The Impact of Trait Mindfulness upon Self-Control in Children

Paul Greenhouse

Doctorate in Educational Psychology (DEdPsy)

2015

Abstract

The resource, or strength, model of self-control (Baumeister, Heatherton & Tice, 1994) suggests that individuals possess a limited resource of strength, or energy, which is depleted by acts of self-control, leading to reduced performance on a subsequent, unrelated, self-control task (Muraven, Tice & Baumeister, 1998). This decrease in self-control has been labelled 'ego depletion' (Baumeister et al., 1998). Review of the research literature reveals an impressive array of effects linked with ego depletion; however, the majority of these studies have focused on depletion in adults. The present study aimed to extend the research literature in this area by investigating the ego depletion effect in 89 primary school children aged between 10 and 11 years. A dual-task procedure was used to investigate the potential ego depletion effect of a brief thought suppression task upon a subsequent task of receptive attention. In addition, the current study aimed to find out whether trait mindfulness (i.e., a disposition towards open and non-judgemental awareness of one's self and attention to the moment) can counteract ego depletion in children (Baer, Smith, Hopkins, Krietemeyer & Toney, 2006; Bishop et al., 2004; Brown & Ryan, 2007a). No significant effect of ego depletion on performance in the second self-control task was found. A borderline significant effect of ego depletion on the children's perceived difficulty of the second self-control task was found. Trait mindfulness was found to be a significant predictor of children's perceived difficulty of the second self-control task. No significant moderation effect of ego depletion by trait mindfulness was found. Implications are explored and future directions discussed.

Summary

This thesis contains three parts: a literature review; an empirical study; and a reflective account. In Part 1 a review of the literature related to the resource model of self-control and mindfulness is presented and a rationale for the study given. The review then seeks to define and characterise self-control and explain why it is of relevance to the everyday lives of children and young people, as well as the practice of educational psychologists. This is followed by an overview of historical and more recent theories of self-control and self-regulation that are pertinent to the present research. An overview of the resource model of self-control is given and evidence for and against it is evaluated. Some alternative explanations for the ego depletion effect are also presented. Cybernetic and process models of self-regulation are explored within the context of ego depletion. The literature review then turns to mindfulness and how this may support self-control. Finally, the research questions are presented.

In Part 2 a review of the literature leads into a quantitative study that aimed to explore ego depletion in primary school aged children and the hypothesis that more mindful pupils may be less affected by ego depletion. The findings are discussed and future directions for research considered.

Finally, in Part 3 a reflection on the research process is presented. This explores elements of the research such as the design and the researcher's epistemological stance. It also focuses on the contribution made by the study to the wider research literature, as well as the contribution made to the researcher's own professional development.

Acknowledgements

I would like to thank all the children who participated in this study and the parents and teachers who gave up their time to make it a reality. I would like to extend my gratitude to Gillian Rhydderch for her advice and guidance whilst supervising this research. Thank you to all my friends and family for their continuous support and encouragement - I am looking forward to seeing a lot more of you all from now on! Finally, thank you to my wife Posy, without whose support, understanding and unwavering belief in me none of this would have been possible.

Contents **Page No.**

List of tables **Page No.**

List of figures **Page No.**

Part 1: Major Literature Review

1. Introduction

Some children display greater academic performance than others, even when situational factors, such as teacher quality, are taken into account (Rivkin, Hanushek & Kain, 2005). Many researchers have explored the impact of individual differences in general intelligence upon academic achievement; however, despite significant empirical support for an association between the two, it has been estimated that between 51% and 75% of the variance in academic achievement cannot be explained by cognitive ability alone (Rohde & Thompson, 2007). More recently, researchers have addressed the relationship between academic success and self-control. It is, perhaps, unsurprising that children who are better at exerting self-control over their emotions, behaviour and attention perform better academically at school. For example, it has been reported that self-control is a significant predictor of grades assigned by teachers (Duckworth, Tsukayama & May, 2010) and school graduation rates (Vitaro, Brendgen, Larose & Tremblay, 2005). Furthermore, a growing body of research suggests that the ability to self-regulate attention is directly related to learning and subsequent academic outcomes (Alloway & Alloway, 2010; Checa, Rodriguez-Bailon & Rueda, 2008).

In recent years one theory of self-control in particular has become highly prominent. The resource, or strength, model of self-control (Baumeister, Heatherton & Tice, 1994) is based upon a simple and intriguing notion: that individuals possess a limited resource of strength, or energy, which is consumed by acts of self-control; and that depletion of some of this energy leads to impaired performance on a subsequent, unrelated, self-control task (Muraven, Tice & Baumeister, 1998). This reduction in self-control has been termed the 'ego depletion effect' (Baumeister, Bratslavsky, Muraven & Tice, 1998). Despite the prominence of this model, to the researcher's knowledge, only two studies have explored ego depletion in school-aged children (Price & Yates, 2010; Price & Yates, 2013). This is unexpected given that self-control has long been recognised to play an important role in the classroom, for instance, Alfred Binet (1916) stated:

> *to succeed in his studies, one must have qualities which depend on attention, will, and character; for example a certain docility, a regularity of habits, and especially continuity of effort. A child, even if intelligent, will learn little in class if he never listens, if he spends his time in playing tricks, in giggling, in playing truant. (p. 254)*

Much of the current interest in self-control stems from the possibility that if self-control can be better understood, it can also be improved (Inzlicht, Legault & Teper, 2014). Research suggests that ego depletion can be alleviated by sleep, rest, positive affect and glucose (Baumeister, 2002; Gailliot, Baumeister, DeWall, Maner, Plant, Tice, & Schmeichel et al., 2007). However, the adoption of sleep and rest during the school day is perhaps a simplistic approach to helping pupils bolster self-regulatory capacity.

In recent years, the role of attention in self-control has also received renewed interest. Cybernetic theories of self-regulation emphasise the important role played by attention in self-control (e.g., Carver & Scheier, 1981). These theories state that attention enhances self-regulation through the monitoring and comparing of one's current state with a pre-determined standard or goal. Similarly, in Inzlicht and Schmeichel's (2012) process model, ego depletion is perceived to be the result of motivational and attentional shifts away from restrictions and the monitoring of discrepancies in one's current state, towards immediate gratification and the possibility of rewards.

Mindfulness is increasingly being recognised as an important phenomenon both in clinical contexts and more recently in education (Greco, Baer & Smith, 2011). Mindfulness is often conceptualised as open, accepting and non-judgemental attention to the moment (Baer, Smith, Hopkins, Krietemeyer & Toney, 2006; Bishop et al., 2004; Brown & Ryan, 2007a). Bishop et al. (2004) stated that mindfulness is associated with increases in attention, attention switching and the ability to disengage from elaborative processing of thoughts and feelings that may hinder the accomplishment of tasks. Mindful awareness of the moment may support self-control by enhancing the monitoring of one's current state, reducing habitual responses. If this is the case, mindfulness-based interventions may enhance self-control and wider aspects of self-

regulation. To the researcher's knowledge, no studies have explored the relationship between mindfulness and ego depletion in school-aged children. The current study aims to contribute to this area by investigating whether trait mindfulness can mitigate the ego depletion effect.

1.1 Overview of the Literature Review

The following literature review begins with a definition of self-control and an account of its importance to young people, adults and society as a whole. The review provides an overview of historical theories of self-control, followed by a critique of the resource model (Baumeister et al., 1994). Alternative explanations for ego depletion are considered; including cybernetic and attentional-based theories (Carver and Scheier, 1981; Inzlicht & Schmeichel, 2012). This review also introduces the concept of mindfulness and offers a mechanism through which mindfulness may counteract ego depletion. The review concludes with the aim of the current research, its relevance to educational psychologists and the research hypotheses.

1.2 Description of Key Sources

Self-control theories presented in the literature review are those that were considered most relevant to the resource model. Theories of self-control related to personality, such as temperament (e.g., Eysenck, 1967; Rothbart & Derryberry, 1981), were excluded from the literature review. Every attempt was made to focus on mindfulness in relation to education and educational psychology. Electronic resources utilised included PsychInfo, Google Scholar and Science Direct. Search terms entered into the above included: 'self-control'; 'self-regulation'; 'willpower'; 'ego depletion'; 'motivation'; 'attention'; 'mindfulness'; and 'mindfulness interventions.' This search was completed on 28th January 2015.

2. Self-Control

2.1 A Definition of Self-Control

Many authors use the terms self-control, self-regulation and willpower interchangeably, often to mean the overriding of a tendency toward one action in order to attain another goal (Bauer & Baumeister, 2011). For others, these terms have different meanings. For example, Carver and Scheier (2011) use the term self-control to describe the deliberate, conscious, effort to alter behaviour and inhibit one's impulses, and Vohs & Baumeister (2011) state that, unlike self-control, self-regulation does not require the suppression of impulses or desires. Duckworth, Gendler and Gross (2014) offer a perspective of self-control, which they assert reflects increasing consensus over its definition, as "the voluntary regulation of attentional, emotional and behavioral impulses when immediate temptations conflict with more enduringly valued goals" (p. 200). This is the definition adopted by the current research.

2.2 The Importance of Self-Control

Human beings demonstrate an extraordinary capacity to regulate the self and override impulsive behaviours, emotions and thoughts in order to determine how they act. The ability to intentionally inhibit responses is more common in humans than any other species and is likely to be related to the development of the frontal cortex (Baumeister, 2014). This ability may also underpin the creation of culture, a unique evolutionary adaptation that has been instrumental in the success of the human race (Baumeister, 2005). Culture offers rules to the individual about how he or she should behave and in return the individual can choose to inhibit certain responses in order to follow these rules.

Whether in the classroom or workplace, impulsive behaviours are likely to hinder the attainment of long-term goals or lead to conflict with others (Tangney, Baumeister & Boone, 2004). Therefore, the ability to inhibit or abstain from such behaviours is an important and adaptive skill for functioning within wider society (Tangney et al., 2004). It has been suggested that many social and behavioural problems, such as obesity, gambling problems and drug abuse are associated with self-

control failures (Baumeister, Heatherton & Tice, 2004; Baumeister, Muraven & Tice, 2000). Conversely, the ability to exert self-control is associated with a number of positive outcomes including academic and career success, improved health and reduced susceptibility to criminality (Gailliot & Baumeister, 2007; Hammer, 2005; Tangney et al., 2004).

2.3 Self-Control in Children and Young People

Self-control is difficult to exercise because it means working towards the attainment of long term goals at the expense of indulging in smaller but more immediate rewards, e.g., resisting tempting but unhealthy food and eating healthy but less enjoyable food in order to reach a desired weight (Baumeister, 2014). In an educational context, the rewards for exerting self-control may be more abstract but are nonetheless important. The achievement of a high grade, or the mastery of a subject, requires a pupil to concentrate on new and difficult tasks, to pay attention to the teacher rather than joking with peers, to continue to practise skills until they become fluent and to work alone on homework rather than spending time with friends. Tsukayama, Duckworth and Kim (2013) asked children from a range of socioeconomic backgrounds to describe the situations that they found most challenging to their self-control. The children were highly consistent in their answers and some of the most common responses included: paying attention in class; rechecking work before resubmitting it; going to bed at a sensible time; controlling their temper when provoked; and listening to others when they felt the urge to interrupt. Other studies have found that self-control predicts better classroom behaviour (e.g., Duckworth, Quinn & Tsukayama, 2011) and greater time spent studying at home (Duckworth & Seligman, 2005).

2.4 Precursors to the Resource Model of Self-Control

Inzlicht, Berkman and Elkins-Brown (in press) suggest that much of the research literature on self-control is based, either directly or indirectly, on the idea that self-control is the result of two opposing forces: a controlling force that drives towards self-control and an impulsive force that drives against it. In this view, self-control fails when the impulse is relatively large and when control is relatively weak. This notion is

evident in many historical and more recent accounts of self-control as outlined briefly below.

2.4.1 Psychoanalytic theory.

Freud viewed human behaviour as the result of biological impulses and unconscious psychic forces (Freud, 1913). Freud hypothesised that these forces drive individuals to seek out pleasure (immediate gratification), and to avoid displeasure, a concept he referred to as the 'pleasure principle.' Freud also hypothesised that as individuals mature they may gradually develop an ability to delay gratification, which he referred to as the 'reality principle.' Freud's structural model of the psyche focused on three symbolic parts, the id, ego and superego. Freud postulated that the ability to override one's instinct and experience brief discomfort in order to attain greater pleasure was central to the ego's development (Freud, 1913), and the gradual pre-eminence of the reality principle (Mischel, 1996). Freud proposed that, whereas the id and superego make instinctual and moralising demands, respectively, it is the function of the ego to use energy to mediate the desires of both in order to effect a decision - a process that Freud considered to be largely outside of conscious awareness.

2.4.2 Behaviourism.

Skinner (1938) viewed behaviour as a response, or sequence of responses, carried out by an individual in order to control the probability of responses to a future event. This process is maintained through self-reinforcement and allows an individual to choose a delayed, larger reward, over an immediate, smaller reward. From the behaviourist perspective, behaviour also takes place outside of conscious control and is dependent upon a person's particular history of reinforcement. In this respect, Freud and Skinner held similar notions that willpower and self-agency are largely an illusion (Metcalfe & Mischel, 1999).

2.4.3 Humanistic theory.

In the 1950s the behaviourist view was being countered by humanists, such as Kelly (1955), and humanistic theories in which the self was viewed as a conscious mediator

of environmental and behavioural responses. This reframing of the self as a causal agent, rather than a product of unconscious or automatic processes, had powerful implications for the role of volition in self-control.

2.4.4 Cognitive affective processing system and hot/cool systems.

The delay-of-gratification paradigm, often labelled by the media as the 'marshmallow test,' was devised to find out whether young children can resist settling for a small but immediate reward, e.g., one marshmallow, in order to get a more substantial but delayed one, e.g., two marshmallows (Mischel, Ebbesen & Zeiss, 1972). In this situation, the longer the child waits for the larger reward, the lower its perceived value becomes, a phenomenon referred to as 'temporal discounting.' To explain this phenomenon, Metcalfe and Mischel (1999) devised the concept of the cognitive affective processing system, which consists of two interacting components: a 'cool' system, which is cognitive, complex and slow; and a 'hot' system, which is emotional, simple and quick (Metcalfe & Mischel, 1999). The hot system is associated with the amygdala (a brain structure involved in the processing of emotional memories) and the fight-or-flight response, whereas the cool system is associated with the frontal lobes of the brain (Metcalfe & Mischel, 1999). The two systems are proposed to be connected via 'hot spots' and 'cool nodes.' The impulsive nature of the hot system places constraints on a person's ability to exert self-control, which is only possible if the cognitive cool system can bypass the hot system by connecting hot spots with cool nodes. As a child matures, the cool system, and its associated network of cool nodes, develops too, evidenced by the child's increasing ability to overcome the power of a stimulus and inhibit a response.

2.4.5 Cybernetic theory.

Carver and Scheier (1981, 2011) applied cybernetic, or control, theory to understand how people monitor their states in relation to goals or other ideals and hypothesised that a significant role of self-awareness is to monitor and facilitate self-regulation. In their model, the self-regulator compares his or her actions against a pre-determined standard, e.g., in the case of weight management. When a discrepancy is detected

between the standard and reality, the self-regulator is prompted to perform additional 'operations,' which could include the inhibition of responses, e.g., eating less. Carver and Scheier (1981) hypothesised that this self-regulatory 'feedback loop' continues until a discrepancy can no longer be detected between the standard and reality. Therefore, attention increases self-regulation through greater awareness and adaptability.

2.4.6 Dual-process models.

In 'dual-process' models (e.g., Epstein, 1994; Kahneman, 2011), mental processes are coordinated by two distinct systems, often labelled as 'System 1' and 'System 2,' which share similarities with Metcalfe and Mischel's (1999) hot/cool systems. System 1 is fast, intuitive, associative and carries out processes that require little cognitive load, such as making judgements and processing perceptual or emotional information. System 1 is difficult to modify and operates in an intuitive manner with little conscious involvement (Evans, 2003). In contrast, System 2 is slow, analytical and requires deliberate attentional control (Hofman, Friese & Strack, 2009). The two systems work in a serial way, allowing System 1 to assess a situation rapidly and effortlessly, with System 2 being invoked if an error is detected. System 1 is fast but its reflex-like responses are prone to systematic errors and biases, e.g., cognitive illusions (Kahneman, 2011). System 2 involves rational decision making and appears to fit with the subjective experience of agency, although the 'self' is equally System 1 (Kahneman, 2011). System 2 has limited capacity and requires more energy than System 1 (Evans, 2003). Although System 2 may function for some time, ultimately it will become depleted, leaving the impulsive System 1 to take over. Furthermore, Rottenstreich, Sood and Brenner (2007) found that ego depletion affects processes occurring in System 2 more than those in System 1. This fits well with the dual-task structure of self-control studies, in which a controlled process is manipulated, e.g., thought suppression, in order to explore the impact on a subsequent impulse task, e.g., the Stroop task in which colour words are presented in conflicting colours and participants are required to name the colour of the ink of the words and resist the tendency to read the word names (Stroop, 1935). The researchers found that ego depletion leads to increased intuitive decision-making associated with System 1.

2.4.7 Cognitive load theory.

Cognitive load theory (Sweller, 1994) suggests that learning takes place through schema acquisition and the automation of learned procedures, which 'free up' capacity in working memory for tasks requiring conscious control. It has been suggested that, unlike System 1, System 2 is adversely affected by cognitive load (Drolet, Griffin, Luce & Simonson, 2005). Consequently, System 2 is only likely to be utilised if cognitive resources are abundant. Shiv and Fedorikhin (1999) found that participants asked to memorise a seven-digit, rather than a two-digit, number were more likely to choose chocolate cake (tasty/unhealthy choice) over fruit salad (less tasty/healthy choice). They concluded that chocolate cake was chosen more often when cognitive resources were stretched. The researchers accounted for this by suggesting that, under conditions of low cognitive load (i.e., remembering a two-digit number), System 2 has abundant resources to override System 1's desires, for example, by focussing on a diet and selecting the fruit salad. However, under conditions of high cognitive load (i.e., remembering a seven-digit number) System 2 is less effective at overriding System 1. Cognitive load may, therefore, affect an individual's decision making.

The conception of System 2 being affected by low resources is compatible with Baumeister and colleagues' resource-theory of self-control. Indeed, Masicampo and Baumeister (2008) hypothesised that System 2 strategies may share a limited resource with self-control. As such, decision making in System 2 may be effortful and costly, consuming large amounts of glucose, leading Masicampo and Baumeister to hypothesise that the exertion of self-control leads individuals to engage in the use of heuristic strategies associated with System 1.

2.5 The Resource Model of Self-Control

Many theories associate self-regulation and self-control with an inner psychological resource, or strength, which, when depleted, can undermine an individual's capacity to exercise self-regulation and self-control. The colloquial term for this strength or energy is willpower (Mischel, 1996), and has been conceptualised by some researchers to be limited in supply (e.g., Bauer & Baumeister, 2011). According to the resource model,

self-control is based upon a shared, global resource of strength, or energy (Baumeister et al., 1998). This resource is limited in capacity and engaging in acts of self-control depletes this resource, reducing an individual's capacity to exert self-control in a subsequent self-control task (Baumeister et al., 1994). Baumeister et al. (1998) referred to the energy depleting effect as 'ego depletion,' borrowing the term 'ego' in homage to Freud's energy model of the self (Vohs & Baumeister, 2011).

Preliminary support for this theory came from two ground-breaking sets of experiments carried out by Baumeister et al. (1998) and Muraven et al. (1998). In one experiment, Baumeister and colleagues allocated participants, who had missed one meal beforehand, to one of two groups. Participants in the experimental group were required to resist the temptation to eat chocolates and instead consume less appetising radishes. Participants in the control group were given the radishes and chocolates but were instructed to eat the chocolates. The participants in the experimental group reported that they had to force themselves to eat the radishes more than the participants in the control group. Moreover, experimental-group participants showed less persistence on a subsequent impossible geometric puzzle than control group participants.

Since the above studies were carried out, over 100 more have lent support to the idea that self-regulation relies on a limited resource or strength (see Hagger, Wood, Stiff & Chatzisarantis, 2010). Researchers have reported depletion effects across a variety of self-control domains, e.g., controlling emotions, attention, thoughts and impulses, as well as cognitive processing, choice and social processing (Baumeister, Vohs & Tice, 2007). According to the resource model, self-control tasks in any of these domains draw upon the same, global, self-control resource because self-regulatory failure is not domain specific. For example, Vohs, Baumeister, Schmeichel, Twenge, Nelson and Tice (2008) proposed that responding actively to make choices and to plan draws upon the same energy reserve and can also lead to similar ego depletion effects. Furthermore, self-regulatory acts have been shown to impair decision-making (Vohs, Baumeister, Vonasch Pochepstova & Dhar, 2014). Baumeister (2014) suggested that the evidence for a common energy resource behind intentional

inhibition and planning and decision-making behaviour may be indicative of the "psychological reality behind the idea of free will" (p. 2).

