, thus protecting long term balanced need satisfaction;
- when cultivating experiences to store need satisfaction individuals will reverse to, or maintain, a meta-motivational state congruent with satisfying the prioritised need.

4.2 Method

4.2.1 Participants

Forty-two participants were recruited to take part in the research, thirty-four participants were recruited as part of a first year undergraduate psychology module practical activity, no course credit was received for participation (M age = 22.90 years, SD = 9.79; 28 males, 14 females). Participants were fluent in written and spoken English, which was the first language for 35 of the participants. Following departmental ethical approval all participants provided informed consent prior to the commencement of the study.

4.2.2 Measures

Pre-task Measure

Balanced Measure of Psychological Needs-General (BMPN-G; Sheldon & Hilpert, 2012; see Appendix 5.S) as a baseline measure of need satisfaction in life generally. The 18-item BMPN-G assessed both satisfaction and dissatisfaction of the three basic psychological needs outlined in SDT: autonomy, competence, and relatedness, resulting in three items per sub-scale. A final aggregate score was calculated by subtracting need dissatisfaction from need satisfaction. Each item was rated on a 1 (*Not at all true*) to 5 (*Very true*) point Likert scale. Gagné (2003) reported coefficient alphas of .69, .71 and .86 for the autonomy, competence and relatedness sub-scales, respectively.

Task-based Measures

Balanced Measure of Psychological Needs- Task (BMPN-T; Sheldon & Hilpert, 2012; see Appendix 5.T). The BMPN-G was adapted to assess need satisfaction during

the experimental trial. Balanced need satisfaction was calculated as the sum of absolute differences between the three need aggregate satisfaction scores (Balance = [A-C] + [A-R] + [C-R]).

Free Choice Measures

Adapted Stroop Task (Thomas et al., 2015; see Chapter 2) as a measure of active meta-motivational state. The adapted protocol consisted of 80 stimuli taking approximately 110s to complete. Participants' response time to each stimulus was recorded and average response times per state computed. Participants‘ active state was classified as the state with the shortest response latency in line with the incongruencey effect demonstrated in the development of the measure (see Chapter 2). The average response latencies to autonomy, competence, and relatedness congruent meta-motivational states were calculated with prioritised need satisfaction inferred by shorter response latency. The Stroop task was completed twice during the free choice period: first at the start assessing active state in the initial stage of satisfying prioritised needs and second, at the end assessing active state in the final stages of satisfying prioritised needs, before experiencing further need deprivation.

Participants' response time to each stimulus presented in the adapted Stroop protocol was recorded and average response times per state computed. The average response latency to autonomy, competence, and relatedness congruent meta-motivational states was calculated (e.g., autonomy response latency = [Paratelic latency + Negativistic latency + Autic latency]/3) with prioritised need satisfaction demonstrated by smaller response latency in line with the incongruencey effect demonstrated in the development of the measure (see Chapter 2).

Behavioural Measure of Need Priority. Behavioural assessment of need priority was carried out throughout the free choice period. Initial assessment involved the

primary researcher observing video footage of the break period, and recording the type and duration of activities completed. The primary researcher classified the activity as autonomy, competence, or relatedness focused behaviour in line with a predetermined classification system. Due to the complexity in assessing behaviour, and the ability for activities to satisfy multiple needs, a broad classification system was used. Specifically, activity that was non-task and non-interpersonal was defined as autonomy focused (e.g., exploring their surroundings); competence focused activity was defined as task focused but non-interpersonal (e.g., completing practice tasks); finally, non-task but interpersonal activity was classified as relatedness focused (e.g., using social network sites). Activities that were task-focused, but not relating to the task undertaken in the experimental trial, were classified as both autonomy and competence focused (e.g., writing a to-do list). It is posited that these task-focused activities offered opportunity to satisfy autonomy, participants were acting volitionally to complete activities not assigned during the experimental trial, and, competence, through providing a sense of achievement or progression. See appendix 5.V for a summary of activities and their need focus classification.

When electronic equipment was used responses to an electronic equipment information questionnaire (see Appendix 5.W) were examined to help classify the need focus of the activity. In cases where electronic equipment had been used for multiple need satisfaction, a ratio was calculated to estimate the duration of time spent focused on each need. For example, if the observed time using electronic equipment was 8mins 20s, yet participants reported using electronic equipment for 10 mins split equally towards competence and relatedness-focused activity, a duration of 4mins 10s for both needs would be recorded. Participants failing to report time spent using electronic equipment across multiple needs were omitted from further analysis involving time spent cultivating need satisfying experiences.

Quantitative Measure of Need Priority (QMNP; see Appendix 5.U) was used as an explicit measure of need priority during the free choice period. The QMNP required participants to respond to three items assessing the extent to which they focused on satisfying the three basic psychological needs outlined in SDT (autonomy; 'feeling free from restriction; making choices, or doing what interests me', competence; 'mastering challenges; practicing to improve future performances, or finding things I could do well', and relatedness; 'interacting with others; trying to contact, interact with, or catch up with people I like and who are important to me'). Participants responded to each item on a 10-point Likert scale ranging from 1 (*Completely Disinterested*) to 7 (*Completely Focused On*).

Post-task Measures

Balanced Measure of Psychological Needs-Current (BMPN-C; Sheldon & Hilpert, 2012; see Appendix 5.X) assessed participants' level of need satisfaction after the free choice period. Participants responded to the stem 'Right now I feel' on a 5-point Likert scale (*Not at All True*) to 5 (*Very True*).

Environmental Manipulation

Manipulation of the level of need satisfaction provided by the environment in the experimental trial produced three experimental conditions: autonomy, competence and relatedness deprivation. Each experimental condition provided imbalanced need satisfaction; ample opportunity to satisfy two of the basic psychological needs, but limited opportunity to satisfy the remaining need (see Table 4.1).

The environmental manipulation of need satisfaction followed previously validated protocols for need satisfaction and need thwarting, creating need satisfaction and need deprivation, respectively (c.f. Deci et al., 1994; Sheldon & Filak, 2008). A detailed description of need manipulation techniques is provided overleaf.

Table 4.1: Level of need satisfaction provided in each experimental condition.

Environmental Condition	Autonomy	Competence	Relatedness
Autonomy Deprivation	Deprived	Satisfied	Satisfied
Competence Deprivation	Satisfied	Deprived	Satisfied
Relatedness Deprivation	Satisfied	Satisfied	Deprived

Autonomy Satisfaction. Three contextual factors were manipulated to create an autonomy supportive environment: participants were provided with a meaningful rationale for engaging in the activity, participant's perspective was acknowledged, and autonomy supportive language was used (c.f. Deci et al., 1994). In addition participants were given opportunities to express their internal locus of control throughout the testing session and activity was concordant with their sense of self (e.g., not cheating, deceive other participants, or arguing for a view point in contrast to their own).

Autonomy Depriving. The contextual factors outlined above were similarly manipulated to deprive participants' autonomy; participants were not given a meaningful rationale to engage in the activity, their perspective was not acknowledged, and autonomy thwarting language was used. Activity was not concordant with participants' preference; participants were instructed to complete the non-favoured task. In addition participants were repeatedly reminded of 'rules' regarding engagement, closely observed, completed the task under visible time pressure and in an order dictated by the researcher.

Competence Satisfaction. Competence supporting language was used to create a need-supportive environment. In addition to this, participants were given standardised competence satisfying performance feedback, in the form of verbal feedback

after each experimental trial, thus expressing high levels of task mastery. The level of task difficulty was moderate to ensure that participants were successful, but still challenged by the task.

Competence Depriving. In contrast, competence thwarting language was used to create the competence deprivation condition including standardised competence thwarting performance feedback in the form of verbal feedback expressing low levels of task mastery. The researcher highlighted their negative expectations relating to the participant's ability to master/complete the task and emphasised the role of chance/luck when successful. The tasks completed were of higher difficulty in comparison to other conditions.

Relatedness Satisfaction. Relatedness supporting statements were presented to participants, in both verbal and written instructional sets, prior to and post task engagement. The researcher took time to get to know the participant prior to participation and had regular interactions with the researcher during the experimental trial.

Relatedness Thwarting. In contrast, to deprive the need for relatedness the primary researcher used relatedness thwarting statements when interacting with the participant. The primary researcher appeared disinterested in the participant by being busy with other tasks, leaving the participant waiting with no instruction, dismissive of the individual's concerns and views, and treated participants as interchangeable. Participants were informed that they would complete the task in isolation, and so, left alone for prolonged periods of time.

4.2.3 Procedure

On arrival at the laboratory participants read the participant information sheet (see Appendix 5.Y) explaining the experimental procedure and that the testing session would be audio and video recorded. If willing to participate, participants completed a questionnaire pack consisting of a consent form (see Appendix 5.A), demographic information (see Appendix 5.E), and a baseline measure of need satisfaction (BMPN-G; see Appendix 5.S). Participants were randomly assigned to one of three need deprivation conditions using randomiser software: autonomy ($n = 13$), competence ($n = 16$) and relatedness ($n = 13$), before reading the standardised instruction sheet corresponding to their environmental condition (see Appendix 5.B).

Participants were informed that the testing session would consist of three stages: two experimental trials, one of which was fictitious, separated by a break. Participants were not aware that the purpose of the experimental trial was to create a period of need imbalance, and the purpose of the free choice period was to provide participants an opportunity to satisfy any deprived needs.

Experimental Trial. The experimental trial utilised simple puzzle tasks that can be easily manipulated (maze tasks and Sudoku puzzles). Participants attempted to complete as many puzzles as possible within the 15-minute trial before completing the task-based measures (BMPN-ET and PNTS). Throughout the experimental trial the primary researcher manipulated the environment inline with techniques detailed previously.

Free Choice Period. Participants received a fifteen-minute free choice period which was framed as a mid task break. The free choice period allowed participants the opportunity to 'top up' the deprived need after experiencing one bout of need deprivation, and before experiencing further deprivation. During the fifteen-minute

free choice period participants were informed that during the break they could act volitionally; use their phone and any other equipment left in the laboratory. Participants were then left alone in the laboratory. A variety of items were available to participants during the free choice period to satisfy the prioritised need (e.g., computer, mixed difficulty practice puzzles, help sheets, and white board markers). Participants' active meta-motivational state was assessed during the first five minutes, and on completion, of the free choice period using the adapted Stroop task.

On completion of the testing session participants completed the post task measures. Participants were then given the opportunity to change their environment for the second experimental trial. Each option would help to satisfy one basic psychological need, for example completing their preferred puzzle type as opposed to the assigned puzzle (autonomy), receive three puzzle hints (competence), or working alongside another participant (relatedness). Participants did not carry out this second trial, but instead were thanked and debriefed.

4.2.4 Data Analysis

Preliminary analyses were conducted to assess the distribution of the data and as a manipulation check of the environmental conditions. The first hypothesis is presented in four sections: need priority, cultivating experiences, storing need satisfaction and balanced need satisfaction. A range of analyses are utilised to assess differences between environmental conditions and intra-individual differences. The second primary hypothesis is examined through repeated measures ANOVA's examining differences in response to need congruent state latencies from the Stroop task.

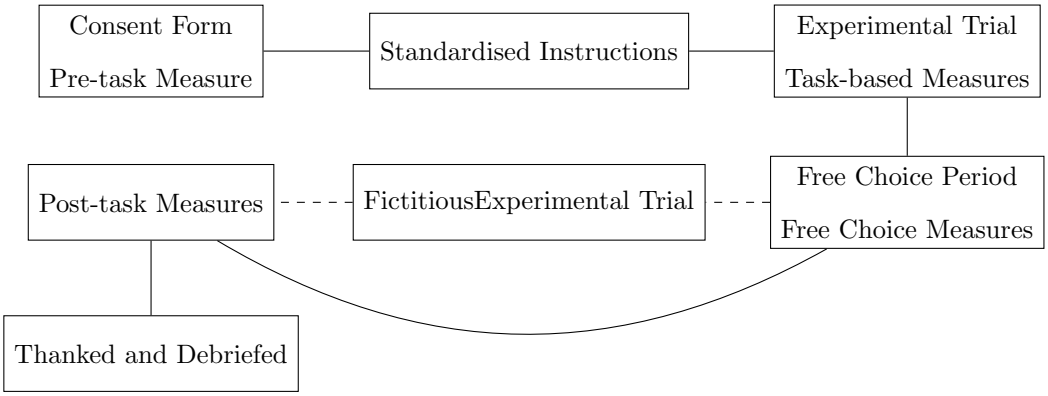

Figure 4.2.4 Flow chart representing the procedure of the testing session (blocked arrows); dashed arrows illustrate the procedure expected by participants.

4.3 Results

4.3.1 Initial Data Screening

As recommended, responses that were too fast (< 300 ms) or too slow (> 1200 ms) on the adapted Stroop task were removed to clear the data set of accidental and explicit responses (Dasgupta, McGhee, Greenwald, & Mahzarin, 2000; Mendoza, Gollwitzer, & Amodio, 2010; Nier, 2005). Data screening revealed acceptable levels of Skewness and Kurtosis (all z scores within 2 to -2 range) for the BMPN-G and the Stroop task when assessing responses from the full data set. Some subscales of the BMPN (task and current) and need congruent state latencies from the Stroop task demonstrated Skewness and/or Kurtosis when assessing responses from environmental conditions independently (see Table 4.2). Two participants appeared as outliers on multiple need congruent latencies, both participants were in the relatedness deprivation condition.

Given the relative novelty of the adapted Stroop task as a measure of meta-motivational state, descriptive statistics were assessed to examine the frequency and response latency of stimuli presented. Data screening of the Stroop task revealed that each stimulus was shown on average 93.54 (SD = 8.69) times throughout the study with an average response latency of 656.34ms (SD

Table 4.2: Descriptive statistics for sub-scales demonstrating extreme levels of Skewness and Kurtosis (z score beyond 2 to -2 range).

Condition and Sub-scale	Mean	SD	Skewness	Kurtosis
Autonomy Deprivation				
Task Relatedness Aggregate	7.08	2.39	-1.99	3.08
Current Autonomy Aggregate	6.15	3.24	-2.13	1.95
Relatedness Deprivation				
Task Balance	11.08	10.97	-2.67	1. 26
Current Relatedness Aggregate	4.92	4.23	-2.54	2.46
Autonomy Congruent Latency	638.75	140.45	2.30	0.90
Relatedness Congruent Latency	138.24	138.24	2.18	1.37

Note. Both the autonomy and relatedness congruent latency sub-scales relate to the second Stroop task assessing active state in the final stages of satisfying prioritised needs.

Randomisation Check

Balanced Measure of Psychological Needs-General. To assess the level of need satisfaction provided in participants' day-to-day lives prior to attending the testing session a one-way ANOVA was conducted. Results demonstrated nonsignificant differences between environmental conditions in need satisfaction, dissatisfaction, and aggregate satisfaction across the three psychological needs (p = .384 - .731; η_p^2 = .016 - 0.48) suggesting that participants' level of need satisfaction prior to attending the session was similar.

4.3.2 Manipulation Check

Balanced Measure of Psychological Needs-Experimental Trial. To assess the overall effectiveness of the environmental manipulation, differences in satisfaction and dissatisfaction of the three psychological needs during the experimental trial (BMPN-ET) were assessed using repeated measures ANOVA's. Results are presented in Table 4.3. Bonferroni post-hoc analyses were performed to determine differences

= 8.69). Nonsignificant differences in response latency between meta-motivational states ($F_{(1,5983)}$ = .208, p = .649) and to stimuli within meta-motivational states were evident (p = .326 to .967).

in need satisfaction during the experimental trial. The results are discussed below with a summary provided in Table 4.4.

Table 4.3: Results from repeated measures ANOVA's assessing differences in satisfaction and dissatisfaction of the psychological needs.

Sub-scale	*df*	*F*	*p*	η_p^2
Autonomy Deprivation				
Satisfaction	2,22	13.16	.000	.545
Dissatisfaction	2,24	26.76	.000	.690
Competence Deprivation				
Satisfaction	2,30	13.77	.000	.479
Dissatisfaction	2,26	31.25	.000	.706
Relatedness Deprivation				
Satisfaction	1.40,24	1.90	.171	.137
Dissatisfaction	2,24	5.60	.010	.318

Autonomy Deprivation Condition. In line with expectations, participants in the autonomy deprivation condition experienced significantly less autonomy satisfaction (M = .633, SD = 2.87) than competence (M = 9.50, SD = 2.58; p = .002, g = -1.12, 95% CI [-1.95, -0.30]) and relatedness satisfaction (M = 10.92, SD = 1.62; p = .001, g = -1.91, 95% CI [-2.83, -0.98]). As expected, participants' experienced similar levels of competence and relatedness satisfaction (p = .653). Supporting the need manipulation, the level of autonomy dissatisfaction (M = 7.92, SD = 2.29) was significantly higher than relatedness dissatisfaction (M = 3.85, SD = 1.14; $p <$ .001, g = 2.18, 95% CI [1.21, 3.15]). However, in contrast to predictions, participants experienced similar levels of autonomy and competence dissatisfaction (M = 8.00, SD = 2.24; p = 1.000, g = 0.03, 95% CI [-0.80, 0.73]), and significantly greater competence than relatedness dissatisfaction ($p <$ .001).