2.5.1 The dual task paradigm.

The most commonly cited experimental procedure to explore ego depletion involves the use of two dissimilar self-control tasks, referred to as the 'dual-task' or 'sequential task' paradigm (Baumeister et al., 1998). In this procedure, participants allocated to an experimental ego depletion group carry out two successive tasks requiring self-control. For participants in the control group, only the second task involves self-control. In this procedure, the resource model predicts that participants in the experimental group will perform less well on the second self-control task (Time 2) than participants in the control group because they have exhausted more of their finite self-control during the initial self-control task (Time 1) (Baumeister, Vohs & Tice, 2007).

Using the dual-task paradigm, it has been found that participants who engaged in an act of self-control at Time 1 were less able to regulate aggression at Time 2 (DeWall, Baumeister, Stillman & Gailliot, 2007). Similarly, participants asked to suppress their emotions in response to a film at Time 1 performed less well on a hand-grip exercise at Time 2 than the control participants who were told that they could express their emotions (Muraven et al., 1998). Ego depletion has also been related to a range of responses including: dishonesty (Mead, Baumeister, Gino, Schweitzer & Areily, 2009); prejudice (Muraven, Gagne & Rosman, 2008); overindulging in unhealthy food (Vohs & Heatherton, 2000); and the consumption of alcohol (Muraven, Collins & Neinhaus, 2002).

Although the research literature supports the domain general nature of the ego depletion effect, views regarding the defining features of a self-control task vary considerably. Many self-control tasks require the exertion of effort in order to suppress a habitual response; however, the degree to which, for instance, a taxing calculation depletes self-regulatory resources is unclear. If complex tasks require the exertion of self-control in order to resist the impulse to quit, then these tasks may also be ego depleting. For instance, Wright, Stewart and Barnett (2008) reported depletion effects on an incongruent Stroop task (requiring the suppression of habitual responses

to colour names) as well as a multiplication task that did not involve response suppression. This is an important consideration as complex tasks have occasionally been employed as the non-depleting task in some dual-task studies (e.g., Johns, Inzlicht & Schmader, 2008; Schmeichel & Zell, 2007). Furthermore, Hagger et al. (2010) note that sufficiently complex tasks may require the continuous updating of working memory. Increased cognitive load may place greater demands on self-control resources than simply holding information in memory. Although consistent with the resource model, this suggests the possibility that task complexity may also mediate the ego depletion effect.

2.5.2 Ego depletion in children.

Out of hundreds of published ego depletion studies, to the researcher's knowledge, only two have involved children and these were conducted by the same researchers. Despite this, preliminary findings suggest a significant impact of depletion upon classroom behaviour and learning. Price and Yates (2010) explored the impact of a three minute resistance to distraction task upon pupil decisions when faced with the choice of an easy or difficult task. The researchers found that ego depleted pupils (between 10 and 14 years) continued to choose to work on easy tasks, whereas pupils who had not been involved in the resistance to distraction task progressed onto more difficult items. Another unexpected finding was that the resistance to distraction task (counting virtual snails appearing and disappearing on a screen) was only three minutes in length, which is shorter than the original studies that involved a 15 minutes self-control induction. In another study, Price and Yates (2013) explored the impact of depletion on creativity by asking pupils (median age 11 years) to spend 15 minutes writing everything they could think of to do with the number 50. The ego depleted pupils, who participated in a difficult matching problem for three minutes at Time 1, produced a similar volume of work to the control group; however, their work was rated as significantly less creative by specialist art teachers and significantly lower in mathematical quality (e.g., number and accuracy of mathematical statements), by specialist mathematics teachers. In both studies, the researchers concluded that ego depletion reduced the effort pupils committed to academic work.

2.5.3 The muscle analogy.

It has been suggested that self-control is analogous to a muscle expending energy to exert force (Baumeister, Gailliot, DeWall & Oaten, 2006). Like a muscle, self-control is subject to the deleterious effects of effort as well as the benefits of rest following exertion (Muraven & Baumeister, 2000; Tyler & Burns, 2008). A growing body of research supports the existence of self-control deficits that appear to be consistent with the muscle analogy.

It has been suggested that, like a muscle, self-control strength can be increased through regular training (Gailliot, Plant, Butz & Baumeister, 2007; Muraven et al., 1999). Gailliot, Plant, Butz and Baumeister (2007) and Muraven et al. (1999) found that participants asked to engage in self-control tasks for two weeks performed significantly better on a dual-task paradigm experiment than participants who had not received this training. Oaten and Cheng (2007) reported a similar finding for participants who engaged in months of financial monitoring, physical exercise and academic study. These results suggest that ego depletion can be reduced through regular self-control training, possibly as a result of a gradual increase in self-regulatory capacity. These findings could be interpreted to indicate the development of increasingly effective self-control 'skills' (Carver & Scheier, 1998; Wills & Dishion, 2004). However, if self-regulatory strength increased with practise, performance at Time 2 in dual-task experiments might be expected to improve, which is the opposite of what is typically reported, although ego depletion experiments are often brief and may not be influenced by longer-term changes in self-control capacity (Vohs et al., 2008).

2.5.4 Rest and replenishment of resources.

For a distance runner, the conservation of energy is critical. Similarly, Muraven, Shmueli and Burkley (2006) reported that the expectation that one will engage in self-control primes the conservation of energy for the future exertion of effort. To explore this possibility, Muraven, Shmueli and Burkley (2006) and Tyler and Burns (2009) informed some participants that they would be required to complete a third self-control task. Participants expecting to engage in another self-control task performed

less well than depleted controls not informed about the third task. It is possible that anticipation of a future self-control task leads to an increase in the perceived cost of performing the current self-control task relative to its benefits, which may result in decreased motivation and increased conservation of self-control resources.

Muraven and Baumeister (2000) hypothesised that self-control resources can be restored following depletion by rest or relaxation. This is supported by the finding that participants given a break between the first and second self-control tasks of a dual-task experiment perform better during the second task than non-depleted participants (Oaten, Williams, Jones & Zadro, 2008; Tyler & Burns, 2008). Furthermore, Tyler and Burns (2008) reported that self-regulatory capacity is relative to recovery time. As such, differences in experimental protocol between the two tasks could explain some of the variability in findings reported across dual-task paradigm studies.

In most studies, resource depletion is only inferred from changes in performance at Time 2 of a dual task procedure. This has led some researchers to question whether the hypothesised self-control resource is more than a metaphor. The few studies that have explored this possibility have identified glucose as a physiological correlate of self-control. Gailliot, Baumeister, DeWall, Maner, Plant, Tice and colleagues (2007) found that ego depletion coincides with a decrease in blood glucose levels, suggesting that the exertion of self-control not only uses glucose but that the effect can be counteracted by increasing blood glucose levels. Other studies have reported that drinking a liquid containing glucose (Denson, von Hippel, Kemp & Teo, 2010), or simply swishing it around the mouth (Hagger, Nikos and Chatzisarantis, 2012; Molden et al., 2012) increases self-control and counteracts ego depletion (Masicampo & Baumeister, 2008). This led Baumeister (2014) to suggest that glucose is one method that can be used for improving intentional inhibition; however, the findings reported by Gailliot and colleagues have been difficult to replicate (Molden et al., 2012). For instance, Lange and Eggert (2014) found no impact of a glucose mouth rinse and a drink containing sugar on ego depletion when compared with a non-calorific sweetener on a consecutive self-control task. Furthermore, Kurzban (2010) argued that it is unlikely that the brain can consume the excessive amounts of glucose needed to explain self-control depletion.

2.6 Trait Self-Control

It is thought that there are stable individual differences in the ability to exercise self-control (Ent, Baumeister & Tice, 2015), and in some capacity-based models self-control is conceptualised as a trait that varies across the population (Hagger et al., 2010; Metcalfe & Mischel, 1999; Muraven & Baumeister, 2000; Tangney et al., 2004). Trait self-control (TSC) has been defined as "A general and abstract ability to exert self-regulation across multiple domains that has mostly beneficial effects" (Imhoff, Schmidt & Girstenberg, 2014, p. 413). It has also been suggested that individuals high in TSC may possess greater self-control capacity (Baumeister et al., 2006). Using a trait measure of self-control, Tagney, Baumeister and Boone (2004) found that high TSC was related to a range of positive outcomes including higher self-esteem, better relationships, less alcohol abuse and less binge eating.

Ent et al. (2015) found that high TSC is associated with minimising (or avoiding), rather than just resisting, temptations and distractions. This suggests that individuals with high TSC may be more adept at reducing their exposure to situations that could lead to self-control failures. It remains unclear how TSC interacts with ego depletion. Some studies suggest that TSC helps to protect individuals from ego depletion, possibly as a result of increased self-control resources (e.g., Dvorak & Simons, 2009; Gailliot, Schmeichel & Maner, 2007). These studies vary significantly in the operationalisation and measurement of TSC (Imhoff et al., 2014), and not all studies have reported this effect (e.g., Gailliot & Baumeister, 2007). Indeed, Imhoff et al. (2014) found greater ego depletion for people with high TSC than those with low TSC across a range of domains including risk-taking and motivation to achieve. The researchers hypothesised that people with high TSC spend less time inhibiting their impulses and have less experience of resisting temptation.

2.7 Meta-Analysis

Replications of experiments carried out by Baumeister and colleagues, as well as research conducted by other researchers, suggest a robust effect that occurs across a range of domains (Hagger et al., 2010). The domain-general nature of these findings suggests that self-control may be a global, finite resource as hypothesised. However, not all studies have reported a significant ego depletion effect. For example, Stillman, Tice Fincham and Lambert (2009) found no difference between experimental group and control group participants in performance on a word production task despite the former taking part in a thought suppression activity beforehand. Similarly, Wright et al. (2007) reported that participants assigned to a depleting counting task did not perform significantly differently on a subsequent mental arithmetic task relative to control participants who had initially carried out an easy counting task.

2.7.1 Publication bias and small study effects.

Variation in findings could be due to methodological differences or task type. To find out more, 198 studies were subjected to a large meta-analysis by Hagger et al. (2010). The meta-analysis reported a medium-sized effect (d = 0.62) for ego depletion across a wide range of responses. However, Carter and McCullough (2013) applied two regression techniques (found in Egger, Smith, Scneider & Minder, 1997; Moreno et al., 2009) and the 'incredibility index' to the data used in the meta-analysis in order to test for publication bias (i.e., when published research differs from all the research carried out in the area, increasing the likelihood that readers and reviewers draw misleading conclusions, Egger & Smith, 1995). The incredibility index is an estimate of the likelihood that a group of studies contains fewer non-significant findings than would be expected if the sample is unbiased (Schimmack, 2012). Carter and McCullough (2013) concluded that the ego depletion effect was not only much smaller than that reported by Hagger et al. (2010), but may in fact be zero. However, Hagger and Chatzisarantis (2014) argue that if the ego depletion effect size is in fact zero, then individual effect sizes would be expected to be scattered randomly about zero in a negative, as well as a positive, direction (i.e., effect sizes that indicate improved performance at Time 2), but no studies have reported a negative effect size.

Carter and McCullough claimed that, according to the incredibility index, the meta-analysis not only lacked statistical power but may also be subject to publication bias. Hagger and Chatzisarantis cautioned that the bias reported in both analyses cannot conclusively be attributed to publication bias and cite Sterne, Gavaghan and Egger (2000) in support of the claim that other sources of bias exist, for example, 'small study effects' (i.e., the finding that smaller studies tend to report larger effect sizes which can lead to bias). The small study effect may also contribute to publication bias if smaller studies reporting findings that are statistically significant are given greater weighting by journals. Furthermore, Hagger and Chatzisarantis suggest that findings that contradict the resource model could provide support to alternative explanations and as a result may be more likely to be published.

2.8 Alternative Explanations for the Ego Depletion Effect

2.8.1 Fatigue.

One of the most significant explanations for ego depletion may also be the most obvious. Is it possible that the ego depletion effect is the result of fatigue following the exertion of self-control? Hagger et al. (2010) analysed the collective data taken from a range of studies and identified fatigue as an experiential correlate of ego depletion. It has been shown that after people engage in self-regulation their bodies show the signs of physiological fatigue, for example, elevated heart rate variability (Segerstrom & Solber Nes, 2007), and a drop in glucose levels (Gailliot, Baumeister, DeWall, Maner, Plant, Tice, Schmiechel et al., 2007). These reports suggest that fatigue may not only be a gauge of ego depletion but a mediating factor in the depletion of self-control (Muraven et al., 1998). For example, effort is required to exert self-control, which can result in fatigue and reduced capacity to exert self-control on a subsequent activity. It has also been suggested that fatigue leads to the conservation of self-control resources when reduced (Muraven, Shmueli & Burkley., 2006). However, it remains difficult to determine whether fatigue relates directly to ego depletion or whether, for example, they are both the result of the procedures used to deplete individuals. Furthermore, Baumesieter et al. (2006) argue that being fatigued is not tantamount to ego depletion because fatigue is domain specific. Moreover, Baumeister et al. (2006)

argue that, unlike those who are ego depleted, fatigued people perform better on a second task and can apply more effort towards important tasks.

2.8.2 Affect.

It has been suggested that the demanding and potentially frustrating nature of self-control tasks (Leith & Baumeister, 1996), may induce negative affect, resulting in coping strategies, such as reduced effort and motivation, which may lead to reduced performance on subsequent self-control tasks (Folkman & Moskowitz, 2000). However, Hagger et al. (2010) report that dual-task studies that include affect as a dependent variable have rarely reported a relationship between positive/negative affect and ego depletion. However, Tice, Baumeister, Shmueli and Muraven (2007) report that positive affect does reduce ego depletion. Similarly, Schmeichel and Vohs (2009) found that self-affirmation diminished the ego depletion effect. Inzlicht and Schmeichel (2012) assert that these findings are incompatible with a limited resource model of self-control as it remains unclear how a limited resource can be restored by either of these factors. This led Inzlicht and Schmiechel (2012) to conclude that an effect similar to ego depletion can be produced in the absence of resource depletion, and that the effect can be diminished by variables such as mood and beliefs.

There is some theoretical overlap between the impact of positive affect on ego depletion and the broaden-and-build theory proposed by Fredrickson (2004). Frederickson suggested that positive emotions create a broadened 'momentary thought–action repertoire,' for example, the way that interest triggers the urge to explore. In contrast, negative emotions lead to a narrowed mindset, for example, the tendency to fight or run. It is possible that negative affect, created by a challenging self-control task, may induce a narrower mindset and impair performance on a subsequent self-control task.

2.8.3 Self-efficacy.

It has been hypothesised that self-efficacy (Bandura, 1994) may play a role in the ego depletion effect because a depleted individual may perceive his or her ability to attain a goal as reduced, despite the value placed upon the goal at hand. In a study by

Wallace and Baumeister (2002), participants were given false feedback in order to manipulate their levels of self-efficacy prior to engaging in an ego depletion task. However, the depletion effect was found to be similar across high and low self-efficacy groups, suggesting that resource depletion is not related to perceptions of ability. Other studies appear to corroborate this finding (Baumeister et al., 2006; Gailliot & Baumeister, 2007). In dual-task experiments the self-control tasks are typically unrelated; as such, reduced self-efficacy on the first task would not necessarily be expected to prime self-efficacy on the second task. In contrast, ego depletion is hypothesised to be domain general.

2.8.4 Motivation.

In the majority of ego depletion studies, participants are given little if any incentive to perform the initial self-control task. Typically, participants in the ego depletion condition work harder than control participants but receive no additional benefit. It may be that depleted participants simply feel less inclined to continue to exert self-control (Inzlicht & Schmeichel, 2012). Insufficient motivation may result from a discrepancy between the value of the goal and the amount of effort needed to attain it. Muraven and Slessareva (2003) reported that the ego depletion effect can be reduced by motivational incentives to exert self-control at Time 2. This suggests that depletion is an artefact of reduced motivation rather than reduced resources. This hypothesis is supported by other studies in which a high motivational state has helped individuals to overcome mental fatigue during short-term tasks (Boksem, Meijman & Lorist, 2006; Lorist, Boksem & Ridderinkhof, 2005).

Proponents of the resource model argue that motivation by itself is insufficient to explain self-regulatory failure. Instead, Muraven and Baumeister (2000) suggest that reduced self-control capacity, following the exertion of self-control, leads individuals to re-assess the perceived value of the goal relative to the effort required to attain it. Therefore, reduced motivation on subsequent self-control tasks is the result of a cost-benefit analysis that favours the conservation of self-control resources. This accounts for the apparently rejuvenating effect of incentives, such as rewards, on self-control capacity (Muraven & Slessareva, 2003), that is, the observation that if self-regulatory

resources are only partially depleted then additional resources can be made available. However, Baumeister, Vohs and Tice (2007) emphasise that motivational incentives can only offset the ego depletion effect to the extent that self-control resources are available to do so.

Self-determination theory (Deci & Ryan, 1985) highlights the positive impact that choice can have upon performance. The self-determination model suggests that having 'free choice,' particularly where options are attractive, can be intrinsically motivating. In contrast, choices offered in ego depletion studies are typically 'forced choices,' which could partly explain why these are ego depleting.

2.8.5 Self-perceptions of willpower.

Clarkson, Hirt, Jia and Alexander (2010) reported that performance on a second self-control task can be better predicted by perceptions of resource depletion than by the exertion of self-control. For instance, Job, Dweck and Walton (2010) reported that individual beliefs about willpower as a limited resource can extinguish the ego depletion effect. This suggests that cognitive and motivational factors may underpin the ego depletion effect rather than a limited resource. Furthermore, Job, Walton, Bernecker and Dweck (2013) found that people who view willpower as plentiful demonstrate higher levels of self-control with or without a sugar boost, suggesting that holding the belief that willpower is limited sensitises people to their own resources and increases their dependency on glucose in order to exert self-control. Vohs, Baumeister and Schmeichel (2013) stressed that these motivational and cognitive reinforcements become less effective as the severity of ego depletion increases, possibly due to more energy from the body's reserves being expended than usual. In a replication of the study by Job et al. (2010), Vohs et al. (2013) found that a belief in willpower as unlimited only counteracted the effect of mild depletion and this belief led to greater difficulties in the face of severe depletion. Moreover, Ainsworth, Baumeister & Boroshuk (2014) found that, for participants who held a belief in unlimited willpower, mild depletion led to an increase in blood glucose levels whereas severe depletion led to a decrease.

Beedie and Lane (2012) suggested that the body makes decisions on where to allocate glucose, which determines the degree to which self-regulation is impaired. This led Baumeister (2014) to postulate that the body's need to selectively allocate resources is indicative of a limited resource which, in the absence of sufficient cognitive and motivational reinforcements, is reallocated as depletion increases. This suggests that ego depletion may result from the brain acting to conserve a *slightly* depleted resource as opposed to running out of fuel as originally proposed (Muraven, Shmueli & Burkley, 2006). This is in line with the findings that simply swishing a glucose drink around the mouth before spitting it out is enough to signal to the body that additional glucose is entering the body and that the conservation of this resource is less important.

2.8.6 Attentional shifts during monitoring.

In their process model, Inzlicht and Schmeichel (2012) propose that the exertion of self-control at Time 1 initiates two interdependent and simultaneous monitoring processes that result in reduced self-control at Time 2. The first process involves a directional shift in motivation away from the intentional inhibition of desires and towards approaching and gratifying them, that is, individuals become increasingly more motivated to seek out rewarding activities and increasingly less motivated to exert self-control. The second process is a directional shift in attention away from detecting conflict and discrepancy and towards cues prompting gratification. This led Inzlicht and Schmeichel (2012) to conclude that poorer self-control at Time 2 is not the result of a depleted energy resource but the consequence of a motivational shift towards seeking gratification and a parallel attentional shift toward the possibility of reward. Conversely, better self-control at Time 2 is the result of a motivational shift toward restraint and a parallel attentional shift towards conflict and discrepancy. However, Baumeister (2014) argue that the process model cannot explain why ego depletion coincides with a decrease in blood glucose levels and why glucose supplements reduce the ego depletion effect (Gailliot, Baumesieter, DeWall, Plant, Tice, Schmeichel et al., 2007). Furthermore, the process model predicts that task motivation will be reduced by ego depletion; however, no significant effect has been established by other researchers who have tested this prediction (Baumeister, 2014).