Competence Deprivation Condition. Participants in the competence deprivation condition experienced significantly less competence satisfaction (M = 6.69, SD = 2.65) than autonomy (M = 10.13, SD = 2.96; p = .006, g = -1.19, 95% CI [-1.95,

-0.44]) and relatedness satisfaction (M = 10.87, SD = 2.42; p = .002, g = -1.61, 95% CI [-2.40, -0.81]). As expected, participants experienced similar levels of autonomy and relatedness satisfaction (p = .769, g = -0.26, 95% CI [-0.96, 0.43]).

In line with expectations, participants experienced significantly greater competence dissatisfaction (M = 8.21, SD = 2.49) than autonomy (M = 5.86, SD = 2.25; p = .001, g = 0.97, 95% CI [0.23, 1.70]) and relatedness dissatisfaction (M = 3.93, SD = 1.07; $p < .001$, g = 2.18, 95% CI [1.30, 3.05]). In addition, participants experienced significantly more autonomy dissatisfaction than relatedness dissatisfaction (p = .016, g = 1.07, 95% CI [0.33, 1.81]).

Relatedness Deprivation Condition. Contrary to predictions, participants in the relatedness deprivation condition reported experiencing similar levels of relatedness (M = 3.85, SD = 1.14) and autonomy dissatisfaction (M = 4.85, SD = 1.35; p = .108, g = -0.78, 95% CI [-1.57, 0.02]), and significantly greater competence dissatisfaction (M = 6.08, SD = 3.25, g = -0.89, 95% CI [-1.69, -0.08]) than relatedness dissatisfaction (p = .047).

Table 4.4: Summary of Means and Standard Deviation from the post-hoc analyses.

Sub-scale	Autonomy M(SD)	Competence M(SD)	Relatedness M(SD)
Autonomy Deprivation			
Satisfaction	6.33(2.87)	**9.50**(2.58)	**10.92**(1.62)
Dissatisfaction	**7.92**(2.29)	8.00(2.24)	3.85(1.14)
Competence Deprivation			
Satisfaction	**10.13**(2.96)	6.69(2.65)	**10.87**(2.42)
Dissatisfaction	5.86(2.25)	**8.21**(2.49)	3.93(1.01)
Relatedness Deprivation			
Satisfaction	**11.62**(2.57)	**9.77**(3.11)	10.31(2.46)
Dissatisfaction	4.85(1.35)	6.08(3.25)	**3.85**(1.14)

Note. Within each row, the bolded mean is predicted to be larger than the other means within that row.

The results suggest that the environmental manipulation was successful for the

competence deprivation condition and partially successful for the autonomy deprivation condition; participants reported need satisfaction and dissatisfaction in line with their environmental condition (see Table 4.1). Contrary to expectations, participants in the autonomy deprivation condition experienced similar levels of autonomy and competence dissatisfaction, however this was not considered overly problematic due to the higher levels of competence satisfaction experienced. When assessing aggregate need satisfaction, which accounts for both satisfaction and dissatisfaction, in line with expectations participants experienced significantly lower autonomy aggregate satisfaction (M = -1.67, SD = 3.80) than competence aggregate satisfaction (M = 1.33, SD = 4.10; p = .012, g = -0.73, 95% CI [-1.53, 0.06]). Analysis of the BMPN-ET suggests that environmental manipulation for the relatedness deprivation condition was not successful; satisfaction and dissatisfaction of the three needs were similar across environmental conditions. As such, the relatedness condition was removed from further analysis.

4.3.3 Hypothesis Testing

Hypothesis 1: when approaching a period of basic psychological need imbalance unmet needs will take priority; individuals will actively cultivate experiences in which to 'store' need satisfaction, thus achieving balanced need satisfaction.

Need Priority- QMNP. A mixed measures ANOVA was performed to assess differences in explicit need priority. Results revealed a significant main effect for need priority ($F_{(1.59,42.92)}$ = 8.53; $p < .002$; η_p^2 = .240; observed power .804) and a non-significant need priority x condition interaction ($F_{(1.59,42.92)}$ = .68; p = .478; η_p^2 = .025; observed power .161). Bonferroni post-hoc analysis revealed that regardless

Power analysis revealed that in order for an effect of this size to be detected (80%) as significant at the 5% level, a total sample size of 72 participants would be required

of need deprivation condition participants reported significantly greater autonomy priority (M = 7.34, SD = 1.84) than both competence (M = 4.66, SD = 2.84; p = .004, g = 1.10, 95% CI [0.55, 1.66]) and relatedness priority (M = 4.97, SD = 2.65; $p < .000$, g = 1.02, 95% CI [0.48, 1.57]). A nonsignificant difference in need priority was evident between competence and relatedness (p = 1.00, g = -0.11, 95% CI [-0.63, 0.40]).

Multiple linear regression was performed to assess if need priority during the free choice period (QMNP) predicted current aggregate need satisfaction (BMPN-C). Results demonstrate that need priority predicted a nonsignificant amount of variance in autonomy satisfaction ($F_{(3,41)} = 2.84$; $p = .051$; $R^2 = .183$). The autonomy motive was a near significant predictor of current autonomy satisfaction (p = .058), followed by relatedness ($p = .270$) and competence motives ($p = .498$). Need priority did not predict a significant amount of variance in competence satisfaction ($F_{(3,38)} = .538$; $p = .659$; $R^2 = .041$).

Cultivating Experiences- Behavioural Assessment. To assess participant's need priority during the free choice period behavioural assessment of their activities during the break was conducted. A mixed measures ANOVA revealed a nonsignificant main effect for need activity ($F_{(2,44)} = .434$; $p < .651$; $\eta_p^2 = .019$; observed power .107) and a nonsignificant need activity X condition interaction ($F_{(2,44)} = 1.62$; p = .209; $\eta_p^2 = .069$; observed power .395).

Results provide no support for the hypothesis; after experiencing a period of basic psychological need imbalance, and approaching further imbalanced, no significant differences in time pursuing need congruent activity was evident, however a tendency for participants to spend longer taking part in need congruent activity was evident. However, all participants, irrelevant of need deprivation condition, reported

Power analysis revealed that in order for an effect of this size to be detected (80%) as significant at the 5% level, a total sample size of 410 participants would be required

Power analysis revealed that in order for an effect of this size to be detected (80%) as significant at the 5% level, a total sample size of 70 participants would be required

Table 4.5: Mean duration of time (s) spent pursuing need satisfying experiences.

Condition	Autonomy M(SD)	Competence M(SD)	Relatedness M(SD)
Autonomy Deprivation	**434.40**(284.88)	224.70(253.91)	297.90(317.54)
Competence Deprivation	269.86(202.13)	**350.64**(212.65)	275.07(184.58)

Note. Within each row, the bolded mean is predicted to be larger than the other means within that row.

prioritising the need for autonomy during the free choice period.

Storing Need Satisfaction. To assess if participants attempted to store need satisfaction during the free choice period a repeated measures ANOVA was conducted examining need satisfaction in general (BMPN-G), during the experimental trials (BMPN-ET), and after the free choice period (BMPN-C) for each condition. Results demonstrated a significant effect of time for both the autonomy deprivation ($F_{(2,24)}$ = 30.12; $p < .000$; $\eta_p^2 = .715$) and competence deprivation conditions ($F_{(1.359,30)}$ = 35.91; $p < .000$; $\eta_p^2 = .705$).

Bonferroni post hoc analysis revealed that participants in the autonomy deprivation condition reported significantly greater autonomy satisfaction at baseline (M = 12.38, SD = 1.66) and after the free choice period (M = 11.00, SD = 2.68) than during the experimental trial (M = 6.54, SD = 2.86; $p < .000$, g = 2.42, 95% CI [1.41, 3.43]. g = 1.56, 95% CI [0.68, 2.44], respectively). However, nonsignificant differences between autonomy satisfaction at baseline and after the free choice period were evident ($p = .207$, g = -0.60, 95% CI [-1.39, 0.19]). Significant differences in competence satisfaction were evident between baseline (M = 11.94, SD = 1.93) and both during the experimental trial (M = 6.69, SD = 2.65; $p < .000$, g = 2.21, 95% CI [1.33, 3.09]) and after the free choice period (M = 9.38, SD = 2.06; p = .003, g = 1.25, 95% CI [0.49, 2.01]), and between the experimental trial and after the free choice period ($p = .000$, g = -1.10, 95% CI [-1.85. -0.36]).

Results provide no support for the hypothesis; despite participants actively cultivating experiences in which to satisfy the deprived need, no store of satisfaction over initial levels was accrued. Despite an increase in need satisfaction after the free choice period, the need satisfaction does not surpass that experienced by participants in their lives in general, suggesting that participants did not build a 'store', however they did recoup lost need satisfaction.

Achieving Balanced Need Satisfaction. To assess if the experiences of the free choice period allow participants to regain balanced need satisfaction a mixed measures ANOVA was performed. Results revealed a significant main effect for time ($F_{(1,24)}$ = 41.85; $p < .000$; $\eta_p^2 = .636$; observed power .999) and a non significant time X condition interaction ($F_{(1,24)} = 1.54$; $p < .227$; $\eta_p^2 = .060$; observed power .244). Bonferroni post-hoc analysis revealed significantly greater imbalance after completing the experimental condition ($M = 18.23$, SD = 7.95) than after the free choice period ($M = 9.00$, SD = 5.64; $p < .000$, $g = 1.32$, 95% CI [0.75, 1.88]) regardless of condition.

Results provide support for the hypothesis; irrespective of environmental condition, participants reduced the magnitude of need imbalance, created during the experimental trial, through the activities cultivated during the free choice period.
As such hypothesis one is partially accepted. Whilst no support was found for prioritising unmet needs or building a store of need satisfaction, participants did achieve balanced need satisfaction after experiencing a period of need imbalance.

Hypothesis 2: following a period of need deprivation individuals will reverse to, or

Power analysis revealed that in order for an effect of this size to be detected (80% chance) as significant at the 5% level, a total sample size of 80 participants would be required.

maintain, a meta-motivational state congruent with satisfying the prioritised need.

Table 4.6 presents the results from repeated measures ANOVA's examining differences in response to need congruent state latencies for both the first Stroop task, assessing active state in the initial stage of satisfying prioritised needs, and the second Stroop task, assessing participants' active state in the final stages of satisfying prioritised needs. Results revealed nonsignificant differences in response latency to need congruent state latencies within each environmental condition at both initial and final stages of satisfying need priority.

Table 4.6: Results from repeated measures ANOVA's examining response latencies (ms) to need congruent states.

Condition	*df*	*F*	*p*	η_p^2	Autonomy Latency *M*(SD)	Competence Latency *M*(SD)	RelatednessLatency *M*(SD)
First Stroop Task							
Autonomy Dep	2,24	1.01	.378	.078	**725.64**(79.57)	732.16(55.78)	746.06(72.81)
Competence Dep	2,30	0.58	.569	.037	673.58(87.73)	**661.59**(83.88)	668.28(71.82)
Second Stroop Task							
Autonomy Dep	2,24	1.85	.179	.134	**628.44**(65.76)	574.46(69.79)	583.31(59.75)
Competence Dep	2,30	1.23	.307	.076	658.33(68.71)	**586.78**(65.56)	599.72(81.81)

Note. Within each row, the bolded mean is predicted to be smaller than the other means within that row.

The results provide no support for the hypothesis; after a period of need deprivation participants' active meta-motivational state was not congruent with those proposed to satisfy the prioritised need. However, a trend is evident, during the initial stage of satisfying prioritised needs, for participants' response latencies to be congruent with satisfying the prioritised need. Response latencies in the second Stroop task, assessing participants' active state in the final stages of satisfying prioritised needs, are consistently shorter for competence congruent stimuli.

4.4 Discussion

The purpose of the present research was twofold: first, to examine whether need prioritisation occurs, allowing a store of need satisfaction to be built; and second, to examine which meta-motivational states are selected/orientated towards when prioritising satisfaction of different psychological needs.

Assessment of participants' need priority employed a multiple method approach as it was theorised that collecting both self report and behavioural data would help inform our understanding of participants' need prioritisation. Analysis of the need priority data revealed some incongruence between participants' self-reported need prioritisation and the behavioural assessment of priority. In line with expectations, the behavioural assessment of need priority revealed that participants pursued activities congruent with satisfying the deprived need for a greater duration than the two satisfied needs, however these difference were nonsignificant. Interestingly, the explicit measure of need priority revealed that participants reported significantly greater focus towards prioritising the need for autonomy, regardless of deprivation condition. The greater focus towards autonomy satisfaction is somewhat in line with present literature arguing that the need for autonomy is 'central' and 'particularly relevant' for growth, thriving, need fulfilment and happiness (Chirkov, Ryan, & Sheldon 2010). This may suggest that the needs, outlined in SDT, are not equal in their importance; despite the environment depriving the need for competence, participants were motivated to attain more autonomy during the free choice period.

Caution should be applied when interpreting the measures of need priority individually. As discussed previously, each method is associated with limitations, for example, the difficulties associated with interpreting the purpose of participants' behaviour and the accuracy of self-report data (c.f. Baumeister et al., 2007). It is possible that categorisation of participants' behaviour was not a true representation, while participants may not have responded accurately and honestly to the explicit

measure. An example of this includes participants reluctant to report a competence focus to avoid appearing concerned regarding their performance or to protect their self efficacy associated with self handicapping or impression management techniques (Leary & Kowalski, 1990; McCrae & Hirt, 2001). The discrepancy between the two approaches raises interesting questions regarding future assessment of need priority. Specifically, is one method more accurate at assessing priority, and should we expect convergence when using a multiple method approach?

I believe the inconsistencies and lack of congruence between the two approaches should not be considered as indicative of an unavailing or ineffective method, but a genuine representation of what is a difficult and complex motive to measure. It is possible that some activities might satisfy multiple needs simultaneously; for example, playing a smartphone game may provide a sense of enjoyment and interest, feeling skilled, and interaction with others. Additionally, I argue that a difference in satisfaction potency between activities may be evident; as such a difference in duration to achieve similar satisfaction is possible. For example, communicating with friends regarding social events may be more satisfying than discussing an upcoming work event, similarly the degree to which the activity is internalised may impact the degree of autonomy satisfaction (Vallerand, 1997). Additionally, it is possible that people unconsciously gravitative towards satisfying activities, and so do not enter the activity with the aim to enhance well-being/ happiness. The non-purposeful attempt to attain happiness might be beneficial, as purposeful attempts at achieving happiness are associated with reduced well-being and happiness (Schooler, Ariely, & Loewenstein, 2003). As such, I believe that a multiple method approach, considering the data alongside each other, is favourable allowing for augmented interpretation of need priority; giving meaning to the numbers and precision to the behavioural data.

When examining balance in need satisfaction, results demonstrated that during

the free choice period participants successfully reduced the magnitude of need imbalance created during the experimental trial. However it is unclear how the return in balanced need satisfaction occurred. It is possible that the trend in the need priority and need congruent meta-motivational state data have merit, and the effect of them is a state of more balanced need satisfaction. Contrastingly, it is possible that balance automatically re-establishes itself, suggesting that any effects of need thwarting are short lived. Whilst the cause of regained balance is unclear, the finding provides support to the evolutionary perspective of the basic psychological needs within SDT (Deci & Ryan, 1985) and are consistent with Sheldon and Gunz's (2009) initial research examining the desire to acquire missing experiences. The present research extends Sheldon and Gunz (2009) work in two important ways: utilising behavioural assessments to demonstrate concrete behaviour prioritising the deprived need, as opposed to solely quantitative measures of need focus; and evidencing the 'motives as desires' theorisation in shorter term situations, within an hour experimental testing session.

Taken together research suggests the basic psychological needs within SDT may act as internal motives that direct behaviour towards satisfying a need that is not available in the current environment. Achieving balanced need satisfaction allows the individual to reduce the stress and conflict associated with an inappropriate allocation of resources (Sheldon & Gunz, 2009) and I posit, experience a broad range of motives and resulting emotions which is associated with optimal psychological health and well-being (Apter, 1982; Apter & Carter, 2002). As such, individuals who, consciously or unconsciously, assess current need satisfaction levels and adapt accordingly will be at an advantage to those with similar overall need satisfaction but with greater variability.