Inzlicht and Schmeichel (2012) suggest that self-control failure occurs when an individual fails to notice when self-control is required due to an attentional shift away from cues to discrepancies and toward rewards. Therefore, self-control failure results from a shift of attention rather than a weakening of it. This fits with Carver and Scheier's (1981) cybernetic control theory that self-control is triggered when a discrepancy is detected between desired states and current states. Carver and Scheier (1981) proposed the test-operate-test-exit (TOTE) model, in which self-control involves a four-step feedback loop. In the 'test' stage, discrepancies between the current state and set goals or standards are detected and monitored; this is followed by the 'operate' stage during which operators can be activated to make corrections to reduce discrepancies. Discrepancies are tested again before the self-control process ceases in the exit stage. In this model, operators are considered to be the 'motor' of self-control.

Inzlicht and Schmiechel (2012) propose that self-control failure may arise from problems with the motor of self-control or because the monitoring system has not detected a discrepancy between an individual's current state and a particular standard or goal. For example, errors made on the Stroop task following the exertion of self-control may be due to a failure to inhibit an impulse to read the word when trying to name the colour. However, errors may also be accounted for by a failure to attend to a discrepancy between the current state and the goal of naming the colour. Indeed, Inzlicht and Gutsell (2007) found that participants who exerted self-control at Time 1 demonstrated poorer attentional control on the Stroop task at Time 2. Inzlicht and Gutsel (2007) suggested that exerting self-control "blunts" attention to discrepancies between an individual's current state and the goals of the desired state. Furthermore, Wan and Sternthal (2008) found that cues that improve self-monitoring of behaviour, such as performance feedback, and individual differences in self-monitoring ability, can reduce ego depletion.

Inzlicht and Schmiechel (2012) propose that the exertion of self-control at Time 1 leads to reduced attentiveness to cues to self-control at Time 2. Furthermore, although operators and monitors are both important to self-control, without the monitoring process self-control cannot be engaged to begin with (Botvinick, Braver, Barch, Carter & Cohen, 2001). This theory offers an interesting contrast with the

resource model that focuses on the operating process of self-control rather than the monitoring process (Wan & Sternhal, 2008). Furthermore, this theory suggests that improved attention to the present moment and greater awareness of shifts in motivation and attention may reduce ego depletion. These are qualities often associated with mindfulness. In the following section the concept of mindfulness is introduced, followed by an explanation for how mindfulness may offer a way to alleviate ego depletion.

3. Mindfulness

3.1 A Definition of Mindfulness

Over the last 20 years, interest in mindfulness has grown almost exponentially (Brown, Ryan & Creswell, 2007a). Despite burgeoning interest, mindfulness remains a novel and unfamiliar concept. The mindfulness construct stems from eastern spiritual traditions, such as Buddhism, and is strongly associated with attention and awareness. Typically, attention is brought to bear on objects and events only briefly before these are processed and attributed meaning. As a result, an individual seldom experiences reality in a truly impartial way that has not already been furnished by his or her thoughts. In a mindful state, attention operates as an observer of the world, allowing an individual to be present in the moment rather than reacting to what is seen through his or her own conceptual lens (Brown et al., 2007a). It is important to note that this is a state of active participation, not passive dissociation (Baer, Smith, Hopkins, Krietemeyer & Tony, 2006). This unbiased quality of mindfulness has also led to it being labelled as "pure awareness" (p. 132) and "bare attention" (p. 134) (Gunaratana, 2002). Presence of mind allows individuals to respond more objectively and flexibly to the world. This means that an individual can step back and take a wider perspective of experiences and events or alternatively choose to focus his or her attention on a particular stimulus (Brown et al., 2007a). Although mindfulness is related to attentional control, it is qualitatively different to concentration in which the constraining of attention involves the removal of other forms of input (Engler, 1986). Mindfulness is also associated with recognising when one is not being attentive, as Brown et al. (2007a) stated: "Mindfulness, then, is noticing what is present, including noticing that one is no longer present" (p. 214), and is contrasted with states of mind in which attention is focused elsewhere, for example, when ruminating over past experiences.

3.2 Psychological Conception of Mindfulness

Whilst definitions of mindfulness vary throughout the research literature and debate continues as to whether it is a self-regulatory capacity (Brown & Ryan, 2003) or a

metacognitive skill (Linehan, 1994; Bishop et al., 2004), it is generally conceptualised to be the embracing of a non-judgemental or non-reactive state of mind, and the self-regulation of attention towards the present (Baer et al., 2006; Bishop et al., 2004; Kabat-Zinn, 1990). There remains some discussion as to whether mindfulness should be considered a multifaceted construct. Baer et al. (2006) compared the psychometric properties of five mindfulness questionnaires and found that together they revealed five factors of mindfulness (i.e., observing, describing, acting with awareness, nonjudging of inner experience, and nonreactivity to inner experience). Conversely, Brown and Ryan (2003) conceptualise mindfulness as a single factor with 'acceptance' as an integral part of attending to the present moment. This is reflected in the Mindful Attention Awareness Scale (MAAS; Brown & Ryan, 2003), which is a single-factor instrument designed to explore an individual's tendency to attend to, and be aware of, the present moment. A number of studies have reported wide variation in MAAS scores in people who have not received training in mindfulness meditations, suggesting that mindfulness is also a trait (Brown & Ryan, 2003; Kabat-Zinn, 2003).

3.3 Mindfulness-Based Approaches

Although the religious conception of mindfulness highlighted awareness and attention, psychological research into mindfulness has tended to focus more on attentional control (Carmody, 2009), which has led to the development of mindfulness-based approaches designed to teach a range of skills. Chambers, Lo and Allen (2008) found that adult participants who experienced a 10-day mindfulness meditation retreat demonstrated significantly increased self-reported mindfulness and improved performance on tests of working memory and sustained attention in comparison to a control group of participants who had not received this training. Similarly, Wenk-Sormaz (2005) found that adult participants who experienced a meditation exercise (to focus their attention on their breathing) produced fewer automatic and habitual responses on word production tasks, i.e., less typical responses on a category production task and a word-stem completion task, suggesting that these participants experienced an increase in attentional control.

Research into the use of mindfulness-based approaches with young people is preliminary but growing (Harnett & Dawe, 2012). Mindfulness-based interventions are well-established in clinical contexts but they are becoming increasingly common in educational contexts too (Greco et al., 2011). For example, Huppert and Johnson (2010) reviewed the four-week Mindfulness in Schools Project and reported significant improvements in mindfulness, flexibility in response to changing demands and psychological wellbeing. Because mindfulness comprises the self-regulation of attention, Bishop et al. (2004) postulated that increased mindfulness would be accompanied by increased attentional functioning. This is evident in the results of many mindfulness interventions. For example, Flook et al. (2010) reviewed an eight-week 'Inner Kids' mindfulness-skills programme and found that children with lower pre-course self-regulation made the greatest improvement in behavioural regulation, executive function (problem-solving, planning, controlling actions and paying attention) and meta-cognition.

3.4 Self-Awareness, Self-Focused Attention and Mindfulness

According to Brown and Ryan (2003), mindfulness is a unique quality of consciousness that is distinct from the constructs of self-awareness and self-focused attention. As evidence of this, Brown and Ryan cite the null to negative correlations reported between trait mindfulness and two often used definitions of trait self-awareness: public and private self-consciousness (Beitel, Ferrer & Cecero, 2005; Brown & Ryan, 2003). Public self-consciousness is related to an awareness of oneself as a 'social object,' whereas private self-consciousness relates to an awareness of one's thoughts. Private self-consciousness can be further divided into self-reflectiveness (e.g., ruminating about oneself) and internal state awareness (e.g., being aware of one's emotional state) (Burnkrant & Page, 1984; Cramer, 2000). Self-reflectiveness has been found to be positively correlated with depression, rumination and anxiety, whereas internal state awareness has been shown to be negatively correlated with these variables (Anderson, Bohon & Berrigan, 1996), suggesting that self-awareness may be more adaptive. Similarly, self-focused attention, which is often used synonymously with self-awareness, has been linked with poorer mental health (Ingram, 1990).

Brown, Ryan and Creswell (2007b) believe that mindfulness is often confused with self-awareness and self-focused attention because these constructs are largely defined as attentiveness to the self. Brown et al. argue that self-awareness and self-focused attention are agents of reflexive consciousness, in which attention is directed towards thinking about aspects of the self. The biases and priorities of self-interested thought have been linked to negative psychological well-being. In contrast, mindfulness involves an unbiased and non-judgemental account of self-experience.

Significant negative correlations have been reported between mindfulness and both public self-consciousness and the self-reflectiveness side of private self-consciousness (Beitel et al., 2005; Brown & Ryan, 2003). Furthermore, a significant positive correlation has been found between mindfulness and internal state awareness, suggesting that mindfulness may be related to the more neutral, or adaptive, side of private self-consciousness (Evans, Ruth, Baer & Segerstrom, 2009). Evans et al. (2009) explored the relationship between self-consciousness and the five facets of mindfulness (Baer et al., 2006) and found that 'non-judging of inner experience' negatively correlated with all facets of self-consciousness, suggesting that, unlike self-consciousness which serves an evaluative function, mindfulness is a non-judgemental form of attention.

3.5 Mindfulness and Self-Control

Masicampo and Baumeister (2007) proposed that self-control, mindfulness and mindfulness interventions may be associated in two ways: firstly, they suggested that mindfulness interventions involve the exercise of self-control, which leads to an increase in self-control resources and the positive effects associated with these interventions; and secondly, that mindfulness is a product of successful self-control. Masicampo and Baumiester hypothesised that fulfilment of a goal results in a moment of rest and a calm state of mind in which intrusive thoughts fade away and self-control increases. This reflects findings that mindfulness is associated with a detachment from wants and increased perceptions of contentedness. Furthermore, recent findings suggest that trait mindfulness, measured using the MAAS (Brown & Ryan, 2003), and trait self-control (measured using the Self-Control Scale, devised by Tangney et al.,

2004), are reasonably well related (Lakey, Campbell, Brown & Goodie, 2007). This would suggest that goal attainment is a more effective means of preventing intrusive thoughts and worries than mindfulness. However, Brown et al. (2007b) argue that mindfulness is a bare observation of what is, including any 'intrusive' thoughts which are simply thoughts, and that the construct of 'intrusive' itself hints at self-relevant thinking and controlling self-regulation. Furthermore, Brown et al. (2007b) argue that this view ignores the possibility that people may be pursuing multiple goals simultaneously, with each at a different point of completion. Consequently, people would have little opportunity for a mindfulness state to establish itself in this manner. Brown et al. (2007b) and Masicampo and Baumeister (2007) partially agree that some forms of mindfulness intervention, such as Mindfulness-Based Cognitive Therapy, require an element of self-control in order to direct attention to the object of thought when first being learned, e.g., focusing on one's breath. However, Brown et al. (2007b) go on to state that, unlike acts of self-control, the purpose of mindfulness-based interventions is to increase awareness of the moment (Leary, Adams & Tate, 2006).

When examining self-control within the context of mindfulness, Brown et al. (2007b) argue that a distinction must be made between the 'I' self (or 'self-as-process'), which describes a unified construction of the self that is created through attention to momentary experience, and the 'Me' self (or 'self-as-object'), which describes a personal identity that is created through identification with attributes, beliefs and goals driven by society and co-constructed with others. The 'Me' self, therefore, is different because it involves filtering actions and thoughts down to those that serve to promote personal identity (Ryan, 1993). In a mindful state, however, the self-regulation of behaviour is autonomous and determined by interest and values rather than socially-constructed drivers of personality (Brown & Ryan, 2003). Brown and Ryan state that self-control is goal-oriented and associated with the control aspect of consciousness and manipulating behaviour to suit a particular need. Brown et al. (2007b) give the following example to illustrate this difference:

> *A student with a large pimple on her nose comes into a professor's office, and his attention is likely to be drawn to her prominent blemish. In a self-controlled mode of regulating his attention, thoughts, emotions, and verbal behavior, he will invoke one or more preconceived, socially-prescribed standards of conduct that may dictate avoidance of this sight so that he can properly focus on the conversation. He may redirect his attention, perhaps to the student's eyes, or even to a spot on the wall above her head, with this goal in mind, and will periodically self-assess to see how well he is meeting his standard(s) of behavior. If these efforts are successful, he will have controlled his behaviour and in so doing, helped to create a pleasant interaction.* (p. 274)

In comparison, open and non-judgemental attention to the student's appearance would have freed the professor's mind of attentional constraints. As a result, the professor would have been able to dedicate more attention to the student. Hypothetically, the objective outcome of this meeting may have been the same but the subjective outcome would have been quite different for the professor because, whereas mindful regulation is stimulating and reviving (Brown & Ryan, 2003), self-controlled regulation is depleting (Baumeister et al., 1998). This reflects the number of positive outcomes (such as greater persistence, enjoyment and performance) often associated with the autonomous regulation of behaviour, as opposed to the negative outcomes frequently linked to behaviours regulated by self-control (Ryan & Deci, 2000; Brown et al., 2007b).

3.6 Mindfulness and Ego Depletion

In Carver and Scheier's (1998) TOTE model, self-awareness involves the continuous monitoring of discrepancies between current and desired states. The detection of a discrepancy prompts an individual to perform behaviours to change the self and reduce the discrepancy. Self-awareness and self-consciousness are essential for self-control and determine the extent to which operations can be performed to reduce discrepancies. The resource model asserts that an individual's capacity to exert self-control is dependent upon a limited resource and can be affected by ego depletion (Baumeister, Vohs & Tice, 2007). The exertion of self-control has been associated with the 'operate' phase of the TOTE model, which entails the performing of operations to reduce discrepancies (Baumeister, Schmeichel & Vohs, 2007). It is possible that

mindfulness can enhance the monitoring of discrepancies during the 'test' stages of a self-regulatory feedback loop by helping individuals to observe internal and external stimuli with greater clarity and neutrality. This would allow individuals to remain present in the moment, rather than "…falling prey to automatic judgements or reactivity" (Segel, Williams, Teasedale, 2002, p 322). Conversely, self-scrutinizing, judgemental, thoughts associated with self-consciousness may increase demands placed upon the monitoring of discrepancies and an individual's limited self-control resources.

Little research has explored the impact of mindfulness upon ego depletion. Using a dual-task procedure, Friese, Massner and Schaffner (2012) found that a brief mindfulness meditation was enough to counteract the depleting effects of an emotion suppression task upon a subsequent self-control task, i.e., the d2 Test of Attention (Brickenkamp & Zillmer, 1998). Jordan, Wang, Donatoni and Meier (2014) explored whether trait mindfulness can predict snack choice (healthy or unhealthy) and whether ego depletion affects less mindful people more than more mindful people when making this choice. They found that more mindful people reported greater self-control strength and made more healthy food choices; however, ego depletion had no influence on food choice, therefore, the moderation of depletion by mindfulness could not be tested. More recently, Yusainy and Lawrence (2015) found that depleted participants who had received a one-time mindfulness meditation behaved less aggressively than depleted participants who had received no mindfulness induction, suggesting that they were more able to exert self-control. The researchers also reported that mindfulness improved performance on a subsequent self-control task (i.e., a hand grip perseverance exercise); however, this improvement was independent of depletion.

4. The Current Research

4.1 Relevance to Educational Psychologists

Children are often required to exert self-control at school in order to achieve long-term goals at the expense of the gratification of short-term rewards, such as comfort and enjoyment. The benefits of self-control have been shown to extend beyond school and predict social, emotional and economic outcomes in adulthood with comparable accuracy to intelligence and socioeconomic status (Moffitt et al., 2011). Given the potential consequences of self-control failure, as well as the positive relationship between self-control and success in school and later life, it is important to consider what educators and educational psychologists can do to foster the development of self-control. One frequently used strategy is to teach children metacognitive strategies, such as goal planning and mental contrasting with implementation intentions (i.e., contrasting the benefits of studying with potential obstacles and considering how to overcome these obstacles) (Duckworth, Grant, Loew, Oettingen & Gollwitzer, 2011). School-based learning programmes, such as the Promoting Alternative Thinking Strategies (PATHS) programme (Bierman, Coie, Dodge, Greenberg, Lochman, McMahon & Pinderhughes, 2010), are also used to build self-control, awareness of feelings and social problem-solving skills.

Given that self-control is hypothesised to be a limited resource, another strategy is to help children and young people to overcome habitual responses by enhancing their ability to observe and accept, as opposed to trying to control or suppress thoughts, emotions and behaviour. Moreover, although self-control and mindfulness may produce similar outcomes, self-control is inherently depleting whereas mindfulness appears to be energising (Brown & Ryan, 2003). Understanding more about the relationship between self-control, ego depletion and trait mindfulness is of importance to educational psychologists, who are uniquely placed to work with children and young people, parents and teachers in order to improve wellbeing and educational outcomes.

4.2 Aims of the Research

Although a large number of studies have been carried out to explore ego depletion, to the researcher's knowledge, only two have involved children, and these showed a significant impact of depletion upon behaviour and learning in the classroom (Price and Yates, 2010; Price & Yates, 2013). A number of suggestions have been offered for ways to counteract ego depletion, such as positive affect, sleep and glucose supplements (Baumeister, Vohs & Tice, 2007); however, no studies have explored whether trait mindfulness can alleviate ego depletion in school-aged children. In recent years there has been growing evidence to suggest that mindfulness-based interventions not only enhance trait mindfulness but may also be beneficial to mechanisms underpinning self-control, including the regulation of emotion (Baer, Smith & Allen, 2004; Brown & Ryan, 2003) and the regulation of attention (Flook et al., 2010). This study aims to investigate the role of trait mindfulness in counteracting ego depletion in upper primary school-aged children.

4.3 Hypotheses

Based upon the above literature review, this study aims to test the following hypotheses at an alpha level of $< .05$:

Hypothesis 1: The exertion of self-control in one task will result in depletion effects on a subsequent self-control task in children.

Hypothesis 2: Ego depletion will affect less mindful children more than mindful children.

5. References

Ainsworth, S. E., Baumeister, R. F., & Boroshuk, J. E. (2014). Glucose allocation during self-regulation is affected by cognitive assumptions and role motivations (Manuscript submitted for publication). Florida State University.

Alloway, T. P., & Alloway, R. G. (2010). Investigating the predictive roles of working memory and IQ in academic attainment. *Journal of experimental child psychology*, *106*(1), 20–29.

Anderson, E. M., Bohon, L. M., & Berrigan, L. P. (1996). Factor structure of the private self-consciousness scale. *Journal of Personality Assessment, 66,* 144–152.

Baer, R. A., Smith, G. T., & Allen, K. B. (2004). Assessment of mindfulness by self-report. The Kentucky inventory of mindfulness skills. *Assessment*, *11*, 191–206.

Baer, R. A., Smith, G. T., Hopkins, J., Krietemeyer, J., & Toney, L. T. (2006). Using self-report assessment methods to explore facets of mindfulness. *Assessment*, *13*, 27–45.

Bandura, A. (1994). Self-efficacy. In V. S. Ramachaudran (Ed.), *Encyclopedia of human behavior* (pp. 71–81). New York: Academic Press.

Bauer, I. M., & Baumeister, R. F. (2011). Self-regulatory strength. In J. Vohs, K. D., & Baumeister, R. F. (2011). *Handbook of self-regulation: Research, theory, and applications* (2nd edition). (pp. 64–82) New York, NY: Guilford.

Baumeister, R. F. (2014). Self-regulation, ego depletion, and inhibition. *Neuropsychologia*, *65*, 313–319.

Baumeister, R. F. (2005). *The cultural animal: Human nature, meaning, and social life*. New York: Oxford University Press.

Baumeister, R. F. (2002). Ego depletion and self-control failure: An energy model of the self's executive function. *Self and Identity*, *1*, 129–136.

Baumeister, R. F., Bratslavsky, M., Muraven, M., & Tice, D. M. (1998). Ego depletion: Is the active self a limited resource? *Journal of Personality and Social Psychology*, *74*, 1252–1265.

Baumeister, R. F., Gailliot, M., DeWall, N., & Oaten, M. (2006). Self-regulation and personality: How interventions increase regulatory success, and how depletion moderates the effects of traits on behavior. *Journal of Personality, 74* (6), 1773–1802.

Baumeister, R. F., Heatherton, T.F., & Tice, D.M. (1994). *Losing control: How and why people fail at self-regulation.* San Diego, CA: Academic Press.

Baumeister, R. F., Muraven, M., & Tice, D. M. (2000). Ego depletion: A resource model of volition, self-regulation, and controlled processing. *Social Cognition*, *18*, 130–150.

Baumeister, R. F., Schmeichel, B. J., & Vohs, K.D. (2007). Self-regulation and the executive function: The self as controlling agent. In A. Kruglanski & E.T. Higgins (Eds.), *Social psychology: Handbook of basic principles* (2nd ed., pp. 516–539). New York: Guilford.

Baumeister, R. F., Vohs, K. D., & Tice, D. M. (2007). The strength model of self-control. *Current Directions in Psychological Science*, *16*, 351–355.

Beedie, C. J., & Lane, A. M. (2012). The role of glucose in self-control: Another look at the evidence and an alternative conceptualization. *Personality and Social Psychology Review*, *16* (2), 143–153.

Beitel, M., Ferrer, E., & Cecero, J. J. (2005). Psychological mindedness and awareness of self and others. *Journal of Clinical Psychology, 61*, 739–750.

Bierman, K. L., Coie, J. D., Dodge, K. A., Greenberg, M. T., Lochman, J. E., McMahon, R. J., & Pinderhughes, E. (2010). The effects of a multiyear universal social-emotional learning program: The role of student and school characteristics. *Journal of Consulting and Clinical Psychology*, *78*, 156–168.

Binet, A., & Simon, T. (1916). *The development of intelligence in children (The Binet Simon Scale)*. Baltimore, MD: Williams & Wilkins.

Bishop, S. R., Lau, M., Shapiro, S., Carlson, L., Anderson, N. D., Carmody, J., ... & Devins, G. (2004). Mindfulness: A proposed operational definition. *Clinical Psychology: Science and Practice*, *11*, 230–241.

Boksem, M., Meijman, T., & Lorist, M. (2006). Mental fatigue, motivation and action monitoring. *Biological Psychology*, *72*, 123–132.

Botvinick, M., Braver, T., Barch, D., Carter, C., & Cohen, J. (2001). Conflict monitoring and cognitive control. *Psychological Review, 108*, 624–652.

Brickenkamp, R., & Zillmer, E. (1998). *The d2 Test of attention*. First US Edition. Göttingen: Hogrefe & Huber Publishers.

Brown, K. W., & Ryan, R. M. (2003). The benefits of being present: Mindfulness and its role in psychological well-being. *Journal of Personality and Social Psychology*, *84*, 822–848.

Brown, K. W., Ryan, R. M. & Creswell, J. D. (2007a). Mindfulness: Theoretical foundations and evidence for its salutary effects. *Psychological Inquiry*, *18*(4), 211–237.

Brown, K. W., Ryan, R. M., & Creswell, J. D. (2007b). Addressing fundamental questions about mindfulness. *Psychological Inquiry, 18*(4) 272–281.

Burnkrant, R. R., & Page, T. (1984). A modification of the Fenigstein, Scheier, and Buss Self-Consciousness Scale. *Journal of Personality Assessment*, *48*, 629–637.

Carmody J. (2009). Invited commentary: evolving conceptions of mindfulness in clinical settings. *Journal of Cognitive Psychotherapy*, *23*, 270–280.

Carter, E. C., & McCullough, M. E. (2013). Is ego depletion too incredible? Evidence for the overestimation of the depletion effect. *Behavioural and Brain Sciences, 36*, 683–684.

Carver, C. S., & Scheier, M. F. (1981). *Attention and self-regulation: A control theory approach to human behavior*. New York, NY: Springer-Verlag.

Carver, C. S., & Scheier, M. F. (1998). *On the self-regulation of behavior*. New York: Cambridge University Press.

Carver, S., & Scheier, M. F. (2011). Self-Regulation of Action and Affect. In K. D. Vohs, & R. F. Baumeister. *Handbook of self-regulation: Research, theory, and applications* (2nd edition). (pp. 3–21) New York, NY: Guilford.

Chambers, R., Lo, B. C. Y., & Allen, N. B. (2008). The impact of intensive mindfulness training on attentional control, cognitive style, and affect. *Cognitive Therapy and Research*, *32*, 303–322.

Checa, P., Rodriguez-Bailon, R., & Rueda, M. R. (2008). Neurocognitive and temperamental systems of self-regulation and early adolescents' social and academic outcomes. *Mind, Brain and Education*, *2*(4), 177–187.

Clarkson, J. J., Hirt, E. R., Jia, L., & Alexander, M. B. (2010). When perception is more than reality: The effect of perceived versus actual resource depletion on self-regulatory behavior. *Journal of Personality and Social Psychology*, *98,* 29–46.

Cramer, K. M. (2000). Comparing the relative fit of various factor models of the self-consciousness scale in two independent samples. *Journal of Personality Assessment*, *75*, 295–307.

Deci, E.L., & Ryan, R.M. (1985). *Intrinsic motivation and self-determination in human behaviour.* New York, Plenum.

DeWall, C. N., Baumeister, R. F., Stillman, T. F., & Gailliot, M. T. (2007). Violence restrained: Effects of self-regulation and its depletion on aggression. *Journal of Experimental Social Psychology, 43*, 62–76.

Denson, T. F., von Hippel, W., Kemp, R. I., & Teo, L. S. (2010). Glucose consumption decreases impulsive aggression in response to provocation in aggressive individuals. *Journal of Experimental Social Psychology*, *46*, 1023–1028.

Drolet, A., Griffin, D., Luce, M. F., & Simonson, I. (2005). The influence of cognitive load on consumer choice processes. University of California, Los Angeles: Los Angeles.

Duckworth, A. L., Gendler, T. S., & Gross, J. J. (2014). Self-control in school-age children. *Educational Psychologist, 49*(3), 199–217.

Duckworth, A. L., Grant, H., Loew, B., Oettingen, G., & Gollwitzer, P. M. (2011). Self-regulation strategies improve self-discipline in adolescents: Benefits of mental contrasting and implementation intentions. *Educational Psychology: An International Journal of Experimental Educational Psychology*, *31*(1), 17–26.

Duckworth, A. L., Quinn, P. D., & Tsukayama, E. (2012). What no child left behind leaves behind: The roles of IQ and self-control in predicting standardized achievement test scores and report card. *Journal of Educational Psychology*, *104*, 439–451.

Duckworth, A. L., & Seligman, M. E. P. (2005). Self-discipline outdoes IQ in predicting academic performance of adolescents. *Psychological Science*, *16*, 939–944.

Duckworth, A. L., Tsukayama, E., & May, H. (2010). Establishing causality using longitudinal hierarchical linear modeling: An illustration predicting achievement from self-control. Social *Psychological and Personality Science*, *1*, 311–317.

Dvorak, R. D., & Simons, J. S. (2009). Moderation of resource depletion in the self-control strength model: Differing effects of two modes of self-control. *Personality and Social Psychology Bulletin*, *35*, 572–583

Egger, M., & Smith, G. D. (1995). Misleading meta-analysis. *British Medical Journal, 310*(6982), 752–754.

Egger, M., Smith, G. D., Schneider, M., & Minder, C. (1997). Meta-analyses: separating the good from the bad. *British Medical Journal, 315*(7109), 629–634.

Engler, J. (1986). Therapeutic aims in psychotherapy and meditation. In K. Wilber, J. Engler, & D. P. Brown (Eds.). *Transformations of consciousness: Conventional*

and contemplative perspectives on development (pp. 17–51). Boston: MA: Shambhala.

Ent, M. R., Baumeister, R. F., & Tice, D. M. (2015). Trait self-control and the avoidance of temptation. *Personality and Individual Difference*, *74*, 12–15.

Epstein, S. (1994). Integration of the cognitive and psychodynamic unconscious. *American Psychologist*, *49,* 709–724.

Evans, G. W. (2003). A multimethodological analysis of cumulative risk and allostatic load among rural children. *Developmental Psychology*, *39*(5), 924–933.

Evans, D. R., Baer, R. A., & Segerstrom, S. C. (2009). The effects of mindfulness and self-consciousness on persistence. *Personality and Individual Differences*, *47*, 379–382.

Eysenck, H. J. (1967). *The biological basis of personality*. Springfield, IL: Thomas.

Flook, L., Smalley, S. L., Kitil, M. J., Galla, B. M., Locke, J., Ishijima, E., ... & Kasari, C. (2010). Effects of mindful awareness practices on executive functions in elementary school children. *Journal of Applied School Psychology, 26*, 70–95.

Folkman, S., & Moskowitz, J. T. (2000). Positive affect and the other side of coping. *American Psychologist, 55*, 647–654.

Fredrickson, B. L. (2004). The broaden-and-build theory of positive emotions. *Philosophical Transactions of the Royal Society London Biological Sciences*, *359*(1449), 1367–1378.

Freud, S. (1913). *The interpretation of dreams (3rd ed)*. New York: The Macmillan Company.

Friese, M., Messner, C., & Schaffner, Y. (2012). Mindfulness meditation counteracts self-control depletion. *Consciousness and Cognition*, *21*, 1016–1022.

Gailliot, M. T., & Baumeister, R. F. (2007). The physiology of willpower: Linking blood glucose to self-control. *Personality and Social Psychology Review*, *11*, 303–327.

Gailliot, M. T., Baumeister, R. F., DeWall, C. N., Maner, J. K., Plant, E. A., Tice, D. M., ... & Schmeichel, B. J. (2007). Self-control relies on glucose as a limited energy source: Willpower is more than a metaphor. *Journal of Personality and Social Psychology*, *92*, 325–336.

Gailliot, M. T., Plant, E. A., Butz, D. A., & Baumeister, R. F. (2007). Increasing self regulatory strength can reduce the depleting effect of suppressing stereotypes. *Personality and Social Psychology Bulletin, 33*, 281–294.

Gailliot, M. T., Schmeichel, B. J., & Maner, J. K. (2007). Differentiating the effects of self control and self-esteem on reactions to mortality salience. *Journal of Experimental Social Psychology, 43*, 894–901.

Greco, L. A., Baer, R. A., & Smith, G. T. (2011). Assessing mindfulness in children and adolescents: Development and validation of the Child and Adolescent Mindfulness Measure (CAMM). *Psychological Assessment*, *23*(3), 606–614.

Gunaratana, H. (2002). *Mindfulness in plain English.* Boston, MA: Wisdom Publications.

Hagger, M, S., & Chatzisarantis, N. L. D. (2014). It is premature to regard the ego-depletion effect as "Too Incredible". *Frontiers in Psychology*, 5(298) 1–2.

Hagger, M, S., & Chatzisarantis, N. L. D. (2012). The sweet taste of success: The presence of glucose in the oral cavity moderates the depletion of self-control resources. *Personality and Social Psychology Bulletin, 39*(1), 28–42.

Hagger, M. S., Wood, C., Stiff, C., & Chatzisarantis, N. L. D. (2010). Ego depletion and the strength model of self-control: A meta-analysis. *Psychological Bulletin*, *136*, 495–525.

Hammer, E. Y. (2005). From the laboratory to the classroom and back: The science of interpersonal relationships informs teaching. *Journal of Social and Clinical Psychology*, *24*, 3–10.

Harnett, P. H., & Dawe, S. (2012). The contribution of mindfulness-based therapies for children and families and proposed conceptual integration. *Child and Adolescent Mental Health*, *17*(4), 195–208.

Hofmann, W., Friese, M., & Strack, F. (2009). Impulse and self-control from a dual-systems perspective. *Perspectives on Psychological Science*, *4*, 162–176.

Huppert, F.A. & Johnson, D.M. (2010). A controlled trial of mindfulness training. In schools: the importance of practice for an impact on well-being. *The Journal of Positive Psychology*, *5*(4), 264–274.

Imhoff, R., Schmidt, A. F., & Gerstenber, F. (2014). Exploring the interplay of trait self-control and ego depletion: Empirical evidence for ironic effects. *European Journal of Personality*, *28*(5), 413–424.

Ingram, R. E. (1990). Self-focused attention in clinical disorders: Review and a conceptual model. *Psychological Bulletin, 107*, 156–176.

Inzlicht, M., Berkman, E. T., & Elkins-Brown, N. (in press). The neuroscience of "ego depletion" or: How the brain can help us understand why self- control seems limited. In E. Harmon-Jones & M. Inzlicht (Eds.), *Social Neuroscience: Biological Approaches to Social Psychology* (pp. 1–44). New York: Psychology Press. Retrieved from http://www.michaelinzlicht.com/wp/wp-content/uploads/downloads/2014/07/Inzlicht-Berkman-Elkins-Brown-in-press.pdf.

Inzlicht, M. & Gutsell, J. N. (2007). Running on empty: Neural signals for self-control failure. *Psychological Science*, 18, 933–937.

Inzlicht, M., Legault, L., & Teper, R. (2014). Exploring the mechanisms of self-control improvement. *Current Directions in Psychological Science*, *23*, 302–307.

Inzlicht, M., & Schmeichel, B. J. (2012). What is ego depletion? Toward a mechanistic revision of the resource model of self-control. *Perspectives on psychological science*, *7*(4), 450–463.

Job, V., Dweck, C., & Walton, G. (2010). Ego depletion: Is it all in your head? Implicit theories about willpower affect self-regulation. *Psychological Science*, *21*, 1686–1693.

Job, V., Walton, G. M., Bernecker, K., & Dweck, C. S. (2013). Beliefs about willpower determine the impact of glucose on self-control. *Proceedings of the National Academy of Sciences of the United States of America*, *11*(37), 14837–14842.

Johns, M., Inzlicht, M., & Schmader, T. (2008). Stereotype threat and executive resource depletion: Examining the influence of emotion regulation. *Journal of Experimental Psychology: General, 137*, 691–705.

Jordan, C., Wang, W., Donatoni, L. R., & Meier, B. P. (2014). Mindfulness eating: Trait and state mindfulness predict healthier eating behaviour. *Personality and Individual Differences*, *86*, 107–111.

Kabat-Zinn, J. (1990). *Full catastrophe living: Using the wisdom of your body and mind to face stress, pain and illness*. New York: Delacorte.

Kahneman, D. (2011). *Thinking, fast and slow*. New York: Farrar, Straus and Giroux.

Kelly, G.A. (1955). *The psychology of personal constructs.* New York: W.W.Norton.

Kurzban, R. (2010). Does the brain consume additional glucose during self-control tasks? *Evolutional Psychology*, *8*(2), 244–259.

Lakey, C. E., Campbell, W. K., Brown, K. W., & Goodie, A. S. (2007). Dispositional mindfulness as predictor of the severity of gambling outcomes. *Personality and Individual Differences*, *43*, 1698–1710.

Lange, F., & Eggert, F. (2014). Sweet delusion. Glucose drinks fail to counteract ego depletion. *Appetite*, *75*, 45–63.

Leary, M. R., Adams, C. E. & Tate, E. B. (2006). Hypo-egoic self-regulation: Exercising self-control by diminishing the influence of the self. *Journal of Personality*, *74*, 1803–1831.

Leith, K. P., & Baumeister, R. F. (1996). Why do bad moods increase self-defeating behavior? Emotion, risk taking, and self-regulation. *Journal of Personality and Social Psychology, 71*, 1250–1267.

Linehan, M. M. (1994). Acceptance and change: The central dialectic in psychotherapy. In S. C. Hayes, N. S. Jacobson, V. M. Follette, & M. J. Dougher (Eds.), *Acceptance and change: Content and context in psychotherapy* (pp. 73–90). Reno, NV: Context Press.

Lorist, M., Boksem, M., & Ridderinkhof, K. (2005). Impaired cognitive control and reduced cingulate activity during mental fatigue. *Cognitive Brain Research*, *24*, 199–205.

Masicampo, E. J., & Baumeister, R. F. (2008). Toward a physiology of dual-process reasoning and judgment: Lemonade, willpower, and expensive rule-based analysis. *Psychological Science*, *19*, 255–260.

Masicampo, E. J. & Baumeister, R. F. (2007). Relating mindfulness and self-regulatory processes. *Psychological Inquiry*, *18*(4), 255–258.

Mead, N. L., Baumeister, R. F., Gino, F., Schweitzer, M. E., & Ariely, D. (2009). Too tired to tell the truth: Self-control resource depletion and dishonesty. *Journal of Experimental Social Psychology, 45*(3), 594–597.

Metcalfe, J., & Mischel, W. (1999). A hot/cool system analysis of delay of gratification: Dynamics of willpower. *Psychological Review*, *106*, 3–19.

Mischel, W. (1996). From good intentions to willpower. In P.M. Gollwitzer & J.A. Bargh (Eds.), *The psychology of action: Linking cognition and motivation to behaviour* (pp. 197–218). New York: Guilford Press.

Mischel, W., Ebbesen, E. B., & Zeiss, A. R. (1972). Cognitive and attentional mechanisms in delay of gratification. *Journal of Personality and Social Psychology*, *21*, 204–218.

Moffitt, T. E., Arseneault, L., Belsky, D., Dickson, N., Hancox, R. J., & … Caspi, A. (2011). A gradient of childhood self-control predicts health, wealth and public safety. *Proceedings of the National Academy of Sciences in the United States*, *108*(7), 2693–2698.

Molden D. C., Hui C. M., Scholer A. A., Meier B. P., Noreen E. E., & … Maryin, V. (2012). Motivational versus metabolic effects of carbohydrates on self-control. *Psychological Science, 23,* 1130–1137.

Moreno, S., Sutton, A., Ades, A., Stanley, T., Abrams, K., … & Cooper, J. (2009). Assessment of regression-based methods to adjust for publication bias through a comprehensive simulation study. *Biomedical Central* (BMC) *Medical Research Methodology*, *9(*2*), 1–17*.

Muraven, M., & Baumeister, R. F. (2000). Self-regulation and depletion of limited resources: Does self-control resemble a muscle? *Psychological Bulletin, 126*, 247–259.

Muraven, M., Baumeister, R., & Tice, D. M. (1999). Longitudinal improvement of self-regulation through practice: Building self-control strength through repeated exercise. *Journal of Social Psychology*, *139*, 446–457.

Muraven, M., Collins, R. L., & Nienhaus, K. (2002). Self-control and alcohol restraint: An initial application of the self-control strength model. *Psychology of Addictive Behaviors, 16*, 113–120.

Muraven, M., Gagne, M., & Rosman, H. (2008). Helpful self-control: Autonomy support, vitality, and depletion. *Journal of Experimental Social Psychology, 44*, 573–585.

Muraven, M., Shmueli, D., & Burkley, E. (2006). Conserving self-control strength. *Personality Processes and Individual Differences*, *91*(3), 524–537.

Muraven, M., & Slessareva, E. (2003). Mechanisms of self-control failure: Motivation and limited resources. *Personality and Social Psychology Bulletin, 29*, 894–906.

Muraven, M., Tice, D. M., & Baumeister, R. F. (1998). Self-control as a limited resource: Regulatory depletion patterns. *Journal of Personality and Social Psychology*, *74*, 774–789.

Oaten, M., & Cheng, K. (2007). Improvements in self-control from financial monitoring. *Journal of Economic Psychology*, *28*, 487–501.

Oaten, M., Williams, K. D., Jones, A., & Zadro, L. (2008). The effects of ostracism on self regulation in the socially anxious. *Journal of Social and Clinical Psychology, 27*, 471–504.

Price, D. A., & Yates, G. C. R. (2010). Ego depletion effects on mathematics performance in primary school students: why take the hard road? *Educational Psychology: An International Journal of Experimental Educational Psychology*, *30*(3), 269–281.

Price, D. A., & Yates, G. C. R. (2013). Impact of a brief ego depletion procedure on creative behaviour in the upper primary classroom. *Educational Psychology: An International Journal, 0*, 1–13.

Rivkin, S. G., Hanushek, E. A., & Kain, J. F. (2005). Teachers, schools, and academic achievement. *Econometrica*, *73*, 417–458.

Rohde, T. E., & Thompson, L. A. (2007). Predicting academic achievement with cognitive ability. *Intelligence*, *35*(1), 83–92.

Rothbart, M.K., & Derryberry, D. (1981). Development of individual differences in temperament. In M.E. Lamb & A. Brown (Eds.), *Advances in developmental psychology* (Vol. 1, pp. 37–86). Hillsdale, NJ: Erlbaum.

Rottenstreich, Y., Sood, S., & Brenner, L. (2007). Feeling and thinking in memory based versus stimulus-based choices. *Journal of Consumer Research*, *33*, 461–469.

Ryan, R. M. (1993). Agency and organization: Intrinsic motivation, autonomy and the self in psychological development. In J. Jacobs (Ed.), Nebraska symposium on motivation (Vol. 40, pp. 1–56). Lincoln, NE: University of Nebraska Press.

Schimmack, U. (2012). The ironic effect of significant results on the credibility of multiple-study articles.*Psychological Methods*, *17*(4), 551–566.

Schmeichel, B. J., & Vohs, K. (2009). Self-affirmation and self-control: affirming core values counteracts ego depletion. *Journal of Personality and Social Psychology*, *96*(4), 770–82.

Schmeichel, B. J., & Zell, A. (2007). Trait self-control predicts performance on behavioral tests of self-control. *Journal of Personality, 75*, 743–755.

Segal, Z. V., Williams, M. G., & Teasdale, J. D. (2012). *Mindfulness-based cognitive therapy for depression* (2nd ed.). New York: Guilford Press.