The present study posited that achieving balance over the course of the testing session would require a structured and strategic approach: consideration of task

selection duration, and monitoring of alternative tasks and future events to satisfy needs in anticipation of need deprivation, or allocation of need satisfaction during the period of need deprivation. Central to this theorisation was that need satisfaction has some permanence, and so, the individual is able to store need satisfaction either through increasing levels of need satisfaction prior to need deprivation, or through recouping lost need satisfaction after a period of deprivation. However, in the present study participants showed no evidence of storing need satisfaction, but recouped need satisfaction prior to experiencing further deprivation; need satisfaction increased after the free choice period, but did not surpass that experienced by participants in general. It remains unclear if individuals are capable of building a store of need satisfaction in anticipation of need deprivation, or if people can reserve a level of satisfaction when under extreme deprivation. As such, further examination of the storing process is required, both in a laboratory and naturalistic setting in which the opportunity to satisfy needs is greater.

It is plausible that the need deprivation in the laboratory setting was not severe, prolonged, or personal enough, to deprive participants to the extent that a store above their general levels of need satisfaction was required, but a move to stable equilibrium was adequate. It is also feasible that, in line with a homeostasis perspective, individuals will prioritise the deprived need until it is equal to other needs, at which point all needs become equal in priority. In a balanced system with limited time and resources, but multiple needs to satisfy, there would be some risk involved in investing heavily in one need if it led to neglect the others (Sheldon & Gunz, 2009). Finally, the results from the present research may be susceptible to a ceiling effect. Participants reported truncated levels of need satisfaction in their lives in general prior to attending the testing session. Examination of the BMPN-G revealed that on average participants responded to the five point Likert scale with a score of four, and so, it may not have been achievable or necessary to exceed these

levels during the free choice period.

It remains unclear to what extent people have the capabilities to store need satisfaction, either in itself or in its effects. Nevertheless, this is an important area to research due to the benefits that are associated with being able to store need satisfaction (e.g., achieving long term balanced need satisfaction, enhanced well-being, and protection against thwarting and stress; Fredrickson, 1998). An interesting question regarding how individuals store need satisfaction and regulate balanced need satisfaction is the potential for individual differences to moderate the 'needs as motives' effect. As previously discussed by Sheldon and Gunz (2009) individual differences may moderate the 'needs as motives' effects in both their ability to recognise and reduce deficits (e.g., an extroverted individual may be more equipped to make new acquaintances than introverts). I argue that individual differences may also moderate the likelihood of storing need satisfaction, the extent of deprivation experienced prior to 'admitting defeat', and the potency of need satisfying activities. As such, despite SDT's proposition that the three needs are universal, and so do not vary across people (Deci & Ryan, 2000), it is possible that individual differences may affect the recognition of deprived needs, desire to attain need satisfying experiences, and degree of need satisfaction sustained from the activity.

The second purpose of the present research was to examine the novel synthesis of SDT and reversal theory, specifically the ability for meta-motivational state motives to feed into the higher order needs outlined in SDT. Results provided some tentative evidence that when cultivating experiences to store need satisfaction individuals might reverse to, or maintaine, a meta-motivational state congruent with satisfying the prioritised need. During the initial stage of satisfying prioritised needs a trend was evident for participants' response latencies to be congruent with satisfying the prioritised need, thus providing tentative support to the theorised commonalities between SDT's needs and the reversal theory motives. Examination of

meta-motivational state in the final stages of satisfying prioritised needs indicates that, irrelevant of need deprivation condition, participants were in a competence congruent meta-motivational state (telic or mastery). It is possible that participants reversed to a competence focused state towards the end of the free choice period in preparation for the second experimental trial, which would require them to complete more puzzle-based tasks, or that completing the Stroop task on more than one occasion induces a reversal to a competence satisfying motivational state.

The trends in the Stroop data provide preliminary support to the proposition that a conscious decision to change the content of focus may act as a contingent event, inducing a purposeful reversal. Specifically, during the initial stage of need prioritisation the conscious decision to focus on deprived needs induced a reversal to a need congruent state. In the later stages of need prioritisation the awareness of upcoming tasks induced a reversal to a competence congruent state. The ability to indirectly control reversals, through changing the focus of one's attention, and so inducing a contingent event has many benefits. Examples include to the individual themselves who has an element of control over their active meta-motivational state, thus allowing them to reverse to the state they are most comfortable in, that is most appropriate for their current situation, or to satisfy a range of motives and needs. Indirect control, through purposeful changes in focus, may also be helpful to significant others (e.g., coaches, teachers and parents) who may create environments that induce reversals to an appropriate state for the current situation. An example of this may include a coach attempting to get a mischievous athlete to focus while attending training sessions. The coach may discuss set plays and tactics, thus focussing the athlete's attention on the upcoming match, and so, inducing a reversal to a telic-mastery state. However, this interpretation should be taken with caution, as findings did not reach significance and further empirical examination of this novel proposition is required.

Despite these promising findings it is worth noting several limitations of the present research. First, regarding manipulation of need satisfaction, the relatedness condition was not effective at depriving participants' need for relatedness, and so, it is not clear if a similar process is evident when the need for relatedness is deprived. In addition, despite significant differences in the level of need satisfaction and dissatisfaction experienced, it is possible that the level of dissatisfaction was not strong enough. This is evidenced by aggregate satisfaction scores revealing that participants were minimally dissatisfied (autonomy = -1.67 and competence = -1.36). This may be attributable to, and highlights the difficulty in, manipulating the level of need satisfaction provided in the environment, particularly in the present study manipulating multiple needs within the same environment. Future research attempting to create similar need manipulation environments should consider using digital, computerised feedback to increase the validity and credibility of the feedback and minimising the authenticity required by the primary researcher.

Greater consideration of participants' expectations regarding their performance, and opportunity for need satisfaction prior to attending the session should be taken; participants may anticipate and/or be unconcerned about displaying competence at the task, and may assume they will have low autonomy when attending a research session, as such manipulation techniques may be ineffective. As previously discussed, the short-term and single bout of need deprivation may not have been sufficient to truly deprive need satisfaction and warrant a 'store' of need satisfaction to be built. Additionally, an awareness of the length of deprivation may be a limiting factor; participants were aware the session would be an hour in duration, and so, any deprivation experienced would be terminated and participants would be free to satisfy any needs. As such, the deprivation lacked some generalisability to real world deprivation in which an end point is not always anticipated.

Finally, the study does not assess intrapersonal events during the free choice

period (e.g., thoughts, feelings, and memories) which have been shown to affect an individual's need satisfaction, emotional regulation and well-being (Phillippe, Koestner, Beaulieu-Pelletier, Lecours, & Lekes, 2011). It is possible that intrapersonal changes during this time reflect prioritising of deprived needs and help to satisfy needs. For example, reminiscing about a recent family gathering might serve to satisfy the need for relatedness, whilst planning future work schedules may satisfy the need for competence.

Despite these limitations, a number of strengths are evident, not least the innovative nature of the study. Through integrating reversal theory and SDT the study examines a novel framework for understanding meta-motivational state reversals and achieving balanced need satisfaction. The study provides further, albeit tentative, evidence that thwarting of the needs outlined in SDT may induce meta-motivational state reversals as evidenced through a trend for participants to reverse to a state congruent with satisfying the deprived need, thus contributing to well-being through achieving balanced need satisfaction. The study provides evidence supporting autonomy deprivation as a motive for need satisfaction, and so building on the work by Sheldon and Gunz (2009) who found no support for this hypothesis which they attribute to a weakness in their manipulation of autonomy deprivation. To the author's knowledge, this is the first study to examine contingent events as a cognitive change through a switch in focus to prioritise a deprived need, as opposed to solely a situational change, with results providing some initial support to the proposition. Finally, the array of measurement tools used in the present study (implicit, explicit, and behavioural assessment) demonstrates an awareness of measurement issues, and a move in line with the prospective change in psychological research (Tashakkori & Creeswell, 2007; Lopez-Fernandez & Molina-Azorin, 2011; Johnson & Onwuegbuzie, 2004).

In sum, the present study enhances our understanding of reversal theory, self

determination theory, and more broadly of psychological need satisfaction, human behaviour, and motivation. Evidence suggests that prioritising satisfaction of SDT's basic psychological needs might be achieved by purposeful reversals, which contribute to well-being through enabling a balanced satisfaction of needs (Sheldon & Niemiec, 2006) and a diverse emotional experience (Apter, 1982). The preliminary evidence suggesting that contingent events might be purposefully induced through cognitive changes is an important area for reversal theorists to examine. From an applied perspective the ability to induce state reversals, through changes in focus of attention, and regulate balanced satisfaction has implications for educators, coaches and many others to ensure well-being and optimal experience.

Chapter 5

General Discussion

5.1 Overview of the Thesis

The main aim of this thesis was to better understand the dynamics of human motivation, that is, how it varies and shifts between different foci over time. The thesis argues that through greater synthesis of contemporary motivational theories, which are often philosophically aligned yet studied in isolation, we can enhance our understanding of psychological phenomena. The thesis advocated meaningful theoretical concordance between self determination theory (SDT: Deci & Ryan, 1985, 2000) and reversal theory (Apter, 1982) to understand how people switch motivational foci, why and when this might occur, and examine whether these motivational switches enhance well-being.

A novel framework was proposed by which individuals may achieve balanced need satisfaction through acute fluctuations in active meta-motivational states. Active thwarting and satiation of the basic psychological needs outlined in SDT were proposed to induce frustration and satiation based state reversals. Additionally, it was posited that movement between meta-motivational states would help regulate balanced need satisfaction, based on the premise that needs are not always satisfied

at once, but might instead be satisfied over time. To examine these ideas, the first challenge to overcome was to quickly and accurately assess in situ meta-motivational state. As such, the first two studies of the thesis developed and validated an implicit measure of meta-motivational state, allowing subsequent studies to examine changes in active state within need satisfying, thwarting, and imbalanced environments.

The main findings of the thesis were: (1) that an implicit measure of meta-motivational state capable of assessing the full spectrum of states within 90s has utility; (2) need satisfying and thwarting environments can trigger meta-motivational state reversals; (3) people are motivated and able to correct acute imbalance in need satisfaction; (4) contingent reversals may be induced through cognitive as well as situational changes; and (5) examination of the interplay between BPNT and reversal theory to understand dynamic motivation appears promising.

5.2 Main Findings and Theoretical Advancements made by the Thesis

Production of the first implicit measure of meta-motivational state. Evidence was provided to support the use of an implicit measure of active meta-motivational state. An adapted Stroop task, successfully used in previous research assessing motivation and emotion (Ayres & Sonandre, 2002; Williams et al., 1996), revealed a pattern of results in which state-incongruent stimuli exerted an interrupt effect and extended response latency relative to state-congruent stimuli. This effect was similar to the original Stroop effect and subsequent research regarding emotions (Kunde & Mauer, 2008; Stroop, 1935). The development of the adapted Stroop task was an important initial step for advancing reversal theory discourse (see Section 5.3), and for progressing the thesis, allowing examination of changes in active meta-motivational state in response to varied environments.

Understanding of how, when, and why people reverse. The third study enhanced our understanding of satiation and frustration based reversals, an important step in reversal theory due to the lack of depth and clarity regarding these inducing agents. Results demonstrated that actively thwarting and satiating the basic psychological needs increased reversal frequency, thus providing initial support for the proposed theoretical framework for understanding meta-motivational state reversals. However, results provided no support for the propositions that need thwarting would induce state reversals more quickly and increase the time spent in a dominant state, in comparison to forced and natural need satiation.

Framework for regulating balanced need satisfaction. The final study provided experimental evidence suggesting that basic psychological need deficits direct behaviour towards restabalising balance. In addition, some evidence in support of meta-motivational states contributing to fulfilment of the higher order needs outlined in SDT is evident, demonstrated by individuals reversing to, or maintaining, a meta-motivational state theoretically congruent with satisfying the prioritised need. Finally, the study tentatively infers that the Stroop data provides preliminary support for the proposition that a conscious decision to change the content of focus may act as a contingent event, inducing a purposeful reversal.

Taken together, the findings of the studies provide some initial support for the concordance between SDT and reversal theory. Specifically, satiation and thwarting of the basic psychological needs are satiation and frustration reversal inducing agents, and reversal between diametrically opposed meta-motivational state pairs might assist the pursuit of needs balance discussed in SDT. However, the conclusions derived are tentative, drawing upon both significant results and nonsignificant

trends evident across the studies, as such the conclusions should be interpreted with caution.

5.3 Methodological Advancements made by the Thesis

One of the main methodological advancements of the thesis is the development and initial validation of an implicit measure of meta-motivational state. The lack of a meta-motivational state measure, capable of assessing the full spectrum of states, has stunted progress of reversal theory; empirical literature of the reversal process, a key principle of the theory, is lacking (Apter, 2013). The four experimental chapters of the present thesis provide evidence that the adapted Stroop task is a useful measure of active state, as demonstrated through the initial validation analysis (see Chapter 2) and changes in active state in line with theorisations grounded within SDT and reversal theory (see Chapters 3 and 4). However, as highlighted previously (see Chapter 2), some aspects of the processing mechanism behind the measure require further examination: the possibility that processing stimuli may be dependent on active meta-motivational state and that completing the measure may induce a meta-motivational state reversal. Whilst the thesis provides initial validation of the adapted Stroop task, I encourage other reversal theorists to use, critique, and develop the measure to advance our field of enquiry.

Other methodological advancements within the present thesis include the manipulation techniques used to create need satiating, thwarting, and imbalanced environments. The use of standardised, computerised feedback was particularly important for increasing the validity and credibility of the feedback provided through minimising the reliance on the primary researcher. Future research attempting similar experimental manipulations may also consider providing a point of comparison to

overcome the effects of manipulation techniques being diluted by an expectation of involvement when completing a research project. An example of this may include participants not reporting autonomy dissatisfaction as they did not expect to make choices and act volitionally when participating in a research project.

Finally, the thesis used behavioural assessment as part of a multi method approach to measuring need priority, which to the authors knowledge has not been used previously. This resulted in the piloting of a classification system that has potential to be a useful tool when attempting to assess behavioural outcomes of need satisfying and thwarting experimental environments. However, further development of this classification system is required due to the complexities in classifying behaviour, specifically the ability for a single behaviour to satisfy multiple needs or satisfy different needs for different people, and the potential differences in potency between need satisfying behaviours (e.g., interacting with friends might be more satisfying that interacting with work colleagues; see Chapter 4).

5.4 Strengths of the Thesis

The major strength of this thesis is the number of novel areas that were pursued. At the most fundamental level the underlying premise of the thesis is innovative and experimental; using constructs from two complimentary, yet independent theories of dynamic motivation to help aid our understanding of human motivation. The initial theoretical chapter highlights areas of conceptual alignment between the two theories culminating in a proposed mechanism for inducing reversals between meta-motivational states and a framework for regulating balanced need satisfaction. The experimental chapters examining these propositions extend both fields of study and begin to attend to criticism within reversal theory literature regarding the limited empirical examination of a central component of the theory. It is hoped that re-

searchers from both theoretical standpoints will critique, develop, and extend the work conducted.

Crucial to the examination of the novel propositions was the development of a measure of active meta-motivational state. As highlighted previously, the demand for a measure of active meta-motivational state is well documented, as such reversal theorists developed an explicit measure of active state concurrently with the adapted Stroop task (Desselles et al., 2014). As previously discussed, explicit measures are susceptible to a number of limitations (Greenwald et al., 2002) many of which are particularly salient when attempting to measure active meta-motivational state. I argue the use of an implicit measure is favourable when attempting to measure meta-motivational state as implicit measures do not require the individual to be fully conscious of their state (Asendorpf et al., 2002), be aware of the attitude being measured (Brunel et al., 2004), or have control over the measurement outcome (Fazio & Olson, 2003). Additionally, the use of such a quick and novel instrument may reduce the likelihood of a measurement-induced reversal, an issue raised in the development of the Stroop task. This endeavor to be innovative and divergent in terms of measurement development, not for the sake of being creative, but based on theory and suitability, is a strength of the present research.

Other methodological strengths within the thesis include the range of psychological measures (implicit, explicit, behavioural assessments), the variety of need manipulation techniques used including the development of an automated computer package to provide credible feedback, and the numerous methods of priming meta-motivational state reversals (imagery, writing tasks, need manipulation, and change in cognitive focus). It is hoped that the range of techniques and measurement types used has helped to add rigor, richness, and depth to the data collected throughout the thesis (Flick, 2002, 2007).

Furthermore, a strength of the thesis is the focused and progressive nature of the

studies. Driven by our poor understanding of dynamic human motivation the thesis developed a measure of meta-motivational state which allowed the subsequent studies to examine a mechanism of inducing state revisals and finally whether changes in state change levels of need satisfaction. The research conducted was guided by a positivist paradigm; utilising experimental testing to examine predetermined hypothesis. Whilst the positivist approach is associated with numerous strengths: objectivity, reliability, rigor and a structured design, it is noted that external validity is reduced. As such, the associations demonstrated in the laboratory setting might not reflect those in a more complex natural setting in which a larger number of factors act together, thus providing scope for future research. Further to this, the positivist approach is not effective at understanding processes or the significance people attach to actions, as such inferences behind behaviours have been made.

5.5 Limitations of the Thesis

One of the limitations of the work presented is its delimitation in terms of exclusion of other theories of motivation. Throughout the thesis the focus has been on two dynamic theories of motivation: SDT, which is one of the most influential paradigms in mainstream motivational psychology, and reversal theory, a prominent theory in the study of personality, motivation and emotion. The focus on these two theories was purposeful and rooted within their similarities (see Chapter 1, Section 1.3). Importantly, both SDT and reversal theory are influential motivational frameworks in terms of assessing the orientation of an individual's motivation. Under SDT, orientation is discussed through the internalisation of extrinsic motivations and in terms of response to different psychological environments. Reversal theory similarly, assumes that people have eight orientations, four of which may be operative at any one time. Both theories explain dynamic changes in motivational orientation

across a range of contexts, and so, are advantageous over theories that are rooted with a specific context. For example, achievement goal theory postulates that an individuals motivation is changeable (task or ego), but is limited to an achievement setting (Duda & Nicholls, 1992). It was neither the purpose, nor scope of this thesis to present a complete review, nor synthesis of, an extensive range of motivational theories; I offer, and provide initial evidence of one example where synthesis may aid understanding.

A number of methodological limitations are evident in the present body of work that may affect the generalisability and utility of the findings. One major limitation is the assumption that achieving balance and reversing is associated with enhanced well-being and experience of emotions. Neither well-being or emotions were assessed in the final two experimental chapters, and so, enhanced well-being and range of emotions experienced is inferred from the relationship reported in previous literature (Apter, 2001; Sheldon & Niemiec, 2006). In addition, the lack of an intervention or longitudinal examination of the proposed mechanism for inducing reversals and regulating balanced need satisfaction is a limitation. An obvious direction for future research would involve the application of interventions using a true experimental design to identify whether reversals can be prompted/increased in a field setting and the resulting effects this may have on well-being. This study would strengthen the applied recommendations discussed in the subsequent section (see Section 5.7).

The population used in the final two experimental chapters is liable to several limitations: diversity, prior relationships, and size. The samples were restricted in their use of a primarily undergraduate student sample from a part of mid Wales with limited ethnic and racial diversity. Participants also had a previous student-lecturer relationship with the experimenter, potentially resulting in biased responses to explicit measures and reduced effectiveness of the environmental manipulation.

Finally, the recruited sample size in the third experimental chapter was not sufficient to examine the random slope variances at the participant level, that is, between group variances of effects of participant or trial-level variables. However, the sample was adequate to reveal differences in reversal frequency and provided evidence highlighting the importance of acknowledging nesting within the data.

5.6 Ethical Considerations

All studies in this thesis were conducted in line with Aberystwyth University's ethical guidelines; each study was given an ethical rating of 1 according to the statement of research councils. The research conducted was not covert, did not use vulnerable participants or participants under the age of 18, and did not expose participants to conditions different to those experienced in everyday life. The final two experimental chapters used need thwarting manipulation techniques that have been associated with maladaptive behaviours including: the development of compensatory motives, rigid behavioural patterns and controlling regulatory styles (Bartholomew et al., 2011; Deci & Ryan, 2000). However, this was not considered overly problematic as the thwarting experienced was short in duration and participants were fully debriefed on completion of the testing session. Findings suggests that short term exposure to need deprivation might not be detrimental to the individual due to the desire of individuals to regulate need satisfaction in an attempt to achieve balance.

5.7 Applied Recommendations

From an applied perspective, the ability to induce reversals and achieve a balance of need satisfaction may prevent maladaptive behaviours associated with both need thwarting and inhibited reversals. As evidenced in the present research, reversals may be induced by an extrinsic source (e.g., people in supportive roles) manipulat-

ing the environment, or internally through a change in focus of attention, inducing a purposeful reversal. The ability to induce a reversal allows the individual to be in the most appropriate meta-motivational state for the current task or situation, to satisfy a deprived need, or overcome undesired effects associated with inhibited reversals/rigid to behaviour patterns. This has applications in a variety of settings, for example, embedding into counselling services (e.g., cognitive behavioural therapy) aimed at preventing rigid behaviours (e.g., eating disorders) or in an education setting to induce reversals to meta-motivational states associated with adaptive learning motivations. Specifically, the most appropriate meta-motivational state for a student may be dependent on the type of lesson; engagement in topics that require a logical, systematic thought process might be enhanced through being in a telic state, whilst topics that require a creative, expressive and 'in the moment' approach might be more suited to a paratelic state.

An individual's ability to correct acute imbalances in need satisfaction suggests that short term need thwarting/deficits may not be detrimental to well-being and growth providing the opportunity to correct any imbalance is anticipated in the near future. This might have implications for structuring daily/weekly schedules, it may be beneficial to provide a 'free time' element to school days, training courses (e.g., soldier initial training) or work days thus allowing the individual to satisfy any deprived needs. The addition of a free time period may impact not only well-being, but other markers of enjoyment such as adherence and effort.

5.8 Future Directions

Due to the novel nature of the present research, the scope for future research is vast. Presented below are promising areas for future research to focus on.

Measurement of Active State. As previously recognised in this thesis, any attempt at measuring or assessing an individual's meta-motivational state has the potential to induce a reversal. This highlights an inherent problem, not only the adapted Stroop task, but all existing measures of meta-motivational state as administering an assessment itself may act as a contingent event causing a reversal. As such, the hurdle for future research to overcome is the prevention/limitation of a measurement-induced reversal. Continuing the development of an implicit measure of meta-motivational state may be a fruitful line of research in the pursuit of a robust meta-motivational state measure. For example, a Stroop task that is embedded within an experimental task may remove any preparation phase, and so, not allow time to mentally prepare or change the focus of attention, thus limiting the opportunity for a measurement-induced reversal.

Reversal Process, Frequency and Well-being. The scope for research examining reversals and the effect on well-being is vast. Discussed below are a few examples that may widen our understanding of the reversal process, reversal frequency and their effect on well-being. As previously highlighted, one limitation of the present body of work is the lack of an intervention or longitudinal examination of the proposed mechanism for inducing reversals and regulating balanced need satisfaction. Within the thesis two studies examine the proposed mechanism in short term, laboratory based settings, as such the external validity and application of the results is reduced. Future research should identify whether reversals can be triggered in a naturally occurring environment and over a longer time period, and the resulting effects on well-being.

As discussed in the present body of work and inferred in recent reversal theory discourse, reversals may be purposefully induced through a change in cognitive focus (Desselles & Apter, 2013). This is an important mechanism in terms of the propo-

sitions and conclusions drawn from the present research. Further research would require examination of participants focus of attention and active meta-motivational states. A laboratory-based study manipulating changes in focus of attention and examining the resulting active meta-motivational state would be a valuable step; progressing our understanding of purposeful reversals and allowing further examination of the proposed need-motive relationship.

One of the underlying premises of the present thesis is that greater lability of reversals, encompassing all meta-motivational states, is associated with positive affective states and heightened well-being as this satisfies the full range of basic psychological needs. However, the extent to which individuals' lability affects response to the reversal inducing mechanism and ability to purposefully induce reversals is unclear. Future research may examine the effectiveness of the reversal inducing mechanism on reversal frequency and lability in populations who suffer from inhibited reversals or rigid behaviour patterns. Displaying the use of the reversal inducing mechanism in a field setting, over longer durations, and in populations who suffer from rigid behaviour patterns would support embedding the mechanism in schemes and settings that aim to change behaviour and enhance well-being (e.g., counselling services) or achieve optimum experience (e.g., education setting).

Examination of Need Storing. Whilst some initial evidence of need storing was obtained in the final study, it is an important area to continue researching due to the potential benefits associated with being able to store need satisfaction (e.g., achieving long term balanced need satisfaction, enhanced well-being, and protection against thwarting and stress). Future research may examine the potential for need storing in a similar experimental setting, but overcoming the methodological flaws associated with the present research; need deprivation was unlikely to have been severe, prolonged, or personal enough to deprive participants to the extent

that a store of need satisfaction greater than that experienced in their daily lives was required. Additionally, a longitudinal field study may be beneficial, allowing need deprivation to be more prolonged and personal. I posit that when presented with more severe, prolonged or personal need thwarting, individuals will cultivate experiences to satisfy the deprived need and will attempt to build a store which can be drawn on later to achieve long term balance and improve the odds of successful coping (Fredrickson, 1998, 2001).

Individual Differences in Need Satisfaction. Despite SDT's proposition that the three needs are universal, and so do not vary across people (Deci & Ryan, 2000), it is possible that individual differences may affect both the recognition of and desire to satisfy deprived needs (Sheldon & Niemiec, 2006), the degree of need satisfaction sustained from the activity and the likelihood of storing need satisfaction. As such, I propose that future research should examine the role of personality (e.g., openness, conscientiousness, extraversion, agreeableness, neuroticism and narcissism) on the ability to recognise need deprivation, the likelihood of cultivating need satisfying experiences, the amount of need satisfaction sustained from the activity. An example of this may include highly conscientious individuals recognising smaller deprivations in competence satisfaction, being more likely to cultivate a competence satisfying experience and plan around upcoming events to store need satisfaction, than an individual with low levels of conscientiousness.

5.9 Concluding Remarks

The conclusions drawn from the thesis advance the literature from both reversal theory and SDT perspectives. For the first time the process of reversing between meta-motivational states has been empirically examined and a mechanism for in-

ducing satiation, frustration and purposeful contingent reversals has been identified. Furthermore, an implicit measure of active meta-motivational state was developed and validated, facilitating future research examining reversal frequency, lability and purpose. A framework for regulating balanced need satisfaction has been proposed and supported with initial quantitative and behavioural data advancing our understanding of how individuals achieve balanced need satisfaction and subsequent well-being. Findings regarding the process of inducing reversals and achieving balanced need satisfaction have important theoretical and applied implications, crucially preventing maladaptive outcomes associated with both need thwarting and inhibited reversals, and achieving optimum well-being.

In summary, the thesis suggests that the way an individual experiences their environment changes depending on the level of satisfaction provided and the individual's focus of attention. People are adept at recognising deficits in the environment, and are motivated to focus their attention on satisfying aspects that are lacking or have been actively deprived. In line with previous literature, the ability to recognise and reduce deprivation will be associated with enhanced well-being.

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5.A SOMIFA

Instructions

Please answer the following questions about the task completed.
Choose one from each of the following pairs of statements which most closely describes your feelings during this task. (Tick the appropriate box in each case).
Please try to judge in terms of **THE TIME YOU WERE ACTUALLY COMPLETING THE TASK (NOT** how you felt immediately before or after, how you should have felt, how you feel now, or how you usually would have felt).

DURING THE TASK I WANTED TO

1. a. achieve something important to me (e.g., improved skills status) ☐

   b. simply enjoy the fun of participating ☐

2. a. keep to the instructions and expectations of the experimenter ☐

   b. do my own thing whatever the consequences ☐

3. a. to feel superior and confident during the task ☐

   b. be friendly and cooperative during the task ☐

4. a. perform well for myself ☐

   b. perform well for the experimenter ☐

5. From the items you chose above, please choose the 3 which you were most aware of or wanted to do most during the task. (Please write the number and letter).

1. _____

2. _____

3. _____

5.B T/PSI

Below are 12 pairs of words that are opposites. Please circle the number that is located **BETWEEN** each pair of words that best indicates how you were feeling during the task. Please try to judge in terms of **THE TIME YOU WERE ACTUALLY COMPLETING THE TASK (NOT** how you felt immediately before or after, how you should have felt, how you feel now, or how you usually would have felt). For example, if the pair were

Happy 1 2 3 4 5 6 Sad

and you were definitely feeling happy, you would circle the 1;
If you were definitely feeling sad, you would circle the 6;
If you were feeling just a bit sad, you would circle the 4.

1	Feeling playful	1 2 3 4 5 6	Feeling serious-minded
2	Wanting peace and quiet	1 2 3 4 5 6	Wanting adventure
3	Trying to accomplishment something	1 2 3 4 5 6	Just having fun
4	Doing the activity just for the fun of it	1 2 3 4 5 6	Doing the activity because it may affect my future
5	Wanting to feel excitement	1 2 3 4 5 6	Wanting to feel calm
6	Wanting to be serious	1 2 3 4 5 6	Wanting to be playful
7	Concerned about the future effects of my current activity	1 2 3 4 5 6	Not concerned about the future effects of my current activity
8	Wanting to just have fun	1 2 3 4 5 6	Wanting to accomplish something
9	Wanting to feel less aroused	1 2 3 4 5 6	Wanting to feel more aroused
10	Living for the moment	1 2 3 4 5 6	Focusing on the future
11	Feeling serious	1 2 3 4 5 6	Feeling playful
12	Feeling adventurous	1 2 3 4 5 6	Not feeling adventurous
13	Not feeling angry	1 2 3 4 5 6	Feeling Angry
14	Feeling rebellious	1 2 3 4 5 6	Not feeling rebellious
15	Feeling compliant	1 2 3 4 5 6	Feeling defiant
16	Wanting to break rules	1 2 3 4 5 6	Wanting to go along with rules

5.C Participant Information Sheet

Participant Information Sheet

Validation of an adapted Stroop test, developing a task concurrent measure of meta-motivational state.

Researchers from Aberystwyth University are conducting research to develop current motivation literature through the development and validation of a state motivation measure.

What will I have to do if I take part?

In this study you will complete a computer based Stroop test, this requires you to respond to the text colour of words presented on a computer monitor. Following this you will complete two short questionnaires relating to your motivation during the task. The study will require you to attend a one off session lasting a maximum of 15 minutes. You can leave the study or request a break at any time.

Do I have to take part?

No, participation is voluntary. If you decide to take part you are free to withdraw from the experiment at any point, without penalty.

How will the data collected be used?

It is anticipated that the findings of the study will be written up for publication in a peer-reviewed journal and presented at international conferences. All results will be anonymised and it will not be possible to identify individual participants data.

What do I do now?

If you are happy to take part in the experiment inform the principal researcher and a convenient time to complete the study can be arranged.

Contact

Please contact Laura Thomas for further information: Tel:(01970) 621947, lbt1@aber.ac.uk. If you have any questions or would like to participate, please ask the researcher for a consent form.

5.D Consent Form

Informed Consent

Thank you for considering taking part in this research. If you have any questions please ask a member of the research team before you decide whether to take part. You will be given a copy of this Consent Form to keep and refer to at any time. Please confirm:

I am older than 18 years of age	☐
I have read the participant information sheet	☐
I understand what is required of me in this research	☐
I am happy to take part in this research	☐
I understand that my participant is voluntary	☐
I understand I can withdraw at any stage of the project	☐

Participant Name: .....

Participant's Signature: ..... Date: .....

Person Obtaining Consent: .....

Signature: ..... Date: .....

5.E Demographic Information

Name: _____

Age: _____

Gender: Male ☐ Female ☐

E mail: _____

First Language: _____

Date: _____

Are you colour blind? Yes ☐ No ☐

To be completed by the researcher: Participant Number: _____

5.F Participant Information Sheet

Participant Information Sheet

Development and Validation of Stroop Task: Priming Meta-motivational State through an Expressive Writing Task.

Researchers from Aberystwyth University are conducting research to develop current motivation literature through the development and validation of a state motivation measure.

What will I have to do if I take part?

Visit 1 (1 hour)

You will attend the University facilities and provide demographic details, complete a validated personality measure and write for 20 minutes about a recent stressful experience. You will learn about reversal theory (the theory that is being used in the study), specifically the motivational states that are proposed by the theory and on which the current study will focus. You will be required to record you experiences over a two day period, of the different motivational states that you experience.

Visit 2 (1 hour)

You will be asked to discuss your experienced examples of different states to check you understanding of these states. Once happy with you understanding of reversal theory you will take part in an imagery technique used to compliment your learning of the meta-motivational states in reversal theory.

Visit 3 (45 minutes)

You will complete a Stroop task, a short computer based colour naming task. You will then be asked to write for 10 minutes about your stressful event, following specific instructions and using the imagery technique learnt previously. You will then be asked to complete a similar Stroop task and a brief questionnaire. This process will then be followed writing from a second perspective.

Do I have to take part?

No, participation is voluntary. If you decide to take part you are free to withdraw from the experiment at any point, without penalty.

How will the data collected be used?

It is anticipated that the findings of the study will be written up for publication in a peer-reviewed journal and presented at international conferences. All results will be anonymised and it will not be possible to identify individual participants data.

What do I do now?