Segerstrom, S. C., Solberg Nes, L. (2007). Heart rate variability indexes self-regulatory strength, effort, and fatigue. *Psychological Science*, *18*, 275–281.

Shiv, B., & Fedorikhin, A. (1999). Heart and mind in conflict: the interplay of affect and cognition in consumer decision making. *Journal of Consumer Research*, *26,* 278–292.

Skinner, B. F. (1938). *The behaviour of organisms.* New York: Appleton-Century-Crofts.

Sterne, J. A., Gavaghan, D., & Egger, M. (2000). Publication and related bias in meta-analysis: power of statistical tests and prevalence in the literature. *Journal of Clinical Epidemiology*, *53*, 1119–*1129.*

Stillman, T. F., Tice, D. M., Fincham, F. D., & Lambert, N. M. (2009). The psychological presence of family improves self-control. *Journal of Social and Clinical Psychology, 28*, 498–529.

Stroop, J. R. (1935). Studies of interference in serial verbal reactions. *Journal of Experimental Psychology*, *18*, 643–662.

Sweller, J. (1994). Cognitive load theory, learning difficulty, and instructional design. *Learning and Instruction*, *4,* 295–312.

Tagney, J. P., Baumeister, R. F., & Boone, A. L. (2004). High self-control predicts good adjustment, less pathology, better grades, and interpersonal success. *Journal of Personality*, *72*(2), 271–324.

Tice, D. M., Baumeister, R. F., Shmueli, D., & Muraven, M. (2007). Restoring the self: Positive affect helps improve self-regulation following ego depletion. *Journal of Experimental Social Psychology, 43*, 379–384.

Tsukayama, E., Duckworth, A. L., & Kim, B. E. (2013). Domain-specific impulsivity in school-age children. *Developmental Science*, *16*, 879–893.

Tyler, J. M., & Burns, K. C. (2009). Triggering conservation of the self's regulatory resources. *Basic and Applied Social Psychology, 31*, 255–266.

Tyler, J. M., & Burns, K. C. (2008). After depletion: The replenishment of the self's regulatory resources. *Self and Identity, 7*, 305–321.

Vitaro, F., Brendgen, M., Larose, S., & Tremblay, R. E. (2005). Kindergarten disruptive behaviors, protective factors, and educational achievement by early adulthood. *Journal of Educational Psychology*, *97*(4), 617–629.

Vohs, K. D., & Baumeister, R. F. (2011). *Handbook of self-regulation: Research, theory, and applications* (2nd edition). New York, NY: Guilford.

Vohs, K. D., Baumeister, R. F., Schmeichel, B. J., Twenge, J. M., Nelson, N. M., & Tice, D. M. (2008). Making choices impairs subsequent self-control: A limited resource account of decision making, self-regulation, and active initiative. *Journal of Personality and Social Psychology*, *94,* 883–898.

Vohs, K. D., Baumeister, R. F., Schmeichel, B. J. (2013). Erratum to "Motivation, personal beliefs, and limited resources all contribute to self-control". *Journal of Experimental Social Psychology*, *49*(1), 184–188.

Vohs, K. D., Baumeister, R. F., Vonasch, A., Pocheptsova, A., & Dhar, R. (2014). Self-control resource depletion impairs active initiative and thus produces passivity. (Unpublished manuscript), Minneapolis: University of Minnesota.

Vohs, K. D., & Heatherton, T. F. (2000). Self-regulatory failure: A resource-depletion approach. *Psychological Science, 11*, 249–254.

Wallace, H. M., & Baumeister, R. F. (2002). The effects of success versus failure feedback on self-control. *Self and Identity, 1*, 35–42.

Wan, E. W., & Sternthal, B. (2008). Regulating the effects of depletion through monitoring. *Personality and Social Psychology Bulletin, 34*, 32–46.

Wenk-Sormaz, H. (2005). Meditation can reduce habitual responding. *Alternative Therapies in Health & Medicine*, *11*, 42–58.

Wills, T. A., & Dishion, T. J. (2004). Temperament and adolescent substance use: A transactional analysis of emerging self-control. *Journal of Clinical Child and Adolescent Psychology, 33*, 69–81.

Wright, R. A., Stewart, C. C., & Barnett, B. R. (2008). Mental fatigue influence on effort related cardiovascular response: Extension across the regulatory (inhibitory)/nonregulatory performance dimension. *International Journal of Psychophysiology, 69*, 127–133.

Yusainy, C., & Lawrence, C. (2015). Brief mindfulness induction could reduce aggression after depletion. *Consciousness and Cognition*, *33,* 125–134.

Part 2: Major Research Journal Article

1. Abstract

The resource, or strength, model of self-control (Baumeister, Heatherton & Tice, 1994) suggests that individuals possess a limited resource of strength, or energy, which is depleted by acts of self-control, leading to reduced performance on a subsequent, unrelated, self-control task (Muraven, Tice & Baumeister, 1998). This decrease in self-control has been labelled 'ego depletion' (Baumeister et al., 1998). Review of the research literature reveals an impressive array of effects linked with ego depletion; however, the majority of these studies have focused on depletion in adults. The present study aimed to extend the research literature in this area by investigating the ego depletion effect in 89 primary school children aged between 10 and 11 years. A dual-task procedure was used to investigate the potential ego depletion effect of a brief thought suppression task upon a subsequent task of receptive attention. In addition, the current study aimed to find out whether trait mindfulness (i.e., a disposition towards open and non-judgemental awareness of one's self and attention to the moment) can counteract ego depletion in children (Baer, Smith, Hopkins, Krietemeyer & Toney, 2006; Bishop et al., 2004; Brown & Ryan, 2007a). No significant effect of ego depletion on performance in the second self-control task was found. A borderline significant effect of ego depletion on the children's perceived difficulty of the second self-control task was found. Trait mindfulness was found to be a significant predictor of children's perceived difficulty of the second self-control task. No significant moderation effect of ego depletion by trait mindfulness was found. Implications are explored and future directions discussed.

2. Introduction

Self-control involves working toward the attainment of long term goals at the expense of gratifying smaller, immediate, rewards (Baumeister, 2014). Self-control is difficult to exercise, e.g., resisting unhealthy favoured food in order to reach a desired weight. The rewards for exerting self-control at school, e.g., academic attainment, are more abstract but nonetheless important. Tsukayama, Duckworth and Kim (2013) asked children from a variety of socioeconomic backgrounds to give examples of the situations they found most challenging to their self-control. The most common responses were: paying attention in class; going to bed at a sensible time; rechecking work before handing it in; listening to others when they felt the urge to interrupt; and controlling their temper when provoked. It has been shown that children who are more able to exert self-control over their emotions, behaviour and attention perform better academically (Alloway & Alloway, 2010; Checa, Rodriguez-Bailon & Rueda, 2008; Duckworth, Tsukayama & May, 2010). In addition, the benefits of self-control go beyond school and predict social, emotional and economic outcomes in adulthood with a similar degree of accuracy to socioeconomic status and intelligence (Moffitt et al., 2011).

Human beings possess the ability to override impulsive behaviours, emotions and thoughts in order to determine how they act. It has been suggested that many behavioural and social problems, such as gambling problems, obesity, and drug abuse, are related to failures of self-control (Baumeister et al., 1994; Baumeister, Muraven & Tice, 2000). The ability to inhibit or refrain from impulsive behaviours is an adaptive skill for functioning within wider society. It is also associated with a range of positive outcomes that include academic and career success, improved health and reduced proneness to criminality (Gailliot & Baumeister, 2007; Hammer, 2005; Tangney, Baumeister & Boone, 2004).

2.1 A Definition of Self-Control

Although the terms self-control, self-regulation and willpower are often used interchangeably, there is growing consensus on the conception of self-control as "…the

voluntary regulation of attentional, emotional and behavioural impulses when immediate temptations conflict with more enduringly valued goals" (Duckworth, Gendler & Gross, 2014, p. 200). This is the definition used in the current study.

2.2 The Resource Model of Self-Control

A particularly influential theory in recent years is the resource, or strength, model of self-control (Baumeister et al., 1994). This model is based upon a simple idea: that individuals have a limited resource of strength, or energy, which is depleted by acts of self-control, leading to impaired performance on a subsequent, unrelated, self-control task (Muraven et al., 1998). This reduction in self-control has been termed the 'ego depletion effect' (Baumeister, Bratslavky, Muraven & Tice, 1998). The most commonly used procedure to explore the ego depletion effect involves the use of two dissimilar self-control tasks, referred to as the 'dual-task' paradigm (Baumeister et al., 1998). In this procedure, participants allocated to an experimental ego-depletion group carry out two successive self-control tasks, whereas for participants in the control group only the second task involves self-control. According to the resource model, participants in the experimental group would be predicted to perform less well on the second self-control task due to the depletion of their self-control resources during the first task (Baumeister, Vohs & Tice, 2007). A lot of the research on the resource model has focused on short-term states of self-control depletion; however, the model also predicts individual (trait) differences in self-control capacity, and that individuals with high trait self-control possess a greater reserve of self-control (Ent, Baumeister & Tice, 2015; Tangney et al., 2004), and are less affected by ego depletion (Dvorak & Simons, 2009).

Findings from over 100 studies support the resource model across a variety of self-control domains that include controlling attention, emotions, thoughts, impulses, and cognitive processing (Baumeister et al., 2007; Hagger, Wood, Stiff & Chatzisarantis, 2010). However, to the researcher's knowledge only two studies have explored ego depletion in school-aged children. Price and Yates (2013) reported a significant depletion effect on creativity. Price and Yates (2010) also found reduced motivation to engage in progressively harder tasks. The second article is particularly relevant to

educational psychology given that ego depleted pupils continued to choose to work on easy tasks.

2.3 Self-Control and Attention

Much of the recent interest in self-control stems from the possibility of finding ways to increase self-control (Inzlicht, Legault & Teper, 2014). Although findings suggest that ego depletion can be alleviated by sleep, rest, positive emotions and glucose supplements (Baumeister, 2002; Gailiot et al., 2007), these strategies may be an impractical way of boosting self-regulatory capacity.

The role of attention in self-control has received renewed interest in recent years and may offer more practical and effective strategies to support self-control. Cybernetic theories of self-regulation (e.g., Carver & Scheier, 1981, 2011) assert that attention enhances self-regulation through the monitoring of one's current state against a pre-determined goal or standard. Similarly, in Inzlicht and Schmeichel's (2012) process model, ego depletion results from motivational and attentional shifts away from restrictions and the monitoring of discrepancies between current and desired states, towards gratification and the possibility of rewards. If an individual's ability to attend to the moment influences the frequency of ego depleting shifts in motivation and attention, then it is plausible that the attentional qualities associated with mindfulness, considered to be "bare attention" to the moment, may reduce depletion (Gunaratana, 2002, p. 132). This possibility is explored in the following section.

2.4 Mindfulness

Interest in mindfulness has grown rapidly over the last 20 years (Brown, Ryan & Creswell, 2007a), and is increasingly being recognised as an important phenomenon in clinical and educational contexts (Greco, Baer & Smith, 2011). Mindfulness is often conceptualised as an open and non-judgemental state of mind and the self-regulation of attention toward the present (Baer et al., 2006; Bishop et al., 2004; Brown & Ryan, 2003; Bishop et al., 2004; Kabat-Zinn, 1990). Bishop et al. (2004) propose that mindfulness is related to increases in attention, attention switching and the ability to

disengage from elaborative processing of thoughts and feelings that can hinder task completion. Furthermore, studies using the Mindful Attention Awareness Scale (Brown & Ryan, 2003) have reported wide variation in mindfulness scores in people who have not participated in mindfulness training, suggesting that mindfulness is a trait as well as a state (e.g., Brown & Ryan, 2003; Kabat-Zinn, 2003).

2.4.1 Mindfulness-based approaches.

The psychological conception of mindfulness has tended to focus on attentional control (Carmody, 2009), and the development of mindfulness-based approaches designed to teach a range of skills. For example, Wenk-Sormaz (2005) reported that adults who experienced a meditation exercise made fewer habitual responses on a category generation task, suggesting that meditation can reduce habitual responses. Research into the use of mindfulness-based approaches with young people in education is growing steadily (Greco, Baer & Smith, 2011; Harnett & Dawe, 2012). Huppert and Johnson (2010) assessed the impact of the four week 'Mindfulness in Schools' curriculum and found significant improvements in mindfulness, flexibility toward changing demands and psychological wellbeing. Furthermore, Flook at al. (2010) assessed an eight-week 'Inner Kids' mindfulness skills programme and reported that children with lower pre-course self-regulation made the greatest gains in behavioural regulation, metacognition and executive function (i.e., planning, controlling actions and paying attention).

2.4.2 Mindfulness and self-control.

Masicampo and Baumeister (2007) proposed that self-control and mindfulness may be related in two ways: 1) mindfulness-based approaches involve the exercise of self-control, which leads to an increase in self-control capacity; and 2) mindfulness is a product of successful self-control. However, Brown and Ryan (2003) assert that these are separate constructs, arguing that, whereas mindful regulation is stimulating and reviving, self-controlled regulation is depleting, reflecting the number of positive outcomes (e.g., persistence and enjoyment) often associated with autonomous behavioural regulation, as opposed to the negative outcomes often associated with

behaviours regulated by self-control (Ryan & Deci, 2000, Brown, Ryan & Creswell, 2007b).

2.4.3 Mindfulness and ego-depletion.

Research into the impact of mindfulness upon ego depletion is in its infancy. Using a dual-task procedure, Friese, Massner and Schaffner (2012) found that a brief mindfulness meditation was enough to counteract the depleting effects of emotion suppression upon a subsequent self-control task involving attention. Furthermore, it has been demonstrated that trait mindfulness can be modified by mindfulness-based approaches. Jordan, Wang, Donatoni and Meier (2014) investigated whether trait mindfulness can predict either a healthy or unhealthy snack choice, or whether ego depletion affects less mindful people more than more mindful people when making this choice. They found that more mindful people reported greater self-control strength and made more healthy food choices; however, ego depletion did not predict food choice, which meant that the moderation of depletion by mindfulness could not be explored.

2.5 Research Aims and Hypotheses

This current study aims to make a contribution to the small research literature on ego depletion in children by investigating whether the exertion of self-control during a thought suppression task leads to depletion effects on a subsequent, and unrelated, self-control task involving receptive attention. As significant effect sizes for ego depletion on effort, perceived difficulty and negative affect have been reported (Hagger et al., 2010), similar indicators of depletion were used in this study, i.e., performance on a test of receptive attention, enjoyment of this test, and perceived difficulty of this test.

Given the potential consequences of self-control failure, one challenge is to find ways to support self-control even when resources are depleted. Therefore, an additional aim of this study is to determine whether more mindful children are less affected by ego depletion as a result of increased attention to, and awareness of, the present moment. Although mindfulness-based approaches have become increasingly

used by applied psychologists (Christopher & Maris, 2010), such approaches have had less impact on the practice of educational psychologists (Burke, 2010). A better understanding of the relationship between trait mindfulness and ego depletion could provide educational psychologists with additional strategies to support self-control in children. The current study aims to test the following hypotheses at an alpha level of < .05:

Hypothesis 1: The exertion of self-control in one task will result in depletion effects on a subsequent self-control task in children.

Hypothesis 1a: Children in the experimental (white bear) condition will perform less well on the Receptive Attention subtest than children in the control condition.

Hypothesis 1b: Children in the experimental (white bear) condition will rate the Receptive Attention subtest as more difficult than children in the control condition.

Hypothesis 1c: Children in the experimental (white bear) condition will rate the Receptive Attention subtest as less enjoyable than children in the control condition.

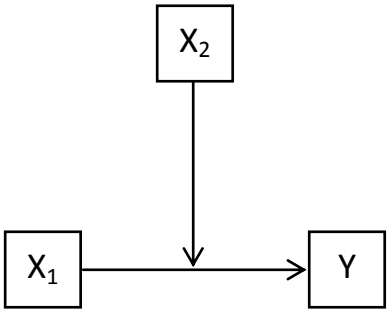
Hypothesis 2: Ego depletion will affect less mindful children more than mindful children (Figure 1).

Hypothesis 2a: Trait mindfulness will moderate the ego depletion effect on children's performance on the Receptive Attention subtest.

Hypothesis 2b: Trait mindfulness will moderate the ego depletion effect on children's ratings of difficulty of the Receptive Attention subtest.

Hypothesis 2c: Trait mindfulness will moderate the ego depletion effect on children's ratings of enjoyment of the Receptive Attention subtest.

Figure 1. Path Model Illustrating the Moderation of Ego Depletion (Condition-Outcome Relationship) by Trait Mindfulness.



Note. X_1 = predictor variable (control vs. experimental (ego depletion) condition), X_2 = predictor variable (trait mindfulness), Y = outcome variable (performance on the Receptive Attention subtest, perceived difficulty of this subtest, or enjoyment of this subtest). In this model the causal effect of X_1 on Y is moderated by the effect of X_2**.** Model reproduced from Warner (2013).

3. Method

3.1 Epistemology and Design

A critical realist perspective was adopted because this allowed the researcher to present one explanation of reality whilst recognising the validity of multiple explanations or 'truths' that considered the researcher's influence and the social, cultural and historical context in which data collection and analysis took place. This epistemology shaped the experimental research design, including the decision to carry out hierarchical multiple regression analyses.

3.2 Participants

A total of 89 pupils participated in the study from eight Year 6 classes across different schools. The pupils were aged between 9.93 and 11.32 years (Mean = 10.65 years). The sample consisted of 42 males and 46 females. This sample size, with 5 independent variables, is larger than the minimum number of 75 (i.e., ratio of 15 participants for each predictor) recommended for multivariate analysis (Stevens, 2002). Children were excluded from the study if informed consent had not been obtained from both themselves and a parent or guardian, and if they had a visual impairment that could affect their ability to locate target letters in the Receptive Attention subtest. The mindfulness measure used in the current study was designed for use with children aged between 8 and 12 years, therefore Year 6 pupils were chosen as their mean age would be similar to the mid-point of this range.

3.3 Ethical Considerations

Ethical approval was sought from the School of Psychology Ethics Committee at Cardiff University. All data were anonymised once collection was complete. An information sheet was provided to parents/guardians (Appendix 4) and pupils (Appendix 5) and informed consent was obtained from both prior to pupils participating in the study. Following participation, pupils were involved in a verbal debriefing session and a debriefing form was given to the pupils (Appendix 7) and their parents/guardians

(Appendix 6). Additional time was set aside after the experiment for the children to ask the researcher questions.

3.4 Measures

3.4.1 Mindful Attention Awareness Scale – Children (MAAS-C).

Trait mindfulness was measured using the Mindful Attention Awareness Scale – Children (MAAS-C) (Benn, 2004; cited in Lawlor, Schonert-Reichl, Gadermann & Zumbo, 2013), (Appendix 1). Pupils rated 15 questions relating to the absence of attention to, and awareness of, the present in daily life (e.g., I walk into a room, and then wonder why I went there) using a 6-point Likert-scale (1 = almost never, 6 = almost always). Items were reverse-scored and then averaged to derive a trait mindfulness score, with higher scores indicating higher levels of trait mindfulness.

3.4.2 Receptive Attention subtest.

The Receptive Attention (RA) subtest is a standardised test of receptive attention taken from the Cognitive Assessment System (Naglieri & Das, 1997). Pupils were asked to underline, row by row, 'target' letter pairs (i.e., letter pairs that have the same name) from one page of the subtest. This page contained 200 pairs of letters with 50 targets (25%) and the same number of distracters (Appendix 8). Pupil performance on this task was calculated as the ratio of the accuracy (i.e., number correctly identified minus the number of false detections) and the total time taken across the item. This test is similar to the structure of the 'crossing-out-letters task' frequently employed as the second self-control task in dual-task paradigm experiments (Hagger et al., 2010). It requires the control of attention in order to accurately and rapidly identify targets, as well as to inhibit attention given to distracters that are the same in terms of being upper or lower case. Therefore, the RA subtest satisfies two frequently recognised elements of self-control, i.e., attention and inhibitory control (Baumeister et al., 2007).

3.4.3 Single item measure of Receptive Attention subtest perceived difficulty.

Pupil reports of their enjoyment of the task were measured using a single-item Likert scale devised by the researcher (Appendix 2). Pupils were given the question "How enjoyable was the 'Find the Letters' activity?" and asked to circle one answer on a five-point response scale (1 = Very enjoyable, 5 = Not at all).

3.4.4 Single item measure of Receptive Attention subtest enjoyment.

Pupils were asked to report how difficult they found the attention task (Appendix 2). This was measured using a single-item Likert scale created by the researcher. Pupils were given the 'stem' statement "Was the 'Find the Letters' activity:" before being asked to circle one answer on a five-point response scale (1 = Very easy, 5 = Very hard).