If you are happy to take part in the experiment inform the principal researcher and a convenient time to complete the study can be arranged.

Contact

Please contact Laura Thomas for further information: Tel:(01970) 621947, lbt1@aber.ac.uk. If you have any questions or would like to participate, please ask the researcher for a consent form.

5.G Writing Task

During today's writing session, your task is to write about your deepest thoughts and feelings about a recent stressful event related to your performance in sport that has happened to you. It could be something you are experiencing right now or experienced not too long ago but must be within the last year. I would like you to write about a topic that is personally relevant to you. In your writing, the most important thing is that you really let go and explore your deepest emotions and thoughts related to this event. You may write about how this experience has affected your view of yourself, others, or of the world in general. You might tie your topic to your relationships with others, including coaches, parents, family, or relatives, or who you are in general as a person. The only rule about the writing task is that you are to write continuously, without stopping, for 20 minutes. Do not worry about spelling, grammar, or sentence structure. All of your writing will be completely confidential and will only be seen by the researchers in the study; if reported in research publications, your writing will remain anonymous. It is important for you to know that your name will not be connected in any way with your writing.

5.H Reversal Theory Information Sheet

Introduction to Reversal Theory

- Reversal Theory is a theory of motivation and personality.
- One of the key proposals of the theory is that at **different times, people experience different states (like frames of mind or ways of seeing things).**
- **These different states come in pairs:**

Serious - Playful
Rebellious - Conforming
Self - Other
Mastery - Sympathy

- **We can only experience one state from each pair at a time and we can switch (or reverse) between states.**
- **It's important to note that none of the states is negative or bad in itself; they are all just different ways of seeing the world, how we feel and what we want to do.**

Serious-Playful States

Serious	**Playful**
When we're in the serious state, we are focused on a goal or an aim. We are trying to achieve something. We are thinking about the future and the consequences of what we're doing. We want what we're currently doing to have a purpose and we see the activity as a means to an end.	When we're in a playful state, we are not focused on a goal or an aim and we're not trying to achieve anything, we only want to enjoy what we're doing at this moment. So we feel very spontaneous and we don't think about the long term consequences of what we're doing. We see activity as a means in itself.
An athlete might be in a serious state when he is focusing on preparation on the morning of a race.	An athlete might be in a playful state when hanging out with friends on a day off training.
Keywords:	Keywords:
Goal, achieve, consequences, future, purpose	**Spontaneous, here and now, enjoyment, fun, arousal**
Think of the Future	Live for Today

Rebellious-Conforming States

Rebellious	**Conforming**
When we're in a rebellious state, we want to rebel against rules and expectations. We want to be free from rules and conventions and see them as restrictive. Instead of wanting to stick with what may be tradition, we want to do things differently, to do things our way. An athlete might be in a rebellious state when she decides not to follow her prescribed training for that day and just do whatever training she wants to. Keywords: **Rebel, freedom, innovative, different, independent** Do it Your Way	When we're in a conforming state, we want to stick to rules and expectations, to say and do what is expected of us. We don't feel comfortable breaking the rules and value tradition. We feel happy to 'do our duty' and want to belong with a group by conforming to group norms. An athlete might be in a conforming state when he is happy to follow the club rules for how athletes should dress and behave on journeys to and from competitions. Keywords: **Conform, rules, tradition, duty, belonging, expectations** Everybody's Doing It

Self-Other States

Self	**Other**
When we are in a self state our focus is on us. We value self-awareness and focus on fulfilling our personal needs. We take personal responsibility for our actions. We are more concerned about ourselves than others. We see ourselves as more important than the group. An athlete might be in a self state when they are focused on making sure that they get a hotel room away from noise and disruption so that they can get a good nights sleep the night before a race. Keywords: **Self, personal needs, personal responsibility, self-awareness** You Owe it to Yourself	When we are in an other state we are focused on other people. We want to help others to satisfy their needs. We see the group as more important than us as individuals. We value giving and being generous to others. An athlete might be in an other state when they are focused on helping a team mate to develop a new technique by giving them extra coaching. Keywords: **Others, group focus, others needs, giving, generosity** The Pleasure of Giving

Mastery-Sympathy

Mastery	**Sympathy**
When we are in a mastery state we are focused on power or ability. We value strength and competence. We see control as important and value toughness and competitiveness. An athlete might be in a mastery state when she is taking part in a tough competition thats pushing her to the limits. Keywords: **Control, competence, toughness, strength, power** Feel the Power	When we are in a sympathy state we see care and compassion as important. We see relationships as important and value personal connections with people, objects and places. An athlete might be in a sympathy state when he spends time with team mates to get to know them outside of training so that the team gets on better. Keywords: **Care, compassion, relationships, support, personal connections** The Joy of Intimacy

- You may have noticed that quite often we experience more than one state at a time (always from different pairs though as remember we can't experience both states in a pair at the same time as they're opposite ways of feeling), for example ...
  - serious and conforming ... we might experience both these states when we're in an examination
  - playful and rebellious ... we might experience both of these states when we're on a night out with friends
- The state combinations that we'll be using in our application of Reversal Theory are:
  - Self-mastery ⇒ (e.g., wanting to feel personally strong)
  - Self-sympathy ⇒ (e.g., wanting to be personally cared for)
  - Other-mastery ⇒ (e.g., wanting to help others to be strong)
  - Other-sympathy ⇒ (e.g., wanting to give others care)

- See if you're able to identify the states being described in the following examples:
  - . . . on the day of a competition you focus completely on your own preparations, you stay in your own hotel away from your family and find a quiet corner in the changing rooms to image yourself playing your game
  - . . . in competition you are playing some great shots and making your opponent work really hard so you are feeling strong and dominating over your opponent
  - . . . focusing on your technique during a training run as you have a competition in a few days time and you want to make sure that you stay injury free as winning the competition is important to you
  - . . . at the end of a training session, having an impromptu game of Frisbee with your team-mates. No-one keeps score as you just want to wind down and have some fun
  - . . . your teammate picks up a slight injury in a training session and afterwards you feel a little sorry for him/her as he/she seems to be unable to shake off this injury problem
  - . . . after a training session, whilst everyone else winds down in the clubhouse, you stay behind to help one of the athletes who is new to the team to work on one of his/her techniques
- Finally, think of times when you've experienced the different states and note your examples below:

Serious state example _____

Playful state example _____

Rebellious state example _____

Conforming state example _____

Self mastery state example _____

Other mastery state example _____

Self sympathy state example _____

Other sympathy state example _____

5.I Guided Imagery Script

Guided Imagery Script

Get as comfortable as you can in your chair, with your notecards and a pen only on your desk. Let your eyes focus comfortably on one spot. You can begin to relax, and as you do, you can close your eyes whenever you feel it is the right time. Focus for a moment on your breathing, being very present, and let your breath be very easy. Allow relaxation to come to all of your stiff muscles, beginning at the top of your head, and to your neck and shoulders. Feel the relaxation, maybe it feels warm, or cool, heavy or light. Feel it go down into your chest and back, stomach and hips. Let it flow down your arms into your hands and fingers. Let it flow down into your legs, feet, and toes. When you are relaxed, your imagination is very powerful, and so we'll be using your imagination today, and it will be fun and easy to do. And though this will take several minutes, your imagination and your creativity is so engaging that you'll have no trouble at all paying attention. And whenever you feel your mind drifting, you know you can always bring it comfortably and easily back to the activity. Hold on to that feeling of relaxation, keep focusing on your breathing, deep and easy. Realise that you can open your eyes and still hold on to that relaxation, but that when you close your eyes, it comes back even more. Go ahead and open your eyes, and keep a hold on the feeling of a comfortable, relaxed body and easy open breathing. Then close your eyes again and feel it even more. So when you are relaxed, with your eyes closed, I'd like you to imagine that you are in a corridor, with 2 doors on either side. Each door has a label, and each label is a reversal theory motivational state, serious and playful.

The first room on your right is labeled Serious. Remember when you've been in the serious state before. Remember the times when you have been goal oriented, thinking about the future, being serious and doing work. As you enter the Serious room, in your imagination, furnish it with things that you associate with the serious state. For example, the serious, or goal oriented room might have a large desk, a project chart on the wall, a book case with reference books, and so on. You need not be restricted to conventional furniture, but include anything that you associate with the serious state. What colour are the walls? What type of flooring is there? Try to think not only of objects, but also of colours, sounds, smells, activities, even people. The aim is that, when you later enter a given room in your imagination, you are so overwhelmed by all the stimuli that you are transported into that state. So be very specific, and don't be afraid to be 'over the top'. This means that if you want to get into one of the motivational states, you can in your imagination walk up the corridor to the room that represents that state and enter into it. In your serious room, you are surrounded by things that make you think seriously about your goals and about the future. When you feel you have a picture of your own personal serious room, you stay relaxed, and keep that image in your mind, but calmly and slowly open your eyes, just for a moment, and write yourself some descriptors of the serious room on one of your notecards. When you are finished, you can close your eyes again, and sit for a moment in your serious room, absorbing the feeling of being surrounded by serious things.

Now, if you are comfortable, I'd like you to leave your serious room and walk across the corridor into the playful room. Remember the times when you've had the experience of being playful, the times when you've been doing things you love so that you were wrapped

up in the experience and forgot about the time. Remember the times when you have just enjoyed life, and been fully present in the moment. As you did earlier, furnish this room with all the things you enjoy, anything that to you seems fun and playful, maybe relaxing things or exciting things, or both. The playful room might have a pool table, a bar, a television set, etc. - for example, the playful room might have various kinds of sports equipment lying around or a hammock hanging. All the things in the room, from the colours to the textures to the objects, should pull you towards enjoyment and being in the moment. When you're in this room you feel full of joy and fun, and want to stay in the moment forever. Continue furnishing your room, and when you feel it is complete, you can again open your eyes, while remaining relaxed, and write on another notecard some reminders of what your playful room is like. Again, when you're finished, you can just sit for a moment, eyes closed, and be absorbed by the atmosphere of your playful room. Now that you have a detailed conceptualisation of your serious and playful rooms, go ahead and leave those two rooms behind.

Now that you've finished furnishing the rooms, step out into your hallway for a final time. Walk very slowly past each door. As you do, you realise you can remember the look, and even more the feeling, of each room you pass.

Now that you have furnished all of these state rooms in your mind, if you want to get into one of the motivational states, you can in your imagination walk up the corridor to the room that represents that state and enter into it. The objects, sounds, colours, furniture, and feel of the room in your imagination will pull you into experiencing that state. So you can confidently stack your reminder notecards together, and begin to focus back on the real world, knowing that your state rooms are never more than a thought away.

5.J Reversal Theory Writing Task

Paratelic Writing Task

During today's writing session, your task is to write for 20 minutes about your very deepest thoughts and feelings about the recent stressful event. I would like you to write about the stressful event you wrote about in our first session. In your writing, the most important thing is that you really let go and explore your very deepest emotions and thoughts related to this event. I would like you to spend the first 10 minutes writing about your event from a serious perspective so use the imagery technique and the cues on your notecard to help you to get into this state by going into your serious room. Do not worry about spelling, grammar, or sentence structure. All of your writing will be completely confidential and will only be seen by the researchers in the study; if reported in research publications, your writing will remain anonymous. It is important for you to know that your name will not be connected in any way with your writing.

I would like you to spend the next 10 minutes writing about your event from a playful perspective so use the imagery technique and the cues on your notecard to help you to get into this state by going into your playful room. Do not worry about spelling, grammar, or sentence structure. All of your writing will be completely confidential and will only be seen by the researchers in the study; if reported in research publications, your writing will remain anonymous. It is important for you to know that your name will not be connected in any way with your writing.

Telic Writing Task

During today's writing session, your task is to write for 20 minutes about your very deepest thoughts and feelings about the recent stressful event. I would like you to write about the stressful event you wrote about in our first session. In your writing, the most important thing is that you really let go and explore your very deepest emotions and thoughts related to this event. I would like you to spend the first 10 minutes writing about your event from a playful perspective so use the imagery technique and the cues on your notecard to help you to get into this state by going into your playful room. Do not worry about spelling, grammar, or sentence structure. All of your writing will be completely confidential and will only be seen by the researchers in the study; if reported in research publications, your writing will remain anonymous. It is important for you to know that your name will not be connected in any way with your writing.

I would like you to spend the next 10 minutes writing about your event from a serous perspective so use the imagery technique and the cues on your notecard to help you to get into this state by going into your serious room. Do not worry about spelling, grammar, or sentence structure. All of your writing will be completely confidential and will only be seen by the researchers in the study; if reported in research publications, your writing will remain anonymous. It is important for you to know that your name will not be connected in any way with your writing.

5.K Motivational Style Profile

These questions ask about you as a person. Decide for each of the following descriptive phrases how far it applies to you. Please respond to each item by circling the appropriate number using the scale provided below. Try not to allow you feeling at this moment to sway you judgement, but make an estimate based on **how you experience things in general**. There are, of course, no right or wrong answers. Please try and be as careful and accurate as possible.

No.	Item	Never	Seldom	Sometimes	Often	Very Often	Always
1	Like to break rules	1	2	3	4	5	6
2	Like to feel powerful	1	2	3	4	5	6
3	Help other people succeed	1	2	3	4	5	6
4	Have fun	1	2	3	4	5	6
5	Welcome attention from others	1	2	3	4	5	6
6	Do things which I consider important	1	2	3	4	5	6
7	Feel rebellious	1	2	3	4	5	6
8	Help others to believe in themselves	1	2	3	4	5	6
9	Attempt to fit in with others	1	2	3	4	5	6
10	Act provocatively	1	2	3	4	5	6
11	Relish competing with others	1	2	3	4	5	6
12	Like to play by the rules	1	2	3	4	5	6
13	Like to be liked	1	2	3	4	5	6
14	Am a good friend	1	2	3	4	5	6
15	Like to be in control of things	1	2	3	4	5	6
16	Help others to achieve things	1	2	3	4	5	6
17	Enjoy myself	1	2	3	4	5	6
18	Worry about whether others like me	1	2	3	4	5	6
19	Work for distant goals	1	2	3	4	5	6
20	Enjoy defying authority	1	2	3	4	5	6
21	Look for responsibility	1	2	3	4	5	6
22	Like to be attractive to others	1	2	3	4	5	6
23	Avoid annoying others	1	2	3	4	5	6
24	Aim to be kind to others	1	2	3	4	5	6
25	Hate to feel unpopular	1	2	3	4	5	6

No.	Item	Never	Seldom	Sometimes	Often	Very Often	Always
26	Give to those in need	1	2	3	4	5	6
27	Plan ahead	1	2	3	4	5	6
28	Look at things in the long term	1	2	3	4	5	6
29	Want to do things that are prohibited	1	2	3	4	5	6
30	Encourage someone else to do better	1	2	3	4	5	6
31	Behave impulsively	1	2	3	4	5	6
32	Act spontaneously	1	2	3	4	5	6
33	Try to avoid "making waves"	1	2	3	4	5	6
34	Ask myself whether I am making progress	1	2	3	4	5	6
35	Try to behave assertively	1	2	3	4	5	6
36	Do what I want to do at that moment	1	2	3	4	5	6
37	Aim to be considerate to others	1	2	3	4	5	6
38	Enjoy giving presents	1	2	3	4	5	6
39	Show belief in someone else's abilities	1	2	3	4	5	6
40	Care what happens to others	1	2	3	4	5	6

5.L Goal Disengagement and Goal Reengagement

Please read each of the following items carefully, thinking about how it relates to you during the task, and then indicate how true it is for you.

No.	Item	Not at all true		Somewhat true		Very true
1	I'm reducing my effort toward the task	1	2	3	4	5
2	I'm seeking out other activities to pass the time	1	2	3	4	5
3	I'm staying committed to the task; I can't let it go	1	2	3	4	5
4	I'm spending mental effort on other things	1	2	3	4	5
6	I'm starting to think about other things	1	2	3	4	5
7	I'm stopping trying to complete the task	1	2	3	4	5
8	I started trying to complete the task	1	2	3	4	5
9	I'm stopping thinking about the task and I'm going to let it go	1	2	3	4	5

5.M Intrinsic Motivation Inventory

For each of the following statements, please indicate how true it is for you, using the following scale:

No.	Item	Not at all true			Somewhat true			Very true
1	I enjoyed doing the task very much	1	2	3	4	5	6	7
2	The task was fun to do	1	2	3	4	5	6	7
3	I thought this was a boring task	1	2	3	4	5	6	7
4	The task did not hold my attention	1	2	3	4	5	6	7
5	I would describe the task as very interesting	1	2	3	4	5	6	7
6	I thought this task was quite enjoyable	1	2	3	4	5	6	7
7	While I was doing the task I was thinking about how much I enjoyed it	1	2	3	4	5	6	7

5.N Basic Psychological Needs Scale-General

Please read each of the following items carefully, thinking about how it relates to you during the study, and then indicate how true it is for you.