3.4.5 Single item measure of fatigue.

Pupils were asked to rate how tired they felt on the day of the experiment (Appendix 2). This was measured using a single-item Likert scale in which participants were given the question: "How tired do you feel today?" Participants were asked to circle one answer on a five-point response scale (1 = Not tired at all, 5 = Very tired).

3.4.6 Reliability of measures.

A validation study carried out by Lawlor, Schonert-Reichl, Gadermann and Zumbo (2013) reported that the MAAS-C has high internal consistency, with all item scales exceeding the recommended minimum for test score reliability ($\alpha = 0.60$), suggesting that all items measured the same construct.

3.5 Procedure

A gatekeeper letter (Appendix 3) was sent to the head teacher of ten schools and included copies of the parent consent form/information letter and pupil consent form/information sheet. Eight head teachers agreed to participate in the study. Copies of the information sheet and consent forms were sent to Year 6 teachers in participating schools. Parents and pupils were asked to return the signed consent forms by the date of the experiment to 'opt in' to the study.

Pupils completed the experiment together in a classroom with the class teacher. All experiments were carried out between 9:30 and 10:00 am on a Friday to control for time of day/day of week effects. Whole classes were assigned to either the control or experimental (white bear) condition, with each pupil completing a version of the white bear task before completing a second self-control task (RA subtest). Each pupil was given a booklet containing all experiment materials. The researcher explained how to complete the MAAS-C, (Benn, 2004; cited in Lawlor et al., 2013), and read each statement aloud.

Pupils in both groups were asked to spend two minutes thinking about the animals they might see at the zoo. Pupils in the white bear group were also asked to avoid thinking about a white bear. This thought suppression task, created by Wegner, Schneider, Carter, and White (1987), has been found to induce ego depletion in adults. Instructions were provided in written form in the booklet and read aloud by the researcher.

Immediately after this, pupils completed a brief practice version of the RA subtest (containing 30 letter pairs). The researcher read aloud the directions given in the Cognitive Assessment System (Naglieri & Das, 1997) administration manual (Appendix 9). Pupils were then instructed to complete the RA subtest from left to right and top to bottom, underlining, row by row, all of the letter pairs that were the same (e.g., BB, bb but not Bd).

A digital clock was placed in full view of all pupils. Pupils completing the task within three minutes were instructed to record their completion time in the booklet

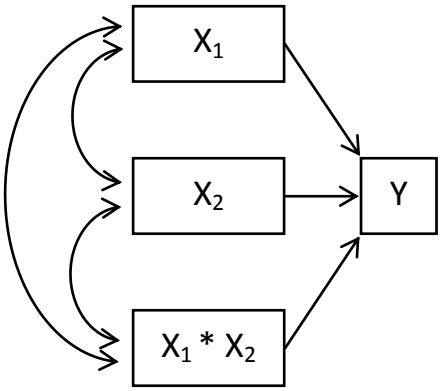
and wait for instruction. Pupils were then asked to complete five Likert items about their perceptions of the thought suppression and attention tasks and one item about how tired they felt on the day (Appendix 2).

3.6 Data Analysis

Data were inputted into SPSS (Statistical Package for Social Scientists) and inspected to check for missing and inaccurate information and that the assumptions for multivariate analysis had not been violated. After conducting descriptive analyses, a number of Pearson Product-Moment Correlation Coefficient analyses were performed to measure the association between the predictor variables and to examine the data for multicollinearity, i.e., the extent to which independent variables correlate with each other (Thompson, 2006).

To test Hypothesis 1, three between-subjects one-way Analysis of Variance (ANOVA) procedures were conducted to test for a difference between the control and white bear groups on the outcome variables: performance on the RA subtest (Attention); enjoyment of this test (Enjoyment); and perceived difficulty of this test (Difficulty). To test Hypothesis 2, three hierarchical multiple regression analyses were performed. Prior to performing the regressions, the predictor variable 'Condition', i.e., control or white bear (ego depletion) group, was effect coded as a dichotomous variable (i.e., 1 = white bear, -1 = control). The predictor variable 'Mindfulness' (MAAS-C score) was computed as a mean-centred continuous variable. To test whether trait mindfulness can moderate the effects of ego depletion on the outcome variables, a new predictor variable called Mindfulness*Condition (a product of Mindfulness and Condition) was added to each regression (Figure 2). Regression models were used to test how well the outcome variables could be predicted by the predictor variables. Gender was controlled for in all regressions as research suggests there may be an effect of gender on performance on the RA subtest (Naglieri & Rojahn, 2001). An alpha level of $< .05$ was used for all analyses.

Figure 2. Path Model of the Statistical Moderation of Ego Depletion (Condition-Outcome Relationship) by Trait Mindfulness.



Note. X_1 = predictor variable (control vs. experimental (ego depletion) condition), X_2 = predictor variable (trait mindfulness), Y = outcome variable (performance on the Receptive Attention subtest, perceived difficulty of this subtest, or enjoyment of this subtest). In this model the moderation (interaction) between the predictor variables X_1 and X_2 is assessed by including the product of X_1 and X_2 as an additional predictor variable. Y is predicted from these three variables, which are sometimes correlated with each other. Model reproduced from Warner (2013).

4. Results

4.1 Descriptive Statistics.

4.1.1 Mean trait mindfulness scores.

The mean self-reported trait mindfulness score for all pupils was 3.96 (minimum = 1, maximum = 6), with 84% of pupils scoring between 3 and 5.

4.1.2 Perceived difficulty of the Receptive Attention subtest.

Pupils in the white bear group rated the RA subtest as more difficult (Mean = 2.63 out of 5, 1 = 'Very easy' 5 = 'Very hard') than those in the control group (Mean = 2.35). Furthermore, 58% of pupils in the white bear group (25 out of 43) rated the difficulty of the RA subtest as a 3 or above in comparison with just 34% in the control group.

4.1.3 Performance on the Receptive Attention subtest.

Pupils in the control group performed marginally better (Mean = 7.79) on the RA subtest than pupils in the white bear group (Mean = 7.62).

4.1.4 Enjoyment of the Receptive Attention subtest.

Pupils in the white bear group reported Task 2 to be marginally more enjoyable (Mean = 2.02 out of 5, 1 = 'Very Enjoyable', 5 = 'Not at all') than pupils in the control group (Mean = 2.15) (Table 1).

Table 1

Descriptive Statistics: Means and Standard Deviations for Receptive Attention Subtest Scores and Ratings of Perceived Difficulty and Enjoyment.

Variable	Group	N	Mean	SD
Attention	Control	46	7.79	3.08
	White Bear	43	7.62	3.35
Difficulty	Control	46	2.35	.71
	White Bear	43	2.63	.926
Enjoyment	Control	46	2.15	.84
	White Bear	43	2.02	.859

Note. SD = standard deviation. Attention = score on the Receptive Attention subtest, Difficulty = subjective rating of the difficulty of the Receptive Attention subtest; Enjoyment = rating of enjoyment of the Receptive Attention subtest.

4.2 Measures of Reliability

Data entered into SPSS were scrutinised for accuracy and missing values, and to check that the assumptions of multivariate analysis were robust to violation.

4.2.1 Missing data.

Pupil ratings of task 1 ('zoo' and 'white bear' activity) enjoyment and difficulty were missing data from 34% of the sample. Therefore, these variables were excluded from all analyses. One value for age and another for gender were missing from the data.

4.2.2 Assumptions of multivariate analysis.

4.2.2.1 Variables are measured without error.

Lawlor et al. (2013) reported that the MAAS-C has high internal consistency ($\alpha = 0.84$), suggesting that this is a reliable measure of the trait mindfulness construct.

4.2.2.2 Variables are normally distributed.

Pearson's Skewness Index was found to be less than 1 and greater than -1 for each variable, indicating that the data were normally distributed.

4.2.2.3 Homoscedasticity.

Visual inspection of the plot of standardised residuals revealed that the assumptions of homoscedasticity, i.e., residuals are approximately equal across predictor variables, were not violated. Preliminary analyses were performed to check for outliers (i.e., data points that are far from the group mean). Standardised residuals for the predictors Attention and Difficulty were less than 3.3 or more than -3.3 away from the mean, indicating that there were no outliers (Weiner, Schinka & Velicer, 2003). One standardised residual was slightly outside this range (-3.542) for the predictor Enjoyment.

4.2.2.4 The relationship between predictor and outcome variable(s) is linear.

To check for linearity, partial regression plots between the predictor and outcome variables were visually examined and the indication was that there were no concerns. A series of Pearson Product-Moment Correlation Coefficient analyses were performed to measure association between the predictor and outcome variables (Table 2). The data were inspected for multicollinearity, i.e., the extent to which predictor variables correlate with each other (Thompson, 2006). All collinearity tolerance values were near .1 and all variance inflation factor values, i.e., how much a variable contributes to the standard error in the regression, were less than 10, indicating that multicollinearity was unlikely to be a concern (Tabachnick & Fidell, 2013).

Table 2

Pearson Product-Moment Correlation Coefficients between Predictor Variables and Outcome Variables.

Variable	A	D	E	M	C	M*C	F	G
Attention (A)	1							
Difficulty (D)	.014	1						
Enjoyment (E)	-.183*	.456**	1					
Mindfulness (M)	.175[BS]	-.277**	-.142	1				
Condition (C)	-.026	.170[BS]	-.076	-.113	1			
M*C	.030	.088	-.111	-.05	-.008	1		
Fatigue (F)	-.086	.217*	.180*	-.2*	.071	.166	1	
Gender (G)	-.142	-.042	-.049	-.069	-.069	-.183*	-.121	1

Note. Statistical significance (1-tailed): * Significant at the $p < .05$ level ** Significant at the $p < .01$ level, [BS] Borderline Significant at $p \leq .055$. Outcome variables: Attention = score on the Receptive Attention subtest, Difficulty = subjective rating of the difficulty of the Receptive Attention subtest; Enjoyment = rating of enjoyment of the Receptive Attention subtest. Predictor variables: Mindfulness = MAAS-C trait mindfulness score; Condition = ego depletion; M*C = interaction between the predictors Mindfulness and Condition.

4.3 Ego Depletion in Children

To test Hypothesis 1, between subjects one-way ANOVAs were conducted to determine whether there were differences between the groups on the RA subtest for the outcome variables Attention, Difficulty, and Enjoyment. The results for each ANOVA are presented below.

4.3.1 Hypothesis 1a: Children in the experimental (white bear) condition will perform less well on the Receptive Attention subtest than children in the control condition.

Performance on the RA subtest score (Attention) was not significantly lower in the white bear group than the control group F(1, 87) = .059, p =.406 (1-tailed). Therefore, the Null Hypothesis must be accepted that there is no statistically significant difference between the groups in terms of performance on this task.

4.3.2 Hypothesis 1b: Children in the experimental (white bear) condition will rate the Receptive Attention subtest as more difficult than children in the control condition.

Subjective ratings of the difficulty of the RA subtest were borderline significantly higher in the white bear group than the control group, F(1, 87) = 2.594, p = .055 (1-tailed). Therefore, the Null Hypothesis must be accepted that there is no statistically significant difference between the groups in terms of subjective ratings of the difficulty of this task.

4.3.3 Hypothesis 1c: Children in the experimental (white bear) condition will rate the Receptive Attention subtest as less enjoyable than children in the control condition.

Ratings of the enjoyment of the RA subtest were not significantly higher (i.e., less enjoyable) in the white bear group than the control group, *F*(1, 87) = .511, *p* = .239 (1-tailed). Therefore, the Null Hypothesis must be accepted that there is no statistically significant difference between the groups in terms of ratings of enjoyment of Task 2.

These findings do not support Hypothesis 1, which predicted that pupils in the white bear group would perform significantly less well on the RA subtest and rate this task as more difficult and less enjoyable. However, the borderline significant result for ratings of perceived difficulty of the RA task suggests that a mild depletion effect may have occurred.

4.4 Moderation of Ego Depletion in Children

In order to test Hypothesis 2, three hierarchical multiple regression analyses were performed to determine whether trait mindfulness has a moderating effect upon ego depletion. Gender and fatigue were controlled for at Step 1 in each regression. The predictor variables Mindfulness (MAAS-C score), Condition (white bear or control group) and the interaction variable Mindfulness*Condition were added at Step 2 in each regression.

4.4.1 Hypothesis 2a: Trait mindfulness will moderate the ego depletion effect on children's performance on the Receptive Attention subtest.

Attention was regressed against the predictor variables in order to test Hypothesis 2a. The addition of the predictors at Step 2 explained 5.3% of the variance for scores on the RA subtest, R^2 = .053, $F(5, 82)$ = .913, p = .477, which was an additional 2.2% of the variance after controlling for gender and fatigue at Step 1, R^2 Change = .022; $F(3, 82)$ = .634; p = .595 (Table 3).

Mindfulness*Condition (β = .025, p = .823), Condition (β = -.011, p = .917) and Mindfulness (β = .149, p = .182) were not statistically significant predictors of pupil scores on the RA subtest. Therefore, the Null Hypothesis must be accepted that trait mindfulness does not moderate the effect of ego depletion on task performance.

Table 3

Hierarchical Multiple Regression Analysis of Predictor Variables and Pupil Performance on the Receptive Attention Subtest.

	R	R^2	R^2 *Change*	B	*SE*	β	*T*	*Sig*
Step 1	.175	.031						
Gender				-.496	.344	-.155	-1.441	.153
Fatigue				-.261	.272	-.103	-.958	.341
Step 2	.230	.053	.022					
Gender				-.440	.354	-.138	-1.242	.218
Fatigue				-.189	.283	-.075	-.669	.505
Condition				-.036	.347	-.011	-.104	.917
Mindfulness				.670	.498	.149	1.345	.182
C*M				.113	.502	.025	.225	.823

Note. R^2 = explained variance, B = unstandardised coefficient, SE = standard error, β = standardised coefficient, T = t-value, Sig = significance level (p-value). Statistical significance (1-tailed): * Significant at the *p*< .05 level. Variables: Mindfulness = MAAS-C trait mindfulness score; Condition = ego depletion; C*M = interaction between the predictors Mindfulness and Condition.

4.4.2 Hypothesis 2b: Trait mindfulness will moderate the ego depletion effect on children's ratings of difficulty of the Receptive Attention subtest.

Difficulty was regressed against the predictor variables in order to test Hypothesis 2b. The addition of the predictors at Step 2 explained 12.2% of the variance for ratings of difficulty of the RA subtest, R^2 = .122, $F(3, 82) = 2.270$, p = .055, which was an additional 7.6% of the variance after controlling for gender and fatigue at Step 1, R^2 Change = .076; $F(3, 82) = 2.350$; p = .078 (Table 4).

Mindfulness (β = -.230, p < .05) was found to be a significant predictor of pupil ratings of difficulty; however, Mindfulness*Condition (β = .048, p = .655) and Condition (β = .129, p = .22) were not statistically significant predictors of pupil ratings of the difficulty of the RA subtest. Therefore, the Null Hypothesis must be accepted that trait mindfulness does not moderate the effect of ego depletion on the perceived difficulty of a task.

Table 4

Hierarchical Multiple Regression Analysis of Predictor Variables and Pupil Ratings of the Difficulty of the Receptive Attention Subtest.

	R	R^2	R^2 *Change*	B	*SE*	β	*T*	*Sig*
Step 1	.215	.046						
Gender				-.013	.088	-.016	-.152	.879
Fatigue				.139	.07	.212	1.987	.05[BS]
Step 2	.349	.122	.076					
Gender				-.018	.088	-.022	-.207	.837
Fatigue				.098	.07	.150	1.388	.169
Condition				.107	.086	.129	1.236	.22
Mindfulness				-.268	.124	-.230	-2.158	.034*
C*M				.056	.125	.048	.448	.655

Note. R^2 = explained variance, B = unstandardised coefficient, SE = standard error, β = standardised coefficient, T = t-value, Sig = reported significance level. Statistical significance (1-tailed): BS Borderline Significant at *p*< .055 level * Significant at the p< .05 level. Variables: Mindfulness = MAAS-C trait mindfulness score; Condition = ego depletion; C*M = interaction between the predictors Mindfulness and Condition.

4.4.3 Hypothesis 2c: Trait mindfulness will moderate the ego depletion effect on children's ratings of enjoyment of the Receptive Attention subtest.

Enjoyment was regressed against the predictor variables in order to test Hypothesis 2c. The addition of the predictors at Step 2 explained 8.1% of the variance for ratings of enjoyment of the RA subtest, R^2 = .081, *F*(3, 82) = 1.445, *p* = .217, which was an additional 4.8% of the variance after controlling for gender and fatigue at Step 1, R^2 Change = .048; *F*(3, 82) = 1.429; *p* = .240 (Table 5).

Mindfulness*Condition (β = -.162, p = .141), Condition (β = -.111, p = .303) and Mindfulness (β = -.131, p = .233) were not statistically significant predictors of pupil ratings of the enjoyment of the RA subtest. Therefore, the Null Hypothesis must be accepted that trait mindfulness does not moderate the effect of ego depletion on the enjoyment of a task.

Table 5

Hierarchical Multiple Regression Analysis of Predictor Variables and Pupil Ratings of Enjoyment of the Receptive Attention Subtest.

	R	R^2	R^2 *Change*	B	*SE*	β	*T*	*Sig*
Step 1	.181	.033						
Gender				-.023	.091	-.027	-.255	.799
Fatigue				.118	.072	.176	1.639	.105
Step 2	.285	.081	.025					
Gender				-.062	.093	-.074	-.675	.501
Fatigue				.120	.074	.178	1.620	.109
Condition				-.094	.091	-.111	-1.037	.303
Mindfulness				-.157	.130	-.131	-1.202	.233
C*M				.195	.131	-.162	-1.488	.141

Note. R^2 = explained variance, B = unstandardised coefficient, SE = standard error, β = standardised coefficient, T = t-value, Sig = significance level (p-value). Statistical significance (1-tailed): * Significant at the $p < .05$ level. Variables: Mindfulness = MAAS-C trait mindfulness score; Condition = ego depletion; C*M = interaction between the predictors Mindfulness and Condition.

5. Discussion

5.1 Ego Depletion in Children

Statistical analyses failed to detect any significant differences between the control and white bear groups for RA subtest performance and ratings of enjoyment, suggesting that a depletion effect did not occur. A borderline significant effect was detected for pupils' ratings of perceived difficulty of the RA subtest, i.e., pupils in the white bear group rated this task as more difficult than pupils in the control group. These results are not consistent with the resource model of self-control (Baumeister et al., 1994) and do not support the hypothesis that the exertion of self-control in one task will result in depletion effects on a subsequent self-control task in children. An alternative explanation for these null findings is that the thought-suppression task was too brief to be sufficiently demanding of the pupils' self-control resources. It is also possible that the RA subtest was not demanding enough to necessitate the exertion of self-control. These possibilities are discussed further in the limitations section.

The borderline significant finding may indicate that a mild depletion effect took place. It is possible that ratings of the RA subtest as more difficult by pupils in the white bear group represent an early indicator that their self-control resources were beginning to be put under strain, akin to light exercise in the resource model muscle analogy. This possibility is interesting given that ego depletion has been shown to reduce willingness to continue with more difficult tasks in similar aged pupils (Price & Yates, 2013). Moreover, Price and Yates found that ego depleted pupils selected easier tasks than non-ego depleted pupils, exhibiting lower achievement motivation. For some pupils, lower motivation to achieve may begin when a task stops feeling easy and starts to feel difficult.

5.2 Moderation of Ego Depletion by Trait Mindfulness in Children

The proposed moderation of ego depletion by trait mindfulness in children was not supported in the current study. It is important to note that no significant depletion effects on RA subtest performance and enjoyment were reported, and only a borderline significant effect on ratings of difficulty was found. Therefore, it was

unlikely that a moderating effect of trait mindfulness on ego depletion could be detected. This finding does not support the hypothesis that trait mindfulness can alleviate the ego depletion effect through increased attention to, and awareness of, the present moment (Brown & Ryan, 2003).

Further examination of the regression analyses revealed that trait mindfulness was a significant predictor of pupils' ratings of the difficulty of the RA subtest, i.e., pupils with higher levels of mindfulness rated the task as less difficult. One explanation is that children who are more mindful in daily life are better at attending to the present and are therefore less likely to engage in habitual responses. This is consistent with Wenk-Sormaz's (2005) findings that adults who experienced a mindfulness meditation exercise made fewer habitual responses on a word-stem completion task. As the RA subtest requires the inhibition of habitual responses, it is plausible that more mindful pupils found the task less difficult because they had engaged in fewer habitual responses.

Given that self-control is considered to be depleting, whereas mindfulness is thought to be replenishing, it is likely that pupils with high self-control could have performed just as well on the RA subtest as pupils with high mindfulness, but would have rated the task as more difficult due to the increased exertion of self-control required to inhibit habitual responses. It has been suggested that mindfulness is a product of successful self-control (Masicampo & Baumiester, 2007). If so, the fulfilment of a goal, such as correctly identifying a target in the RA subtest, would be expected to create a momentary calm and mindful state. However, it is unclear how these mindful states could have translated into a judgement of the overall difficulty of the task after these states had dispersed. If trait mindfulness and self-control are as highly related as Masicampo and Baumeister propose, then it is necessary to measure trait self-control as well as trait mindfulness; however, trait self-control was not measured in the current study. This is discussed further in the limitations.

5.3 Limitations of the Study and Implications for Future Research

5.3.1 Self-control task.

One possible reason why a significant ego depletion effect was not detected is that the thought suppression task was too brief to elicit an effect. Evidence suggests that a self-control induction as brief as three-minutes can lead to depletion in primary school-aged pupils (e.g., Price and Yates, 2010). The self-control induction employed in this study was only two minutes in duration. There may be a temporal threshold between two and three minutes that leads to ego depletion effects in children of this age. It would be facile to assume that all pupils of a similar age experience ego depletion at the same point, but this could offer a 'rule of thumb' for the effect. Future research may benefit from a longer self-control induction.

5.3.2 Ego depletion manipulation check.

The RA subtest was used to measure pupils' post-depletion performance. When used as part of the Cognitive Assessment System (Naglieri & Das, 1997), this subtest is administered in two parts. The rules of the first part are incongruous with those in the second, forcing the individual to work harder to 'unlearn' the rules of the first part, which creates greater conflict. The two parts were not administered together in this study because administration would have taken at least 6 minutes and this could have increased the likelihood of fatigue effects. In future research it may be useful to combine one half of the first part with one half of the second part of the RA subtest to create a more challenging test that is relatively quick to administer.

5.3.3 Self-report measures.

Although efforts were made by the researcher to emphasise the separate nature of the tasks before the pupils started the experiment, it is possible that the pupils in the white bear group felt that they had satisfied the researcher's requests during the first task. If so, these pupils may have felt less inclined to continue to exert effort, which may explain why they rated the second task as more difficult.

To control for the effects of fatigue, all pupils were asked to report how tired they felt on the day of the experiment. This was done after all tasks had finished so that it could be completed alongside other Likert items. However, pupils' self-judgements of fatigue on the day may have been influenced by how tired they felt after they had completed the tasks. Furthermore, had a before and after measure of fatigue been conducted the possibility that depletion results from fatigue could have been investigated.

5.3.4 Trait self-control.

Trait self-control relates to an individual's dispositional self-control capacity and has been found to be strongly related to trait mindfulness (Lakey, Campbell, Brown & Goodie, 2007). Evidence suggests that trait self-control moderates the ego depletion effect (e.g. Dvorak & Simons, 2009); however, in this study trait self-control was not accounted for. Future studies could incorporate a measure of trait self-control so that this can be controlled for when investigating the potential moderation effects of trait mindfulness.

5.4 Conclusion

Contrary to the resource model, the current study did not find evidence that the exertion of self-control in one task leads to ego depletion effects in a subsequent, unrelated, self-control task in children. Furthermore, trait mindfulness was not found to moderate (i.e., alleviate) the ego depletion effect in children. Despite the limitations, this study provides an original extension to the small body of research exploring ego depletion in school-aged children. To the researcher's knowledge, it is also the first study to investigate the potential moderation of ego depletion by trait mindfulness in children.

The finding that dispositional differences in mindfulness predicted judgements of task difficulty in school-aged children highlights a potentially important role of trait mindfulness in pupil persistence and motivation. Although significantly less research has explored the use of mindfulness-based approaches with children than with adults, there is growing evidence of the efficacy of these approaches, with children and young

people, for educational psychologists to consider. For example, Flook et al. (2010) found that mindfulness not only increased the executive functions of children aged seven to nine, but also enhanced meta-cognition and behavioural regulation. Although an extensive body of research into mindfulness-based approaches exists, further research is needed into the application of these approaches in educational psychology.

6. References

Alloway, T. P., & Alloway, R. G. (2010). Investigating the predictive roles of working memory and IQ in academic attainment. *Journal of Experimental Child Psychology*, *106*(1), 20–29.

Baer, R. A., Smith, G. T., Hopkins, J., Krietemeyer, J., & Toney, L. T. (2006). Using self-report assessment methods to explore facets of mindfulness. *Assessment*, *13*, 27–45.

Baumeister, R. F. (2014). Self-regulation, ego depletion, and inhibition. *Neuropsychologia*, *65*, 313–319.

Baumeister, R. F. (2002). Ego depletion and self-control failure: An energy model of the self's executive function. *Self and Identity*, *1*, 129–136.

Baumeister, R. F., Bratslavsky, M., Muraven, M., & Tice, D. M. (1998). Ego depletion: Is the active self a limited resource? *Journal of Personality and Social Psychology*, *74*, 1252–1265.

Baumeister, R.F., Heatherton, T.F., & Tice, D.M. (1994). *Losing control: How and why people fail at self-regulation.* San Diego, CA: Academic Press.

Baumeister, R. F., Muraven, M., & Tice, D. M. (2000). Ego depletion: A resource model of volition, self-regulation, and controlled processing. *Social Cognition*, *18*, 130–150.

Baumeister, R. F., Vohs, K. D., & Tice, D. M. (2007). The strength model of self-control. *Current Directions in Psychological Science*, *16*, 351-355.

Bishop, S. R., Lau, M., Shapiro, S., Carlson, L., Anderson, N. D., Carmody, J., ... & Devins, G. (2004). Mindfulness: A proposed operational definition. *Clinical Psychology: Science and Practice*, *11*, 230–241.

Brown, K. W., & Ryan, R. M. (2003). The benefits of being present: Mindfulness and its role in psychological well-being. *Journal of Personality and Social Psychology*, *84*, 822–848.

Brown, K.W., Ryan, R.M. & Creswell, J.D. (2007a). Mindfulness: Theoretical foundations and evidence for its salutary effects. *Psychological Inquiry*, *18*(4), 211–237

Brown, K. W., Ryan, R. M., & Creswell, J. D. (2007b). Addressing fundamental questions about mindfulness. *Psychological Inquiry, 18*(4) 272–281.

Burke, C. (2010). Mindfulness-based approaches with children and adolescents: A preliminary review of current research in an emergent field. *Journal of Child and Family Studies*, *19*, 133–144.

Carmody J. (2009). Invited commentary: evolving conceptions of mindfulness in clinical settings. *Journal of Cognitive Psychotherapy*, *23,* 270–280.

Carver, S., & Scheier, M. F. (2011). Self-regulation of action and affect. In J. Vohs, K. D., & Baumeister, R. F. (2011). Handbook of self-regulation: *Research, theory, and applications* (2nd edition). (pp. 3–21) New York, NY: Guilford.

Carver, C. S., & Scheier, M. F. (1981). *Attention and self-regulation: A control theory approach to human behavior*. New York, NY: Springer-Verlag.

Checa, P., Rodriguez-Bailon, R., & Rueda, M. R. (2008). Neurocognitive and temperamental systems of self-regulation and early adolescents' social and academic outcomes. *Mind, Brain, and Education*, *2*(4), 177–187.

Christopher, J. C., & Maris, J. A. (2010). Integrating mindfulness as self-care into counselling and psychotherapy training. *Counselling and Psychotherapy Research*, *10*(2), 114–125.

Dvorak, R. D., & Simons, J. S. (2009). Moderation of resource depletion in the self-control strength model: Differing effects of two modes of self-control. *Personality and Social Psychology Bulletin*, *35*, 572–583

Duckworth, A. L., Gendler, T.S., & Gross, J. J. (2014). Self-control in school-age children. *Educational Psychologist, 49*(3), 199–217.

Duckworth, A. L., Tsukayama, E., & May, H. (2010). Establishing causality using longitudinal hierarchical linear modeling: An illustration predicting achievement from self-control. *Social Psychological and Personality Science*, *1*, 311–317.

Ent, M. R., Baumeister, R. F., & Tice, D. M. (2015). Trait self-control and the avoidance of temptation. *Personality and Individual Difference*, *74*, 12–15.

Flook, L., Smalley, S. L., Kitil, M. J., Galla, B. M., Locke, J., Ishijima, E., ... & Kasari, C. (2010). Effects of mindful awareness practices on executive functions in elementary school children. *Journal of Applied School Psychology, 26*, 70–95.

Friese, M., Messner, C., & Schaffner, Y. (2012). Mindfulness meditation counteracts self-control depletion. *Consciousness and Cognition*, *21*, 1016–1022.

Gailliot, M. T., & Baumeister, R. F. (2007). The physiology of willpower: Linking blood glucose to self-control. *Personality and Social Psychology Review*, *11*, 303–327.

Greco, L. A., Baer, R. A., & Smith, G. T. (2011). Assessing mindfulness in children and adolescents: Development and validation of the Child and Adolescent Mindfulness Measure (CAMM). *Psychological Assessment*, *23*(3), 606–14.

Gunaratana, H. (2002). *Mindfulness in plain English*. Boston, MA: Wisdom Publications.

Hagger, M. S., Wood, C., Stiff, C., & Chatzisarantis, N. L. D. (2010). Ego depletion and the strength model of self-control: A meta-analysis. *Psychological Bulletin*, *136*, 495–525.

Hammer, E. Y. (2005). From the laboratory to the classroom and back: The science of interpersonal relationships informs teaching. *Journal of Social and Clinical Psychology*, *24*, 3–10.

Harnett, P. H., & Dawe, S. (2012). The contribution of mindfulness-based therapies for children and families and proposed conceptual integration. *Child and Adolescent Mental Health*, *17*(4), 195–208.

Huppert, F.A. & Johnson, D. M. (2010). A controlled trial of mindfulness training in schools; the importance of practice for an impact on well-being. *The Journal of Positive Psychology*, *5*(4), 264–274.

Inzlicht, M., Legault, L., & Teper, R. (2014). Exploring the mechanisms of self-control improvement. *Current Directions in Psychological Science*, *23*, 302–307

Inzlicht, M., & Schmeichel, B. J. (2012). What is ego depletion? Toward a mechanistic revision of the resource model of self-control. *Perspectives on Psychological Science*, *7*(4), 450–463.

Jordan, C., Wang, W., Donatoni, L. R., & Meier, B. P. (2014). Mindfulness eating: Trait and state mindfulness predict healthier eating behaviour. *Personality and Individual Differences*, *86*, 107–111.

Kabat-Zinn, J. (1990). *Full catastrophe living: Using the wisdom of your body and mind to face stress, pain and illness*. New York: Delacorte.

Lakey, C. E., Campbell, W. K., Brown, K. W., & Goodie, A. S. (2007). Dispositional mindfulness as a predictor of the severity of gambling outcomes. *Personality and Individual Differences*, *43*, 1698–1710.

Lawlor, M. S., Schonert-Reichl, K. A., Gadermann, A. M., & Zumbo, B. D. (2013). A validation of the mindful attention awareness scale adapted for children. *Mindfulness*. Retrieved March 16, 2014, from http://link.springer.com/article/10.1007%2Fs12671-013-0228-4#

Masicampo, E. J. & Baumeister, R. F. (2007). Relating mindfulness and self-regulatory processes. *Psychological Inquiry*, *18*(4), 255–258.

Moffitt, T. E., Arseneault, L., Belsky, D., Dickson, N., Hancox, R. J., & … Caspi, A. (2011). A gradient of childhood self-control predicts health, wealth and public safety.

Proceedings of the National Academy of Sciences in the United States, *108*(7), 2693–2698.

Muraven, M., Tice, D. M., & Baumeister, R. F. (1998). Self-control as a limited resource: Regulatory depletion patterns. *Journal of Personality and Social Psychology*, *74*, 774–789.

Naglieri, J. A., & Das, J. P. (1997). *Cognitive Assessment System*. Chicago: Riverside Publishing.

Naglieri, J. A., & Rojahn, J. (2001). Gender differences in planning, attention, simultaneous, and successive (PASS) cognitive processes and achievement. *Journal of Educational Psychology, 93*, 430–437.

Price, D. A., & Yates, G. C. R. (2013). Impact of a brief ego depletion procedure on creative behaviour in the upper primary classroom. *Educational Psychology: An International Journal, 0*, 1–13.

Price, D. A., & Yates, G. C. R. (2010). Ego depletion effects on mathematics performance in primary school students: why take the hard road? *Educational Psychology: An International Journal of Experimental Educational Psychology*, *30*(3), 269–281

Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist, 55*, 68–78.

Weiner, I. B., Schinka, J. A., & Velicer, W. F. (2003). Handbook of psychology, volume 2, research methods in psychology (2nd ed.). Newyork, NY: Wiley.

Stevens, J. (2002). Applied multivariate statistics for the social sciences (4th ed.). Mahwah, New Jersey: Lawrence Erlbaum Associates, Inc.

Tabachnick, G. G., & Fidell, L. S. (2007*). Experimental Designs Using ANOVA*. Belmont, CA: Duxbury.

Tangney, J. P., Baumeister, R. F., & Boone, A. L. (2004). High self-control predicts good adjustment, less pathology, better grades, and interpersonal success. *Journal of Personality*, *72*, 271–322.

Thompson, B. (2006). Foundations of Behavioral Statistics: An Insight-Based Approach. New York: Guilford Press.

Tsukayama, E., Duckworth, A. L., & Kim, B. E. (2013). Domain-specific impulsivity in school-age children. *Developmental Science*, *16*, 879–893.

Warner, R. M. (2013). Applied statistics: From bivariate through multivariate techniques (2nd ed.). Thousand Oaks: Sage.

Wegner, D.M., Schneider, D.J., Carter, S.R., & White, T.L. (1987).Paradoxical effects of thoughts suppression. *Journal of Personality and Social Psychology*, *53*, 5–13.

Wenk-Sormaz, H. (2005). Meditation can reduce habitual responding. *Alternative Therapies in Health & Medicine*, *11*, 42–58.

Part 3: Major Research Reflective Account

1. Introduction

The aim of this reflective account is to give an overview of the research process, including the researcher's ontological and epistemological stances, the methods employed and the way in which the data were analysed. The researcher's experience of carrying out the study as practitioner-researcher is also reflected upon. These aims are considered in two sections: the first section offers a critical consideration of the research process itself; and the second section reflects on the contribution made to knowledge, its relevance to educational psychology practice and future directions.

2. Critical Consideration of the Research Process

2.1 Origin of Research Question

The idea behind this study developed through personal reading, university-based sessions and work carried out during my second year placement. My interest in the construct of self-control, or willpower, in a school context was sparked by anecdotal experience of working with young people who found it difficult to exert self-control in order to focus on their learning. I had become particularly interested in understanding what self-control is and why some young people are more able to exert self-control than others. At the same time I had started reading a book written by Daniel Kahneman (2011) called 'Thinking, Fast and Slow,' which reframed my view of the self-control construct. The core theme of this book was decision making, principally, the concept that mental processes are directed by two distinct systems: System 1, which is fast, intuitive and impulsive; and System 2, which is slow, deliberate and controlled. Throughout the book, one idea stood out as potentially relevant to education and the practice of educational psychologists (EP), this was the idea that self-control is a limited resource and that the exertion of self-control depletes this resource further, making it more difficult to carry out a subsequent self-control task – a phenomenon called the 'ego depletion effect.' Throughout the book the ego depletion effect was only described in adults, which led me to question whether ego depletion occurs in children and young people and what research existed in this area. It occurred to me that exploring the ego depletion effect would involve an in-depth analysis of the self-

control literature, which would not only benefit my professional knowledge and understanding but could lead to the development of strategies for reducing ego depletion and/or restoring self-control in children and young people.

2.2 Exploring the Research Literature

My first consideration was that the ego depletion effect might be accounted for by fatigue, which is already a well-researched area with a range of established classroom strategies in place to deal with this issue. I decided that it was important to find out whether this was an area in which I could make a unique contribution to EP knowledge and practice. Further reading suggested that fatigue was a separate issue. The literature on ego depletion was wide, spanning three decades and more than one hundred studies. I was able to identify a large and relatively recent meta-analysis of the literature (Hagger, Wood, Stiff & Chatzisarantis, 2010). I used this to explore a large swathe of research in a short period of time in order to look for gaps and pick out any research that had been carried out with children and young people.

The findings of the meta-analysis revealed that, although many studies had been carried out into the ego depletion effect, all of these had investigated depletion in adults and mainly with undergraduate students. Given the nature of self-control and its importance to behaviour I was surprised by the lack of research with children and young people. Further research beyond the meta-analysis identified just two peer-reviewed articles that had examined depletion in a school context with children. These articles were written by the same researchers and explored the effect of depletion on creativity and mathematics performance. The researchers reported a significant effect of ego depletion on creativity (Price & Yates, 2013) and willingness to engage in progressively harder tasks (Price & Yates, 2010). The second article was particularly interesting as the researchers reported that, following a self-control task, ego depleted pupils continued to choose to work on easy tasks (Price & Yates, 2010). In contrast, control pupils began working on moderately difficult work before progressing onto more difficult items.

The findings of this review of the literature prompted me to consider that not only is little known about the ego depletion effect and its influence on young people,

but that its effect on classroom behaviour and learning may be of interest to EPs and other education professionals. I reflected on my own teaching experience and practice as a trainee EP and came to several conclusions: firstly, that pupils are expected to exert self-control in order to inhibit certain behaviours and follow school rules; secondly, pupils are required to replace their impulses with behaviours that increase their likelihood of attaining certain goals; and thirdly, the continued exertion of self-control may impair a pupil's ability to continue to exert self-control and do his or her best throughout the school day.

Having decided that ego depletion was of relevance and that little work had been carried out with children on this topic, I carried out a more comprehensive review of the literature. This was critical to identifying opportunities to carry out a unique piece of research. Most of the studies reviewed used the dual-task paradigm to identify new domains of self-control in which ego depletion could occur. Few studies focused on trying to explicate the process itself, and rarely did a study offer suggestions regarding strategies that might alleviate depletion. Studies that had explored this possibility offered suggestions in line with the resource, or strength, model of self-control (Baumeister et al., 1998), such as the benefits of rest, relaxation and glucose supplements (Gailliot et al., 2007). Subsequently, I decided that this was an under-researched area and of sufficient relevance to schools and the role of the EP to warrant investigation.

During my reading I came across a number of cybernetic and motivational theories of self-regulation (e.g., Carver & Scheier, 1981; Inzlicht & Schmeichel, 2012) that suggested that self-regulation is enhanced by attention because the more aware an individual is of internal and external experiences, the more easily that individual can detect when self-control is needed. At the time I had also been reading about mindfulness and open and non-judgemental attention to the moment (Bishop et al., 2004). This led me to hypothesise that children with high trait mindfulness may be less affected by ego depletion, leaving more self-control resources for a subsequent self-control task.

2.3 Research Paradigm

Before beginning the study it was necessary to adopt a stance regarding a theory of being and the nature of reality (ontology) and a theory of knowledge and how individuals come to make sense of reality (epistemology). Adopting a research stance was an important consideration to make, not least because it influenced all subsequent decisions regarding the research design (Darlaston-Jones, 2007). Scientific research has often aligned itself with a positivist stance and the assertion that reality is objective, tangible and exists independently of our subjective experience (Robson, 2002). Conversely, constructivism states that reality is socially constructed through human activity and is subject to the observer's interpretations (Rogers & Pilgrim, 2005). The constructivist perspective states that science can only offer a description of reality and that there is no way of discerning which knowledge is closer to the 'truth' (Bergin, Wells & Owen, 2008). As such, no attempt is made to reveal an objective truth.

In recent years a third philosophical stance has emerged. Critical realism acknowledges that there is an objective reality but that different perspectives of that reality can be taken (Bhaskar, 1998; Bergin et al., 2008; Robson, 2002). According to this approach, reality is composed of three layers, or domains, called the 'real,' the 'actual' and the 'empirical' (Bhaskar & Danermark, 2006). The real domain is associated with all existing natural and social 'objects' and the mechanisms through which these interact to produce events in the world (Sayer, 2000). The mechanisms of the real are then acted out in the actual domain, whether these are experienced or not. The empirical domain, however, consists only of what individuals experience (Collier, 1994). These different domains of reality allow different theories of the same object to be generated. Critical realism states that whilst an objective truth may exist in the real domain, it cannot be fully 'known' because people can only observe reality from the vantage of the empirical domain. However, unobservable events taking place in the real domain can be inferred from observable events. From this perspective, the experiment employed in this study is an example of an observable event and its results are the product of unobservable mechanisms in the real domain. Therefore, the

'realism' aspect of critical realism relates to the existence of real mechanisms through which observable events take place (Bergin, 2008).