No.	Item	Not at all true			Somewhat true			Very true
1	I feel like I am free to decide for myself how to complete the tasks within the study	1	2	3	4	5	6	7
2	I really liked interacting with the researcher during the study	1	2	3	4	5	6	7
3	During the study I did not feel competent	1	2	3	4	5	6	7
4	During the study I felt pressured	1	2	3	4	5	6	7
5	The researcher told me I am good at the task	1	2	3	4	5	6	7
6	I got along with the researcher	1	2	3	4	5	6	7
7	I kept to myself during the study and did not have a lot of social contact	1	2	3	4	5	6	7
8	During the study I felt free to express my ideas and opinions	1	2	3	4	5	6	7
9	I consider the researcher to be friendly	1	2	3	4	5	6	7
10	I felt able to learn during the study	1	2	3	4	5	6	7
11	During the study I had to abide by the researcher's instructions	1	2	3	4	5	6	7
12	I felt the researcher cared about me	1	2	3	4	5	6	7
13	I felt a sense of accomplishment from completing the study	1	2	3	4	5	6	7
14	I felt the researcher took my feelings into consideration	1	2	3	4	5	6	7
15	During the study I had the opportunity to show how capable I am	1	2	3	4	5	6	7
16	During the study I felt close to the researcher	1	2	3	4	5	6	7
17	During the study I felt I could be myself	1	2	3	4	5	6	7
18	I felt the researcher did not like me much	1	2	3	4	5	6	7
19	During the study I did not feel capable	1	2	3	4	5	6	7
20	During the study there was not much opportunity for me to decide for myself how to complete the tasks	1	2	3	4	5	6	7
21	During the study the researcher was friendly to me	1	2	3	4	5	6	7

5.O Psychological Need Thwarting Scale

Please read each of the following items carefully, thinking about how it relates to you during the study, and then indicate how true it is for you. Use the following scale to respond:

No.	Item	Strongly disagree						Strongly agree
1	During the study I felt prevented from making choices with regard to the way I completed the task	1	2	3	4	5	6	7
2	I felt pushed to behave in certain ways	1	2	3	4	5	6	7
3	I felt forced to follow study instructions	1	2	3	4	5	6	7
4	I felt under pressure to agree with the instructions given	1	2	3	4	5	6	7
5	During the study I was made to feel incapable	1	2	3	4	5	6	7
6	During the study there were times when I was told things that made me feel incompetent	1	2	3	4	5	6	7
7	During the study I was made to feel inadequate	1	2	3	4	5	6	7
8	I felt inadequate because I was not given the opportunities to fulfil my potential	1	2	3	4	5	6	7
9	I felt rejected by the researcher	1	2	3	4	5	6	7
10	I felt the researcher was dismissive of me	1	2	3	4	5	6	7
11	I felt the researcher disliked me	1	2	3	4	5	6	7
12	I felt the researcher was envious when I achieved success	1	2	3	4	5	6	7

5.P Participant Information Sheet

Participant Information Sheet

Motivation, cognitive ability and concentration

Researchers from Aberystwyth University are conducting research to enhance understanding of motivation and concentration.

What will I have to do if I take part?

Participation will require you to attend a one-hour session at the Carwyn James building. You will be asked to complete 10 computer based puzzles (Brain Trainer Software) each followed by a Stroop task (responding to the colour of words presented on a computer monitor) and a short questionnaire assessing motivation. On completion of the ten puzzles you will be asked to complete two short questionnaires assessing feelings throughout the session.

Do I have to take part?

No, participation is voluntary. If you decide to take part you are free to withdraw from the experiment at any point, without penalty.

How will the data collected be used?

It is anticipated that the findings of the study will be written up for publication in a peer-reviewed journal and presented at international conferences. All results will be anonymised and it will not be possible to identify individual participants data.

What do I do now?

If you are happy to take part in the experiment inform the principal researcher and a convenient time to complete the study can be arranged.

Contact

Please contact Laura Thomas for further information: Tel:(01970) 621947, lbt1@aber.ac.uk. If you have any questions or would like to participate, please ask the researcher for a consent form.

5.Q Experimental Instructions

Autonomy Satisfaction

Brain Trainer 5.1

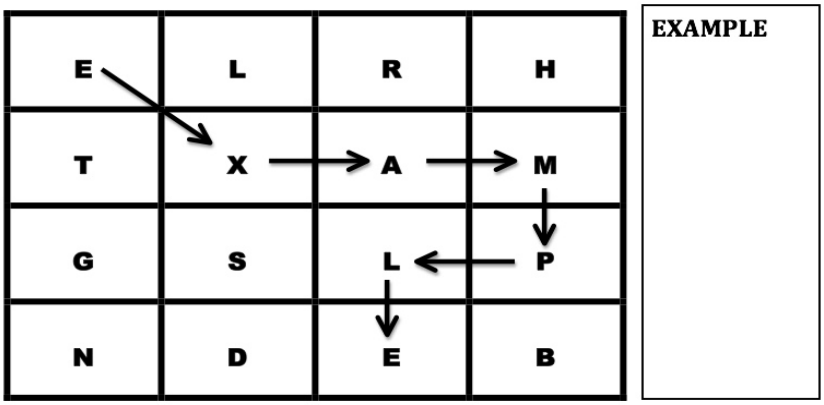
Experiment Instructions

For the purpose of this experiment you are asked to complete a selection of puzzles using the Brain Trainer Software 5.1 (BTS). The BTS assesses and enhances cognitive ability using two types of puzzle (word grids and Sudoku puzzles) which have been shown to improve working memory, concentration, and increase the number of receptors for dopamine-a chemical messenger involved in learning. An explanation of the puzzles is given below.

Word Grid

A word grid is made up of 16 letters, laid out in a 4X4 grid, to complete the word grid you should try to find as many words as possible during the 2 minute time period. When searching for words in the grid try and remember the words should:

- be three letters long,
- have letters in the word are connected horizontally, vertically, or diagonally
- only use a cube once in a word



We appreciate that completing this type of puzzle can become monotonous; you can, if you want, play around with the puzzle and find your own way of completing them to make the task more enjoyable.

Sudoku Puzzle

Each Sudoku puzzle is made up of a 9X9 grid. You should try your best to fill the grid so that each column, row, and sub-grid (3X3) contains all of the digits from 1 to 9 (see below example). Try your best to complete as much as the puzzle as you can in 2 minutes.

5	3			7				
6			1	9	5			
	9	8					6	
8				6				3
4			8		3			1
7				2				6
	6					2	8	
			4	1	9			5
				8			7	9

5	3	***4***	***6***	7	***8***	***9***	***1***	***2***
6	***7***	***2***	1	9	5	***3***	***4***	***8***
1	9	8	***3***	***4***	***2***	***5***	6	***7***
8	***5***	***9***	***7***	6	***1***	***4***	***2***	3
4	***2***	***6***	8	***5***	3	***7***	***9***	1
7	***1***	***3***	***9***	2	***4***	***8***	***5***	6
9	6	***1***	***5***	***3***	***7***	2	8	***4***
2	***8***	***7***	4	1	9	***6***	***3***	5
3	***4***	***5***	***2***	8	***6***	***1***	7	9

Post Task Feedback

After completing each puzzle you will receive personalised feedback regarding your performance and how it fits with that of other people similar to yourself.

Reminder

We appreciate that completing this type of puzzle can become monotonous; you can, if you want, play around with the puzzle and find your own way of completing them to make the task more enjoyable.
We are grateful for your time and patience.

Relatedness Satisfaction

Brain Trainer 5.1

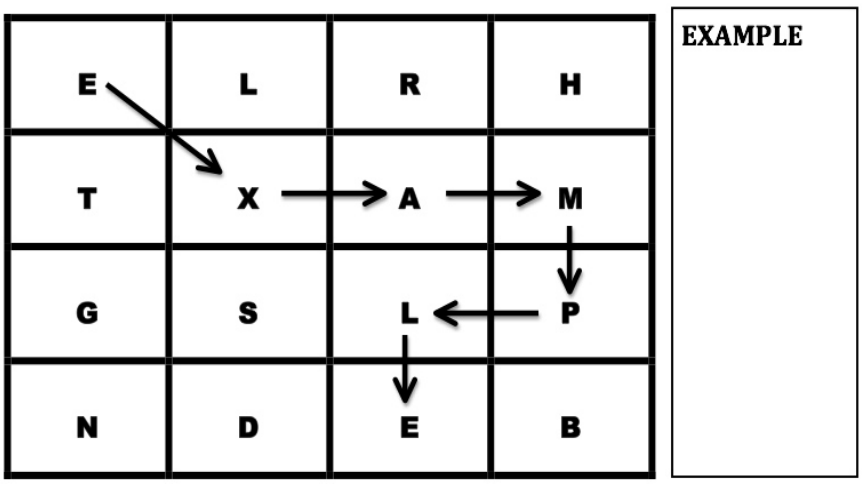
Experiment Instructions

I'm Laura, and I'll be working with you on this experiment today. For the purpose of this experiment you are asked to complete a selection of puzzles using the Brain Trainer 5.1 Software (BTS). BTS assesses and enhances cognitive ability using two types of puzzles (word grids and Sudoku puzzles) which have been shown to improve working memory, concentration, and increase the huber of receptors for dopamine, a chemical messenger involved in learning. An explanation of the puzzles is given below.

Word Grid

A word grid is made up of 16 letters, laid out in a 4X4 grid, to complete the puzzle you are asked to find as many words as possible, in two minutes. When searching for words in the grid try and remember the words should:

- be a minimum of three letters long
- have letters connected wither horizontally, vertically, or diagonally
- use each cube once in a given word.



Everyone is unique in the way they complete word grids, and so it is up to you to play around with the puzzle and find your own way of completing them, find what suits you best!

Please remember we are interested in you as an individual, your learning style and method of completing the word grids and so it would be great if you could discuss with me how you found completing the word grids at the end of the experiment.

Sudoku Puzzle

Each Sudoku puzzle is made up of 9X9 grid. I would like you to try to complete the grid so that each column, row, and sub-grid (3X3) contain all of the digits from 1 to 9. You are asked to complete the puzzle, as fully as possible, in the 2 minutes.

5	3			7				
6			1	9	5			
	9	8					6	
8				6				3
4			8		3			1
7				2				6
	6					2	8	
			4	1	9			5
				8			7	9

5	3	**4**	**6**	7	**8**	**9**	**1**	**2**
6	**7**	**2**	1	9	5	**3**	**4**	**8**
1	9	8	**3**	**4**	**2**	**5**	6	**7**
8	**5**	**9**	**7**	6	**1**	**4**	**2**	3
4	**2**	**6**	8	**5**	3	**7**	**9**	1
7	**1**	**3**	**9**	2	**4**	**8**	**5**	6
9	6	**1**	**5**	**3**	**7**	2	8	**4**
2	**8**	**7**	4	1	9	**6**	**3**	5
3	**4**	**5**	**2**	8	**6**	**1**	7	9

Post Task Feedback

After completing each puzzle you will receive feedback regarding your performance in relation to your demographic population.

Reminder

Everyone is unique in the way they complete word grids, and so it is up to you to play around with the puzzle and find your own way of completing them, find what suits you best!

Please remember we are interested in you as an individual, your learning style and method of completing the word grids and so it would be great if you could discuss with the experimenter how you found completing the word grids at the end of the experiment.

Please feel free to chat with me if you have any queries.

Brain Trainer 4.1

Competence Satisfaction

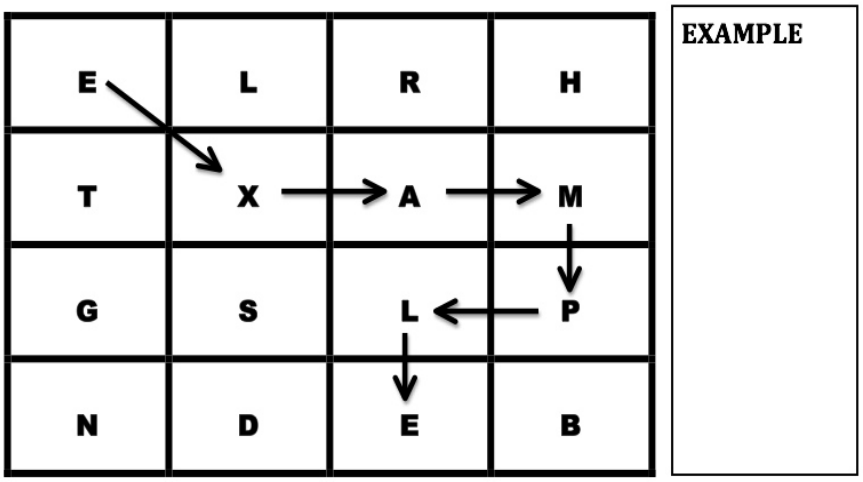
Experiment Instructions

For the purpose of this experiment you are asked to complete a selection of puzzles using the Brain Trainer 4.1 Software (BTS). BTS assesses and enhances cognitive ability using two types of puzzles (word grids and Sudoku puzzles). An explanation of the puzzles is given below.

Word Grid

A word grid is made up of 16 letters, laid out in a 4X4 grid, to complete the puzzle you are asked to find as many words as possible, in two minutes. When searching for words in the grid try and remember the words should:

- be a minimum of three letters long
- have letters connected wither horizontally, vertically, or diagonally
- use each cube once in a given word.



The BTS puzzles are quite challenging. Do the best you can, and I'm sure you'll improve quickly. I have confidence in you!

Sudoku Puzzle

Each Sudoku puzzle is made up of 9X9 grid. You are asked to complete the grid so that each column, row, and sub-grid (3X3) contain all of the digits from 1 to 9. You are asked to complete the puzzle, as fully as possible, in the 2 minutes.

5	3			7				
6			1	9	5			
	9	8					6	
8				6				3
4			8		3			1
7				2				6
	6					2	8	
			4	1	9			5
				8			7	9

5	3	***4***	***6***	7	***8***	***9***	***1***	***2***
6	***7***	***2***	1	9	5	***3***	***4***	***8***
1	9	8	***3***	***4***	***2***	***5***	6	***7***
8	***5***	***9***	***7***	6	***1***	***4***	***2***	3
4	***2***	***6***	8	***5***	3	***7***	***9***	1
7	***1***	***3***	***9***	2	***4***	***8***	***5***	6
9	6	***1***	***5***	***3***	***7***	2	8	***4***
2	***8***	***7***	4	1	9	***6***	***3***	5
3	***4***	***5***	***2***	8	***6***	***1***	7	9

Post Task Feedback

After completing each puzzle you will receive feedback regarding your performance in relation to your demographic population.

Reminder

The BTS puzzles are quite challenging. Do the best you can, and I'm sure you?ll improve quickly.

Brain Trainer 5.1

Control Condition

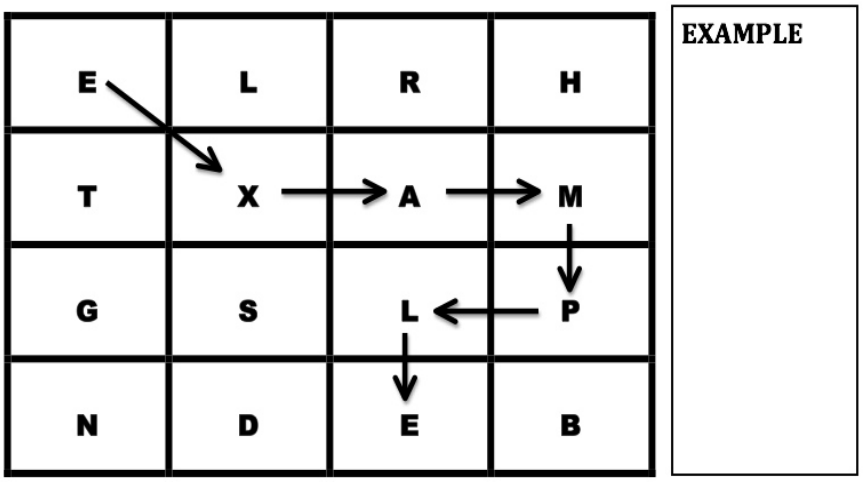
Experiment Instructions

For the purpose of this experiment you are asked to complete a selection of puzzles using the Brain Trainer 5.1 Software (BTS). BTS assesses and enhances cognitive ability using two types of puzzles (word grids and Sudoku puzzles). An explanation of the puzzles is given below.

Word Grid

A word grid is made up of 16 letters, laid out in a 4X4 grid, to complete the puzzle you are asked to find as many words as possible, in two minutes. When searching for words in the grid try and remember the words should:

- be a minimum of three letters long
- have letters connected wither horizontally, vertically, or diagonally
- use each cube once in a given word.



Sudoku Puzzle

Each Sudoku puzzle is made up of 9X9 grid. You are asked to complete the grid so that each column, row, and sub-grid (3X3) contain all of the digits from 1 to 9. You are asked to complete the puzzle, as fully as possible, in the 2 minutes.

5	3			7				
6			1	9	5			
	9	8					6	
8				6				3
4			8		3			1
7				2				6
	6					2	8	
			4	1	9			5
				8			7	9

5	3	**4**	**6**	7	**8**	**9**	**1**	**2**
6	**7**	**2**	1	9	5	**3**	**4**	**8**
1	9	8	**3**	**4**	**2**	**5**	6	**7**
8	**5**	**9**	**7**	6	**1**	**4**	**2**	3
4	**2**	**6**	8	**5**	3	**7**	**9**	1
7	**1**	**3**	**9**	2	**4**	**8**	**5**	6
9	6	**1**	**5**	**3**	**7**	2	8	**4**
2	**8**	**7**	4	1	9	**6**	**3**	5
3	**4**	**5**	**2**	8	**6**	**1**	7	9

Post Task Feedback

After completing each puzzle you will receive feedback regarding your performance in relation to your demographic population.

Reminder

Everyone is unique in the way they complete word grids, and so it is up to you to play around with the puzzle and find your own way of completing them, find what suits you best!

Please remember we are interested in you as an individual, your learning style and method of completing the word grids and so it would be great if you could discuss with the experimenter how you found completing the word grids at the end of the experiment.

Brain Trainer 5.1

Autonomy Thwarting

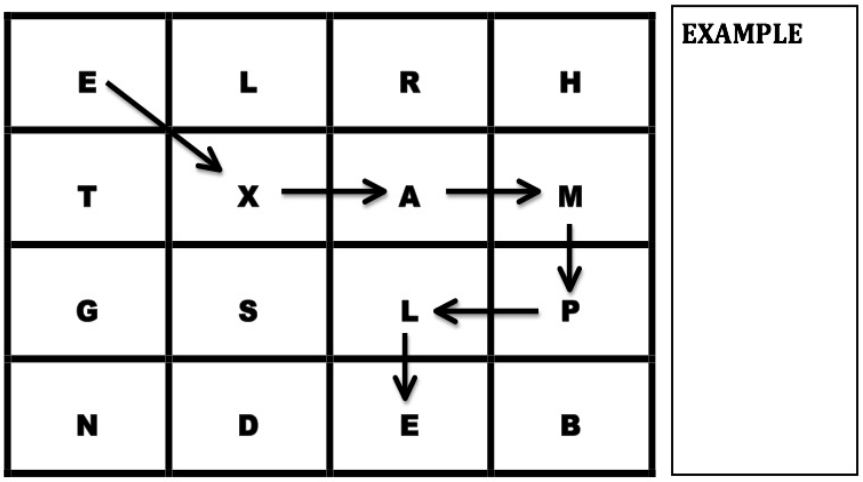
Experiment Instructions

For the purpose of this experiment you must complete a set of assigned puzzles using the Brain Trainer 5.1 Software (BTS). BTS assesses cognitive ability using two types of puzzles (word grids and Sudoku puzzles). An explanation of the rules you must follow, regarding completing the puzzles, is detailed below.

Word Grid

A word grid is made up of 16 letters, laid out in a 4X4 grid, you are required to find as many words as possible, within the **2 minute time limit, abiding by the following rules:**

- **each word must be a minimum of three letters long**
- the letters in the word **must be connected** horizontally, vertically, or diagonally
- each cube **must not be used more than once** in a given word.



It is important you follow the instructions during the experiment to achieve experimental control.

Please keep your opinions/observations regarding the experiment to yourself during the testing blocks. Do not ask questions; continue if you are unsure.

Sudoku Puzzle

Each Sudoku puzzle is made up of a 9X9 grid. You must fill the grid so that each column, row, and sub-grid (3X3) contain all of the digits from 1 to 9. You must complete the puzzle, as fully as possible, in the **2 minute time limit.**

5	3			7				
6			1	9	5			
	9	8					6	
8				6				3
4			8		3			1
7				2				6
	6					2	8	
			4	1	9			5
				8			7	9

5	3	***4***	***6***	7	***8***	***9***	***1***	***2***
6	***7***	***2***	1	9	5	***3***	***4***	***8***
1	9	8	***3***	***4***	***2***	***5***	6	***7***
8	***5***	***9***	***7***	6	***1***	***4***	***2***	3
4	***2***	***6***	8	***5***	3	***7***	***9***	1
7	***1***	***3***	***9***	2	***4***	***8***	***5***	6
9	6	***1***	***5***	***3***	***7***	2	8	***4***
2	***8***	***7***	4	1	9	***6***	***3***	5
3	***4***	***5***	***2***	8	***6***	***1***	7	9

Post Task Feedback

After completing each puzzle you will receive feedback regarding your performance in relation to a demographic population.

Reminder

It is important you follow the instructions during the task to achieve experimental control, you have no choice regarding this.

Please keep your opinions/observations regarding the experiment to yourself during the testing blocks. Do not ask questions; continue if you are unsure.

Brain Trainer 5.1

Relatedness Thwarting

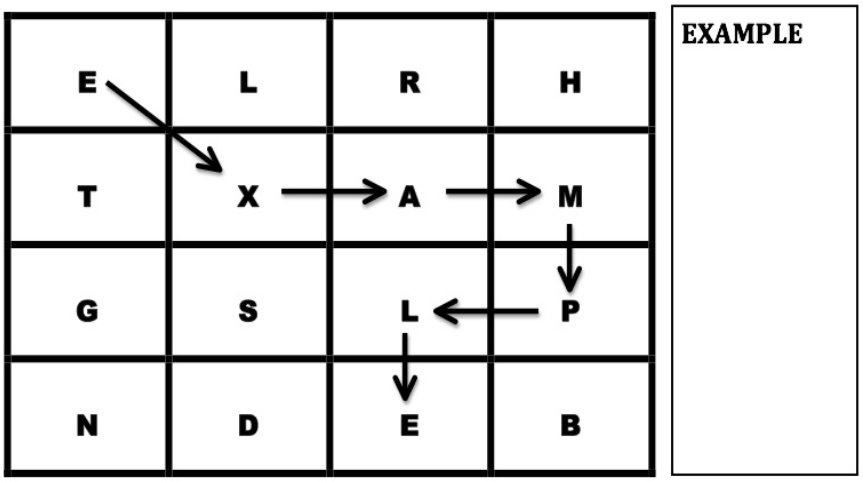
Experiment Instructions

For the purpose of this experiment you are asked to complete a selection of puzzles using the Brain Trainer Software 5.1 (BTS). The BTS assesses and enhances cognitive ability using two types of puzzles (word grids and Sudoku puzzles). An explanation of the puzzles is given below.

Word Grid

A word grid is made up of 16 letters, laid out in a 4X4 grid, to complete the puzzle you are asked to find as many words as possible, in two minutes. When searching for words in the grid try and remember the words should:

- be a minimum of three letters long
- have letters connected wither horizontally, vertically, or diagonally
- use each cube once in a given word.



Throughout the experiment be aware we are not interested in how different individuals might try to complete the word grid, we just need your data, so please keep your opinions/observations regarding the experiment to yourself during the testing blocks.

Sudoku Puzzle

Each Sudoku puzzle is made up of 9X9 grid. You are asked to complete the grid so that each column, row, and sub-grid (3X3) contain all of the digits from 1 to 9. You are asked to complete the puzzle, as fully as possible, in the 2 minutes.

5	3			7				
6			1	9	5			
	9	8					6	
8				6				3
4			8		3			1
7				2				6
	6					2	8	
			4	1	9			5
				8			7	9

5	3	**4**	**6**	7	**8**	**9**	**1**	**2**
6	**7**	**2**	1	9	5	**3**	**4**	**8**
1	9	8	**3**	**4**	**2**	**5**	6	**7**
8	**5**	**9**	**7**	6	**1**	**4**	**2**	3
4	**2**	**6**	8	**5**	3	**7**	**9**	1
7	**1**	**3**	**9**	2	**4**	**8**	**5**	6
9	6	**1**	**5**	**3**	**7**	2	8	**4**
2	**8**	**7**	4	1	9	**6**	**3**	5
3	**4**	**5**	**2**	8	**6**	**1**	7	9

Post Task Feedback

After completing each puzzle you will receive feedback regarding your performance in relation to your demographic population.

Reminder

Throughout the experiment be aware we are not interested in how different individuals might try to complete the word grid, we just need your data, so please keep you opinions/observations regarding the experiment to yourself during the testing blocks.

Do not talk to the experimenter outside of the study protocol.

Brain Trainer 3.1

Competence Thwarting

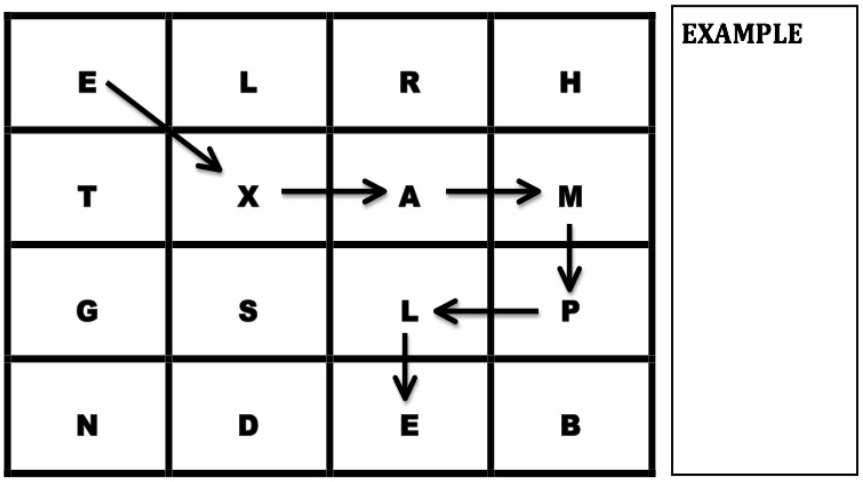
Experiment Instructions

For the purpose of this experiment you are asked to complete a selection of puzzles using the Brain Trainer 3.1 Software (BTS). BTS assesses and enhances cognitive ability using two types of puzzles (word grids and Sudoku puzzles). An explanation of the puzzles is given below.

Word Grid

A word grid is made up of 16 letters, laid out in a 4X4 grid, to complete the puzzle you are asked to find as many words as possible, in two minutes. When searching for words in the grid try and remember the words should:

- be a minimum of three letters long
- have letters connected wither horizontally, vertically, or diagonally
- use each cube once in a given word.



Keep in mind that the puzzles in the BTS are quite difficult. Beginners, like yourself, do not find very many words, but do the best you can; maybe you will be lucky.

Sudoku Puzzle

Each Sudoku puzzle is made up of 9X9 grid. You are asked to complete the grid so that each column, row, and sub-grid (3X3) contain all of the digits from 1 to 9. You are asked to complete the puzzle, as fully as possible, in the 2 minutes.

5	3			7				
6			1	9	5			
	9	8					6	
8				6				3
4			8		3			1
7				2				6
	6					2	8	
			4	1	9			5
				8			7	9

5	3	***4***	***6***	7	***8***	***9***	***1***	***2***
6	***7***	***2***	1	9	5	***3***	***4***	***8***
1	9	8	***3***	***4***	***2***	***5***	6	***7***
8	***5***	***9***	***7***	6	***1***	***4***	***2***	3
4	***2***	***6***	8	***5***	3	***7***	***9***	1
7	***1***	***3***	***9***	2	***4***	***8***	***5***	6
9	6	***1***	***5***	***3***	***7***	2	8	***4***
2	***8***	***7***	4	1	9	***6***	***3***	5
3	***4***	***5***	***2***	8	***6***	***1***	7	9

Post Task Feedback

After completing each puzzle you will receive feedback regarding your performance in relation to your demographic population.

Reminder

The puzzles in the BTS are quite difficult. Beginners, like yourself, do not find very many words, but do the best you can; maybe you will be lucky.

We do not expect someone like you, at your level, to succeed

5.R Exploratory Analysis of Active Meta-motivational State

Exploratory analysis of active meta-motivational state: Discrete Multilevel models for Repeated Measures Data

A three level model of binomial responses in which trial number was the repetition at level 1 (k) nested within participants (i), nested within environmental conditions (j) was utilised to examine active meta-motivational state. Four separate models were created in line with the pairs of meta-motivational states. Data were coded to represent the participant's state during each trial according to the Stroop task; the telic, conformist, sympathy, and alloic states were coded 0, whilst the paratelic, negativistic, mastery, and autic states were coded 1. The model for the probability of a 1 response Π_{kij}.

The null model:

$$\begin{aligned} y_{ijk} &\sim Binominal(denom_{ijk}, \Pi_{ijk}) \\ Logit(\Pi_{ijk}) &= \beta_{0jk} cons \\ \beta_{ojk} &= \beta_o + v_{ok} + u_{ok} \\ \\ [v_{ok}] \sim N(0, \Omega_v) : \Omega_v &= [\sigma^2_{vo}] \\ [u_{ok}] \sim N(0, \Omega_v) : \Omega_v &= [\sigma^2_{uo}] \\ \\ Var(Telic/Paratelic_{ijk}|\Pi_{ijk}) &=_{ijk} (1 - \Pi_{ijk})/denom_{ijk} \end{aligned} \tag{5.1}$$

The model was extended to examine the main effect of time (see 5.2)

$$\begin{aligned} y_{ijk} &\sim Binominal(denom_{ijk}, \Pi_{ijk}) \\ Logit(\Pi_{ijk}) &= \beta_{0jk} cons + \text{Time} \\ \beta_{ojk} &= \beta_o + v_{ok} + u_{ok} \\ \\ [v_{ok}] \sim N(0, \Omega_v) : \Omega_v &= [\sigma^2_{vo}] \\ [u_{ok}] \sim N(0, \Omega_v) : \Omega_v &= [\sigma^2_{uo}] \\ \\ Var(Telic/Paratelic_{ijk}|\Pi_{ijk}) &=_{ijk} (1 - \Pi_{ijk})/denom_{ijk} \end{aligned} \tag{5.2}$$

The null model probability scale suggests that telic, conformist, mastery and alloic states were predominantly active throughout the testing session (53.5%, 51.1%, 50.1% and 52.5%, respectively). No group differences in active state or variation between participants within environmental conditions were evident, with one exception; significant variation between participants within environmental conditions (u_{ok}) was revealed in the telic-paratelic state pair. The second model, in which time was added as an exploratory factor, revealed a nonsignificant trend for participants to occupy a mastery state over time.

Table 5.1: Parameter estimates and standard deviations for the model assessing participants' active meta-motivational state

Model	T-P	C-N	M-S	A-A
Null Model				
β_{0jk}	-.139 (.099)	-.043 (.079)	.006 (.081)	-.098 (.082)
p	.080	.344	.471	.116
σ^2_{vo}	.000 (.000)	.000 (.000)	.000 (.000)	.000 (.000)
σ^2_{uo}	.238 (.115)	.003 (.072)	.022 (.075)	.036 (.078)
Probability	.465	.489	.501	.475
Time				
β_{0jk}	-.043 (.179)	-.080 (.167)	.203 (.169)	.152 (.169)
p	.405	.316	.115	.184
Time	-.018 (.028)	-.023 (.027)	-.037 (.028)	.152 (.169)
p	.260	.197	.093	.184
σ^2_{vo}	.000 (.000)	.000 (.000)	.000 (.000)	.000 (.000)
σ^2_{uo}	.242 (.117)	.003 (.072)	.024 (.076)	.036 (.078)
Probability	.489	.480	.551	.538

Probability = eβ_{0jk} / (1 + eβ_{0jk}); T-P = Telic-Paratelic, C-N = Conformist-Negativistic, S-M = Sympathy-Mastery, A-A = Alloic-Autic

Discrete Multilevel Models for Repeated Measures Data: Group Differences

$$\begin{aligned} y_{ijk} &\sim Binominal(denom_{ijk}, \Pi_{ijk}) \\ Logit(\Pi_{ijk}) &= \text{TimeSatCon+TimeThwCon+TimeConCon} \end{aligned} \tag{5.3}$$

$$Var(Telic/Paratelic_{ijk}|\Pi_{ijk}) = _{ijk}\ (1 - \Pi_{ijk})/denom_{ijk}$$

Table 5.2: Parameter estimates and standard deviations for the model assessing group differences in active meta-motivational state

Condition	T-P	p	C-N	p	M-S	p	A-A	p
β_{0jk}	-.035 (.168)		.081 (.167)		-.145 (.081)		.207 (.168)	
Forced Satiation	-.207 (.031)	.000	.005 (.031)	.436	.030 (.031)	.167	.024 (.031)	.220
Need Thwarting	-.010 (.031)	.374	-.038 (.032)	.118	-.028 (.031)	.183	.015 (.031)	.314
Natural Satiation	-.021 (.045)	.321	-.040 (.043)	.176	-.096 (.046)	.018	-.073 (.047)	.060
Probability	.491		.520		.551		.463	

Probability = eβ_{0jk} / (1 + eβ_{0jk}); T-P = Telic-Paratelic, C-N = Conformist-Negativistic, S-M = Sympathy-Mastery, A-A = Alloic-Autic

Model 5.3 suggests that the likelihood of participants in the natural satiation and need thwarting conditions occupying a telic meta-motivational state is equal throughout the testing session. Given the exploratory nature of these analyses there were some interesting directional trends, however these are reported strictly in terms of significance above. Participants in the natural satiation condition were significantly more likely to be mastery state active during the testing session, whilst the likelihood of participants in the forced satiation and need thwarting condition occupying a mastery state was equal throughout the testing session. A near significant increase ($p = .06$) in the likelihood of participants in the natural satiation condition to be alloic state active during the session is evident, whilst the likelihood of participants in the forced satiation and need thwarting condition occupying an alloic state is equal throughout the testing session.

The exploratory examination of active meta-motivational state suggests that of the mutually exclusive pairs of state, the telic, conformist, mastery and alloic states were predominantly active throughout the testing session, however this was only significant for the mastery-sympathy state pair. The results suggest that across participants and conditions the sample approached the task in a mastery state; wanting to succeed and appear dominant as opposed to being cooperative and friendly during the task. The competitive nature displayed by participants is unsurprising given the nature of the task and setting, having performance recorded and receiving consistent feedback that prevents achievement progress. The repeated assessment of an active mastery state provides some construct validity in support of the Stroop task as a measure of meta-motivational state as it is likely that the nature of the task would result in the mastery as opposed to the sympathy state.

When comparing active meta-motivational states between environmental conditions two significant results emerged: an increased likelihood to be telic state active in conditions which over satisfy needs, whilst an increased likelihood of occupying a mastery meta-motivational state was revealed when needs are naturally satiated. Previously in this thesis the motives associated with a telic and mastery meta-motivational state have been linked to the need for competence (see Chapter 1, Section 1.3). It is argued that the level of competence provided in the forced and natural satiation conditions results in either the telic or mastery state being operative. The forced satiation condition provided consistent high achievement feedback, as such participants might be focused on maintaining the high level of performance and setting their own personal goals to achieve this; characteristics associated with a telic state. In contrast, the natural satiation condition provided consistent average achievement feedback which might result in attempts to outperform the majority and achieve a better than average performance. As such, the participant might become more competitive and dominating; characteristics associated with a mastery meta-motivational state.

5.S Balanced Measure of Psychological Needs-General

Please read each of the following items carefully, thinking about how true it is for you, in your life. Use the following scale to respond:

No.	Item	Not at all true		Somewhat true		Very true
1	I feel a sense of contact with people who care for me and who I care for	1	2	3	4	5
2	I can successfully complete difficult tasks and projects	1	2	3	4	5
3	I am free to do things my own way	1	2	3	4	5
4	I am lonely	1	2	3	4	5
5	I have experienced some kind of failure, or have been unable to do well at something	1	2	3	4	5
6	I have a lot of pressures I could do without	1	2	3	4	5
7	I feel close and connected to other people who are important to me	1	2	3	4	5
8	I have taken on and mastered challenges	1	2	3	4	5
9	My choices express my "true self"	1	2	3	4	5
10	I feel unappreciated by one or more important people	1	2	3	4	5
11	I did something stupid, that made me feel incompetent	1	2	3	4	5
12	There were people telling me what I had to do	1	2	3	4	5
13	I felt a strong sense of intimacy with the people I spend time with	1	2	3	4	5
14	I did well even at the hard things	1	2	3	4	5
15	I was really doing what interests me	1	2	3	4	5
16	I had disagreements or conflicts with people I usually get along with	1	2	3	4	5
17	I struggled doing something I should be good at	1	2	3	4	5
18	I had to do things against my will	1	2	3	4	5

5.T Balanced Measure of Psychological Needs-Task

Please read each of the following items carefully, thinking about how true it is for you **during the task**. Use the following scale to respond:

No.	Item	Not at all true		Somewhat true		Very true
1	I felt a sense of contact with the researcher	1	2	3	4	5
2	I successfully completed difficult tasks and projects	1	2	3	4	5
3	I was free to do things my own way	1	2	3	4	5
4	I was lonely	1	2	3	4	5
5	I experienced some kind of failure, or was unable to do well at the task	1	2	3	4	5
6	I felt a lot of pressures I could do without	1	2	3	4	5
7	I felt I got along with the researcher	1	2	3	4	5
8	I took on and mastered challenges	1	2	3	4	5
9	My choices expressed my "true self"	1	2	3	4	5
10	I felt unappreciated by the researcher	1	2	3	4	5
11	I did something stupid, that made me feel incompetent	1	2	3	4	5
12	The researcher was telling me what I had to do	1	2	3	4	5
13	I felt the researcher cared about me	1	2	3	4	5
14	I did well even at the hard things	1	2	3	4	5
15	I was really doing what interests me	1	2	3	4	5
16	I had disagreements or conflicts with the researcher	1	2	3	4	5
17	I struggled doing something I should be good at	1	2	3	4	5
18	I had to do things against my will	1	2	3	4	5

5.U Quantitative Measure of Need Priority

Please read each of the following items carefully, thinking about how it relates to you **during the break**. Indicate how important each item was on the scale.
During the break I was focused on...

1. interacting with others; trying to contact, interact with, or catch up with people I like and who are important to me.

1	2	3	4	5	6	7	8	9	10
Completely disinterested									Completely focused on

2. mastering challenges; practicing to improve future performances, or finding things I could do well

1	2	3	4	5	6	7	8	9	10
Completely disinterested									Completely focused on

3. feeling free from restriction; making choices, or doing what interests me

1	2	3	4	5	6	7	8	9	10
Completely disinterested									Completely focused on

5.V Need Classification of Free Choice Activities

Need Focus	Description	Behaviour
Autonomy	Expressing internal locus of control	Completing their preferred task type
		Breaking rules
		Exploring the laboratory
		Using computer for non-task specific purpose
		Listening to music
	Changing Environment	Changing seat position
	Creativity	Whistling
		Singing
		Day-dreaming
Competence	Attempts to improve	Completing practice puzzles
		Re-reading task instruction
		Reading advice books and worksheets
	Focusing on previous performance	Looking at leader board
		Examining completed puzzles
Relatedness	Directly contacting significant others	Text messaging
		Phone calls
		Emails
	Interest in others	Using social media
		Looking out of the window
Autonomy and Competence	Task focused activity not related to the experimental trial	Writing to-do list
		Completing work not set in the experimental trial
		Playing apps on phone
		Drawing

5.W Electronic Equipment Use

During the break period I used electronic equipment to...

Use of equipment		Duration of use (minutes)
Search online for hints/tips	YES/NO	
Communicate with friends/family	YES/NO	
Communicate with colleagues	YES/NO	
Use social networks/media	YES/NO	
Play games/apps	YES/NO	
Other (please give a brief description)	YES/NO	

5.X Balanced Measure of Psychological Needs-Current

Please read each of the following items carefully, thinking about how true it is for you **right now**. Use the following scale to respond:

Right now I feel...

No.	Item	Not at all true		Somewhat true		Very true
1	that I belong	1	2	3	4	5
2	successful	1	2	3	4	5
3	I can do things my own way	1	2	3	4	5
4	lonely	1	2	3	4	5
5	incapable	1	2	3	4	5
6	that I am under a lot of pressure	1	2	3	4	5
7	that I get along with the people that I communicate with/care about	1	2	3	4	5
8	that I can take on and master any challenge	1	2	3	4	5
9	free to express my ideas and opinions	1	2	3	4	5
10	unappreciated	1	2	3	4	5
11	stupid and incompetent	1	2	3	4	5
12	that I am being told what to do	1	2	3	4	5
13	cared for	1	2	3	4	5
14	that I have done well even during difficult challenges	1	2	3	4	5
15	that I am doing what interests me	1	2	3	4	5
16	that I have disagreements and conflicts with the people I communicate with	1	2	3	4	5
17	that I struggle at doing things I should be good at	1	2	3	4	5
18	I have to do things against my will	1	2	3	4	5

5.Y Participant Information Sheet

Participant Information Sheet

Development and Validation of Stroop Task: Priming Meta-motivational State through an Expressive Writing Task.

Researchers from Aberystwyth University are conducting research to to enhance understanding of motivation and concentration.

What will I have to do if I take part?

Participation will require you to attend a one-hour session at the Carwyn James building. You will be asked to complete puzzle-based tasks for two 15-minute trials, separated by a 15-minute break. During the testing session you will be asked to complete a Stroop task (responding to the colour of words presented on a computer monitor) and short questionnaires assessing your motivation. On completion of the session you will be asked to complete two short questionnaires assessing feelings throughout the session. The testing session will be video and audio recorded.

Do I have to take part?

No, participation is voluntary. If you decide to take part you are free to withdraw from the experiment at any point, without penalty. However, if you opt out of the testing session you will be required to attend a session, equivalent in duration, in which the primary researcher will outline the testing procedure, priming materials etc., and so, will gain the same knowledge from the session as the students taking part in the research project.

How will the data collected be used?

The process of the study, and the data collected will be used to consolidate and extend content delivered in SS13210 (motivation, concentration, mood and emotion) whilst also providing students the opportunity to experience a piece of psychological research. It is anticipated that the findings of the study will be written up for publication in a peer-reviewed journal and presented at international conferences. All results will be anonymised and it will not be possible to identify individual participants data.

What do I do now?

If you are happy to take part in the experiment inform the principal researcher and a convenient time to complete the study can be arranged.

Contact

Please contact Laura Thomas for further information: Tel:(01970) 621947, lbt1@aber.ac.uk. If you have any questions or would like to participate, please ask the researcher for a consent form.

5.A Consent Form

Informed Consent

Thank you for considering taking part in this research. If you have any questions please ask a member of the research team before you decide whether to take part. You will be given a copy of this Consent Form to keep and refer to at any time. Please confirm:

I am older than 18 years of age	☐
I have read the participant information sheet	☐
I understand what is required of me in this research	☐
I understand that the testing session will be video and audio recorded	☐
I am happy to take part in this research	☐
I understand that my participant is voluntary	☐
I understand I can withdraw at any stage of the project	☐
I am aware that my eta will be anonymised	☐

Participant Name: .....

Participant's Signature: ..... Date: .....

Person Obtaining Consent: .....

Signature: ..... Date: .....

5.B Experimental Instructions

Autonomy Deprivation

You have been assigned to a condition that prevents you from having choices and making decisions. For the next hour you will be informed what to do, when to do it, and how to act.

For the purpose of this experiment you are required to complete as many of the assigned puzzles as possible within a **30-minute time limit**. The puzzles must be completed in the **order specified by the researcher**. You will stop and re-focus for 15-minutes halfway through the testing session.

When completing the puzzles you **must follow the rules** set by the researcher. Do not deviate from the rules set, even if you would like to do something a different way. **You will be observed** during the test session to ensure you abide by the rules of the task.

The researcher will **record the time taken to complete each puzzle** and will provide you with a time countdown throughout the test session.

You have been assigned to complete Sudoku puzzles during the test session. An explanation of the rules you must follow is detailed below. **Read the instructions regarding your assigned puzzle carefully.**

Sudoku Rules

Each Sudoku puzzle is made up of a 6X6 grid. You must:

- **fill the grid** so that each column, row, and sub-grid (3X2) contain all of the digits from 1 to 6;
- **complete the grid in the order specified above- columns, rows and finally sub-grids;**
- **complete the puzzle fully before moving onto the next puzzle.**

5	3			7	
6			1	9	5
	9	8			
8				6	
4			8		3
7				2	
	6				
			4	1	9
				8	

5	3	**4**	**6**	7	**8**	**9**	**1**	**2**
6	**7**	**2**	1	9	5	**3**	**4**	**8**
1	9	8	**3**	**4**	**2**	**5**	6	**7**
8	**5**	**9**	**7**	6	**1**	**4**	**2**	3
4	**2**	**6**	8	**5**	3	**7**	**9**	1
7	**1**	**3**	**9**	2	**4**	**8**	**5**	6
9	6	**1**	**5**	**3**	**7**	2	8	**4**
2	**8**	**7**	4	1	9	**6**	**3**	5
3	**4**	**5**	**2**	8	**6**	**1**	7	9

Reminder

During the testing period you have no opportunity to make your own choices, decisions, or act in ways other than those instructed. You must follow the instructions during the experiment to achieve experimental control.

Competence Deprivation

In this testing session you are asked to complete a selection of puzzles that have been designed to be very difficult and challenging. It is therefore expected that you will struggle and perform poorly at this task.

For the purpose of this experiment you will be asked to complete as many puzzles as possible within a 30-minute period including word grids, Sudoku puzzles, and mazes. The puzzles can be completed in an order chosen by yourself. You will receive a 15-minute break half way through the testing session.

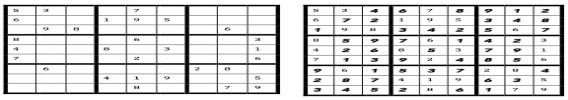
You will have 3 minutes to complete each puzzle. If you fail to complete the puzzle in this time period you will be asked to move onto the next puzzle. **A scoring system will be used to assess your performance during the testing session:**

- 3 points for each puzzle correctly completed in under 2 minutes;
- 2 points for each puzzle correctly completed between 2 and 2.5 minutes;
- 1 point for each puzzle correctly completed in over 2.5 minutes;
- -1 point for each incomplete puzzle.

Your performance will be **recorded on the leader board displayed in the laboratory.**
An explanation of how to complete the puzzles is detailed below. Please read the instructions regarding the puzzles carefully.

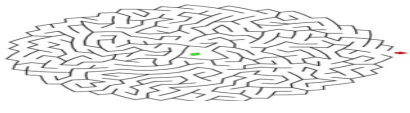
SUDOKU

Each Sudoku puzzle is made up of a 6X6 grid. You should fill the grid so that each column, row, and sub-grid (3X2) contain all of the digits from 1 to 6 (see the example below). Complete the Sudoku as fully as possible in the 3 minutes.



MAZE

Each maze shows a start point (green arrow) and an end point (red arrow). Starting from the green arrow you should try and find your way out of the maze (red arrow). You should complete the maze as fully as possible in 3 minutes.



Reminder

The puzzles presented during this testing session are very challenging. It is expected that you will struggle to complete the puzzles due to the high task complexity; please continue with the puzzles even when you are failing to complete them

Relatedness Deprivation

You have been assigned to a condition that prevents you from interacting with other people. During the testing session you will be in isolation; do not interact with the researcher, friends, or other participants.

For the purpose of this experiment you will be **left in a solitary environment** and asked to complete as many puzzles as possible within a 30-minute period including word grids, Sudoku puzzles, and mazes. You can choose the order in which you complete the puzzles and to skip a puzzle if you can not complete it.

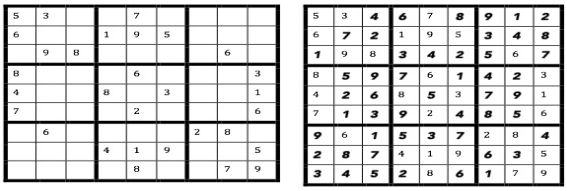
You will be **completing the puzzles in isolation**, and so you will have no contact with the researcher, or other people during the testing session. You will receive a 15-minute break half way through the testing session.

Throughout the experiment be aware that **I am not interested in you, or how you complete the puzzles.** I am just interested in the data you are providing, so please keep your opinions to yourself throughout and after the testing session.

An explanation of the puzzles is given below. Please read the instructions carefully and ask any questions regarding the task. This will be your last opportunity to ask questions and have any form of interaction before being left alone in the laboratory.

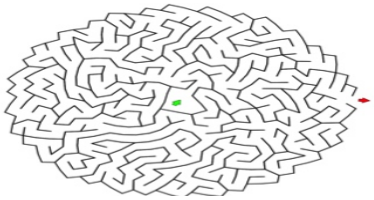
SUDOKU

Each Sudoku puzzle is made up of a 6X6 grid. The task requires the participant to fill the grid so that each column, row, and sub-grid (3X2) contain all of the digits from 1 to 6 (see the example below).



MAZE

Each maze shows a start point (green arrow) and an end point (red arrow). Starting from the green arrow find a way out of the maze (red arrow).



Reminder

During the testing period **the researcher is not interested in the participant, or how the participant completes the puzzles.** I am just interested in the data provided, so please refrain from expressing opinions throughout and after the testing session.