The critical realist perspective was adopted in this study because it allowed me to present one explanation of reality whilst acknowledging the validity of other explanations that considered my influence and the social, cultural and historical context in which data collection and analysis took place. If I had taken a constructivist stance I might, for example, have focused solely on how the pupils viewed mindfulness and self-control by analysing their discourses on the matter. However, reducing the existence of these constructs to language might have hindered my understanding of the complex relationships between trait mindfulness and self-control and the impact of these upon receptive attention.

2.4 Research Design

The following section considers the ontological and epistemological considerations whilst designing the study. The adoption of a critical realist epistemology shaped all aspects of the research design, including the decision to carry out a quantitative study employing multiple regression analyses. The positivist, or empiricist, stance maintains that social phenomena are not only difficult to observe but exist in a state of constant flux (Ron, 2002). Therefore, procedures such as regression analyses can be used to control for many of the effects associated with complex natural and social phenomena, thus allowing for the identification of causal patterns or 'laws.' However, Ron (2002) argues that, from a critical realist perspective, social scientists use regression analyses to find situations in which the results of an unobserved mechanism can be observed. For instance, in the current study the MAAS-C was used to measure trait mindfulness. From a positivist perspective, trait mindfulness would be considered to be an objective entity independent of those observing it, open to empirical investigation and the creation of testable hypotheses. From a critical realist stance, the mechanisms through which mindfulness may or may not have influenced participants in the real domain can only be *inferred* from the regression analyses. Furthermore, this creates just one explanation that needs to be subjected to further enquiry.

For comparison purposes, a quantitative design based upon the dual-task paradigm was utilised as this was in line with previous research into ego depletion. Self-report Likert scales and Likert items were used to gather information. A literature review was carried out in order to find a suitable measure of trait mindfulness. A number of self-report scales were found that assessed the degree to which an individual experiences his or her life in an automatic state and takes a non-judgemental and open stance towards experiences. These included scales such as the Five Facet Mindfulness Questionnaire (Baer et al., 2006), and the Kentucky Inventory of Mindfulness Skills (KIMS) (Baer et al., 2004), which are reported to correlate positively with adaptive processes and negatively with less adaptive processes such as thought suppression and rumination (Baer et al., 2004, 2006; Cardaciotto, Herbert, Forman, Moitra & Farrow, 2008). However, I found that these scales were unsuitable for use with children, often because of the complexity of the language used and statements that were not appropriate, for example, about driving a car. Further research led me to the Child and Adolescent Mindfulness Measure (CAMM) (Greco, Baer & Smith, 2011). Greco et al. (2011) reported a significant positive correlation between self-reported scores obtained on the CAMM and positive outcomes such as academic skills. The CAMM was produced from sections of the KIMS, relating to observing, acting with awareness, and accepting without judgement. Again these appeared to fit with the most widely used definition of mindfulness.

However, there were some potential ethical issues associated with the use of this scale. For example, statements such as: 'I get upset with myself for having feelings that don't make sense'; 'I tell myself I shouldn't feel the way I'm feeling'; and 'I think that some of my feelings are bad and that I shouldn't have them' could potentially lead to pupils experiencing negative affect. It is a generally accepted ethical standard in psychological research that "Subjects should not feel worse after an experiment than before" (Schuler, 2013, p. 121). Furthermore, it is stated in the British Psychological Society's Professional Practice Guidelines (BPS, 2002, p. 14) that "In attending to the needs and interests of their primary clients (young people) educational psychologists should endeavour not to cause harm to others involved with them." I explored the literature again and found one other mindfulness scale for children called the Mindful

Attention Awareness Scale – Children (MAAS-C) (Benn, 2004; cited in Lawlor, Schonert-Reichl, Gadermann & Zumbo, 2013). The MAAS-C is a modified version of the Mindful Attention Awareness Scale (Brown & Ryan, 2003). Lawlor et al. (2013) concluded that it was psychometrically sound when used with children between years 4 and 7 (8 to 12 years) at school. This instrument was also reported to have good construct validity, meaning that it measured what it aimed to measure.

For the attention task I used one part of the receptive attention subtest, taken from the Cognitive Assessment System (Naglieri & Das, 1997). A significant advantage of using measures that have already been used widely is that these have been shown to be reliable and valid.

2.5 Contacting 'Gatekeepers'

With the exception of two previously unfamiliar primary schools, I approached head teachers with whom a strong rapport had already been established. A practical issue arose at some schools because the space allocated for the experiment was sometimes unsuitable. For example, in one school a table was set up in a hall with only dividing screens to separate the experiment from a loud sports lesson taking place at the same time. Unfortunately, in this example an alternative space could not be provided by the school. Given that part of the experiment was a test of receptive attention I had to make the difficult decision to remove this data from the study, which resulted in an unequal number of participants between the two conditions.

2.6 Procedure

The process of obtaining consent from the ethics committee took longer than anticipated. As such, many of the schools that had initially been willing to participate stated that they no longer wanted to participate so close to the end of the academic year. Given the importance of controlling for participant age I decided not to split data collection across two academic years. Although this meant delaying the start of the study, I decided not to begin data collection until September 2014. Furthermore, because I intended to carry out a quantitative analysis I concluded that I had sufficient time to analyse the data – although the quantitative analyses ended up being far more

complex and time consuming than I had expected. I also decided to carry out experiments on Fridays at 9:30 in order to control for time of day/day of week effects, and because this was the time I was able to carry out the experiment. The design of the study allowed many pupils to participate at the same time, meaning that larger quantities of data could be gathered in an economical way.

2.7 Analysis of the Data

As explained, the decision to analyse the data using multiple regression analyses was influenced by a critical realist stance and my interest in the mechanisms through which trait mindfulness and self-control may influence receptive attention. Prior to this study I had some experience of carrying out quantitative research; however, because of the complexity involved in the analyses I had some concerns about: carrying out the hierarchical multiple regressions using the Statistical Package for Social Scientists (SPSS); making sense of the statistical output; and ensuring that the data did not violate statistical assumptions. As a result I experienced some anxiety related to feelings of conscious incompetence. To increase my feelings of competence I carried out a thorough review of the literature before I entered the data into SPSS. This benefitted me greatly in terms of developing my research skills, confidence and understanding.

Another important consideration was whether to treat the level of the data collected as ordinal or interval as this had potentially important implications for the way in which the data would be treated. The MAAS-C has been reported to have good construct validity and is a true Likert scale in the sense that it is composed of many items that all measure the same construct. As such, the literature suggested that this data could be treated at interval scale level, i.e., the distance between points on the MAAS-C could be considered equal, and be analysed using a parametric test (Carifio & Perla, 2007). However, the manipulation check items, such as difficulty, were single Likert response format items that could be treated as ordinal level data. Treating this data as ordinal would have led to the use of a non-parametric equivalent of the hierarchical linear regression and the loss of information quality due to the rank ordering of the data. Given that the Likert items consisted of five-points with equal

intervals, and that these measured continuous constructs, I decided that it was more important to stick to the original, non-ranked, data. This made me reflect upon the difficult choices that need to be made when conducting 'real world' research and the importance of proceeding with caution and being able to justify a research procedure.

2.8 Ethical Concerns

Obtaining ethical approval was a lengthy process as it was necessary for all written forms of communication with participants, such as consent forms and debriefs, to be scrutinised by the university ethics committee. The current study involved the participation of children in a primary school context. This created three areas of concern: the process of obtaining informed consent; maintaining confidentiality; and managing 'risk' to the participants (Felzmann, 2009). Consent forms were given to both children and parents as I could not assume pupil willingness to participate based upon parental consent alone. In order to do this I tailored consent forms and debrief forms accordingly, which was a time consuming process. I also made it clear to the children that they could discontinue the experiment at any point. I provided additional time at the beginning and end of each experiment in order to discuss the aims of the study and issues pertaining to confidentiality and the anonymity of their responses.

2.9 Contribution to Professional Development

After carrying out this research I feel that I have acquired a good understanding of a substantial body of knowledge at the forefront of psychological theory. The in-depth reading I undertook has helped me to better understand theories of attention, self-control and trait mindfulness that are relevant to many elements of practice as an EP. This in-depth reading has also helped me to speculate on how mindfulness practices may be used to support self-control in children in schools. Although I consider myself to be an inexperienced researcher, carrying out this study has been a reflective and reflexive process that has helped me to better understand quantitative research methods and to really consider my philosophical stance with regards to research.

During the research process I have learned the importance of allowing sufficient time to carry out complex statistical analyses and report the findings. The

process of obtaining ethical approval was also an arduous task due to the nature of carrying out an experiment with children in a school context; however, this was a necessary part of the research and afforded me greater insight into the experience of working as a research-practitioner. I have since developed a greater awareness of the ethical implications of carrying out research with children in a school context.

I originally intended to carry out a larger study that would have involved an investigation into whether mindfulness-based approaches (e.g., brief mindfulness meditation) can counteract ego depletion in children. I was initially concerned about having to reduce the scale of the project to an exploration of trait mindfulness as I was predominantly interested in the practical applications of mindfulness interventions. However, on reflection, the original study would not have been feasible given the time required and my time commitments as a trainee EP on placement. Again, this made me reflect on the compromises that sometimes need to be made when working as a research-practitioner. Furthermore, this allowed me to focus in on two main research questions and explore these in greater depth.

3. Contribution to Knowledge

3.1 Rationale for the Study and Relevance to Practice

The literature review indicated that school children are continuously expected to exert self-control in order to focus their attention on long-term goals over more immediate rewards. The review also highlighted an association between attentional control and self-control. Evidence gleaned from the literature implied that mindfulness and mindfulness-based interventions may foster self-control, for example, through the regulation of attention (Flook et al., 2008). Several studies reported that the benefits of self-control extend into adult life and are strongly associated with social, emotional and economic outcomes later in life (Moffitt et al., 2011). For example, self-control has been found to be associated with the grades assigned by teachers (Duckworth, Tsukayama & May, 2010) and school graduation rates (Vitaro, Brendgen, Larose & Tremblay, 2005), also, the ability to self-regulate attention has been found to predict academic outcomes (Alloway & Alloway, 2010; Checa, Rodriguez-Bailon & Rueda, 2008). I decided that understanding more about mindfulness, self-control and how the two are related was important for developing potential strategies for reducing ego depletion. This made me reflect on the unique position of EPs in carrying out research and developing strategies to improve the wellbeing and educational outcomes of children and young people.

3.2 Summary of Study Aims

In light of the consequences of self-control failure, I decided that it was important to explore ways to support self-control. The present research explored self-control and trait mindfulness in school-aged children. I sought to investigate whether the performance of primary school pupils on a receptive attention task is affected by ego depletion. I also explored the potentially moderating effects of trait mindfulness on ego depletion. This is the first study to investigate the impact of trait mindfulness on ego depletion in school-aged children. In so doing, the study built on the very small research literature on ego depletion in children by showing that a very brief self-control task can affect pupil perceptions of the difficulty of a task.

3.3 Summary of Gaps in the Literature Review

The resource model of self-control states that individuals have a limited resource of energy that is consumed by acts of self-control, and reductions in this resource result in poorer performance on a subsequent act of self-control (Muraven, Tice & Baumeister, 1998), a phenomenon labelled 'ego depletion' (Baumeister et al., 1998). Review of the self-control research literature revealed a wide range of effects linked with ego depletion; however, most studies had only explored ego depletion in adults. Extensive review of the research literature revealed just two studies that had explored ego depletion in school-aged children, and these had been written by the same authors. Price and Yates (2010) found that ego-depleted pupils continued to choose to work on easy tasks, conversely, pupils who had not been depleted progressed onto more difficult items, and in 2013, Price and Yates found that ego depleted primary school pupils produced work that was less creative and mathematically accurate than their non-ego depleted counterparts.

Part of my research interest in this area was the possibility of discovering ways to support self-control. Research related to the resource model of self-control suggested that ego depletion effects can be lessened by sleep, rest, glucose supplements and positive emotions (Baumeister, 2002; Gailiot et al., 2007b). However, these strategies seemed too simplistic and impractical for use in schools. The literature review identified research focused on the role played by attention and motivation in self-control that could yield more effective strategies (e.g. Carver & Scheier, 1981; Inzlicht & Schmiechel, 2012). These theories explored the way attention can serve self-regulation through the monitoring and comparing of an individual's current state with certain standards or goals.

The research literature revealed some important links between these theories and mindfulness. Mindfulness is often defined as open and unbiased attention to the present (Bishop et al., 2004). The literature review suggested that mindfulness interventions are increasingly being used in education (Greco, Baer & Smith, 2011), and that mindfulness is related to improvements in sustained attention, attention switching and disengagement from thoughts and feelings that may affect task

completion. I hypothesised that trait mindfulness may support self-control and reduce ego depletion in children through an open awareness of one's current state and desired state. Although the manipulation of mindfulness was deemed beyond the scope of the study, it occurred to me that the results may point towards the use of mindfulness strategies for increasing trait mindfulness. The purpose of the study, therefore, was to find out whether Year 6 pupils are affected by ego depletion, and whether more mindful pupils are less affected by ego depletion.

3.4 Contribution to Knowledge

The results of this study have implications for further research and practice. The present study contributed to the literature by showing that trait mindfulness lessens the perceived difficulty of a self-control task involving receptive attention. This study also offered the suggestion that perceptions of difficulty may be an indicator that self-control resources need to be conserved. This is the first study to explore the influence of trait mindfulness on ego depletion in school-aged children and extends the research literature on ego depletion in children by demonstrating that even a very short (two minute) act of self-control can induce a mild (borderline significant) increase in how difficult a subsequent task is perceived to be.

3.4.1 Knowledge related to ego depletion.

No significant ego depletion effect was found, although a borderline significant depletion effect was observed on the perceived difficulty of the Receptive Attention task, i.e., depleted pupils judged the second task as more difficult than the pupils who had not exerted self-control. These findings were unexpected and in contrast to most of the research carried out into ego depletion (Hagger et al., 2010). The borderline significant depletion effect on perceived difficulty of the receptive attention task suggested that a mild depletion effect may have occurred. I hypothesised that the self-control induction may have been too brief to strain the pupils' self-control resources, although the perceived difficulty may have been an early indicator of such an effect. This finding carries greater weight when considered in relation to the study by Price

and Yates (2013), which reported reduced motivation to continue with more difficult tasks in ego depleted primary school pupils.

3.4.2 Knowledge related to mindfulness.

Trait mindfulness significantly predicted perceived difficulty of the receptive attention task, although it was not a significant predictor of performance on this task or of perceived enjoyment of this task. I also did not expect to find that trait mindfulness was not a significant predictor of task performance given the reported benefits of mindfulness upon the self-regulation of attention (Brown & Ryan, 2003). Trait mindfulness was found to be a significant predictor of perceived difficulty, possibly as a result of better attentional regulation (Baer et al., 2006; Bishop et al., 2004; Kabat-Zinn, 1990), and improved state-goal discrepancy monitoring (Carver & Scheier, 1981; Inzlicht & Schmeichel, 2012).

3.4.3 Knowledge related to the moderation of ego depletion.

As no significant depletion effect was found on task performance it was not possible to investigate whether trait mindfulness moderates ego depletion. However, it was found that trait mindfulness did not moderate the borderline significant effect of depletion upon perceived difficulty, suggesting that mindfulness may not alleviate ego depletion in school-aged children. This finding offers some support to the theory that mindfulness is not a unique phenomenon but a product of successful self-control (Masicampo & Baumiester, 2007).

3.4.4 Limitations of the study and future directions.

The research utilised self-report measures for mindfulness and single Likert items such as perceived difficulty of the receptive attention task. Several key concerns and limitations have been associated with the use of self-report measures. These include response distortions such as acquiescence bias, which can lead to participants responding more positively than negatively (Paulhaus, 1991), and social desirability bias, which can lead to participants presenting themselves in a self-motivated way,

although it is unclear how or why pupils would have wanted to present themselves differently when completing the MAAS-C.

Although there is evidence to suggest that a self-control induction as short as three-minutes can lead to depletion in school-aged pupils (e.g., Price and Yates, 2010), the two-minute self-control induction used in this study may have been too short to elicit the ego depletion effect. Future research would benefit from a longer self-control induction.

Although the separate nature of the tasks were emphasised before the pupils started the experiment, it is possible that the pupils in the depletion group felt that they had fulfilled the researcher's requirements after the initial task was complete and may have felt less motivated to continue to exert self-control. This could explain why these pupils rated the receptive attention task as more difficult.

In order to control for fatigue effects, once the pupils had completed the second self-control task they were asked to report how tired they felt that day. This Likert item was presented at the end of the experiment so that pupils could complete it alongside other Likert items. However, judgements of tiredness may have been influenced by how tired they felt at the end of the experiment. Moreover, if a measure of fatigue had been carried out before and after the experiment, the relationship between fatigue and depletion could have been explored in greater depth. This is certainly an important consideration for future research.

Two measures were removed from the study due to missing data. These included pupils' ratings of enjoyment of the initial self-control task (white bear task) and the zoo task used in the control condition. These were developed in order to investigate whether task enjoyment could offer an alternative explanation to ego depletion. It would be useful to employ this measure in future research to explore whether task enjoyment influences depletion.

As mentioned, Price and Yates (2010) found that ego-depleted pupils continued to choose easy tasks, whereas non-ego depleted pupils continue to progress onto more difficult tasks. In the current study it was found that pupils in the ego depletion

condition rated the receptive attention task as more difficult. Increased perceptions of difficulty may be an early sign of depletion and reduced academic motivation. Future research could explore the degree to which trait mindfulness influences pupil decisions over task difficulty following a self-control induction.

Despite these limitations, the findings of this study have extended the research literature by showing that trait mindfulness decreases the perceived difficulty of a self-control task involving the regulation of attention. This study is the first to investigate the impact of trait mindfulness on ego depletion in primary school children. It also adds to the very small number of studies that have investigated ego depletion in school-aged children.

4. References

Alloway, T. P., & Alloway, R. G. (2010). Investigating the predictive roles of working memory and IQ in academic attainment. *Journal of Experimental Child Psychology*, *106*(1), 20–29.

Baer, R. A., Smith, G. T., & Allen, K. B. (2004). Assessment of mindfulness by self-report. The Kentucky Inventory of Mindfulness Skills. *Assessment*, *11*, 191–206.

Baer, R. A., Smith, G. T., Hopkins, J., Krietemeyer, J., & Toney, L. T. (2006). Using self-report assessment methods to explore facets of mindfulness. *Assessment*, *13*, 27–45.

Baumeister, R. F. (2002). Ego depletion and self-control failure: An energy model of the self's executive function. *Self and Identity*, *1*, 129–136.

Baumeister, R. F., Bratslavsky, M., Muraven, M., & Tice, D. M. (1998). Ego depletion: Is the active self a limited resource? *Journal of Personality and Social Psychology*, *74*, 1252–1265.

Benn, R. (2004). [Modified Mindful Attention Awareness Scale]. Unpublished raw data.

Bergin, M., Wells, S. G., & Owen, S. (2008). Critical realism: a philosophical framework for the study of gender and mental health. *Nursing Philosophy*, *9*, 169–179.

Bhaskar R. (1998) Philosophy and scientific realism. In: M. Archer, R. Bhaskar, A. Collier, T. Lawson & A. Norrie (Eds) *Critical Realism: Essential Readings, Critical Realism: Interventions* (16–47). Routledge, London.

Bhaskar R. & Danermark, B. (2006). Metatheory, interdisciplinarity and disability research: a critical realist perspective. *Scandinavian Journal of Disability Research*, *8*(4), 278–297.

Bishop, S. R., Lau, M., Shapiro, S., Carlson, L., Anderson, N. D., Carmody, J., &Devins, G. (2004). Mindfulness: A proposed operational definition. *Clinical Psychology: Science and Practice*, *11*, 230–241.

British Psychological Society (BPS) (2002). Professional practice guidelines. Leicester: BPS.

Brown, K. W., & Ryan, R. M. (2003). The benefits of being present: Mindfulness and its role in psychological well-being. *Journal of Personality and Social Psychology, 84,* 822–848.

Cardaciotto L, Herbert, J. D., Forman, M. E., Moitra, E., & Farrow, V. (2008). The assessment of present-moment awareness and acceptance: The Philadelphia Mindfulness Scale. *Assessment, 15*, 204–223.

Carifio, J., & Perla, R. J. (2007). Ten common misunderstandings, misconceptions persistent myths and urban legends about Likert scales and Likert response format and their antidotes. *Journal of Social Sciences*, *3*(3), 106–116.

Carver, C. S., & Scheier, M. F. (1981). *Attention and self-regulation: A control-theory approach to human behavior.* New York: Springer-Verlag.

Checa, P., Rodriguez-Bailon, R., & Rueda, M. R. (2008). Neurocognitive and temperamental systems of self-regulation and early adolescents' social and academic outcomes. *Mind, Brain, and Education*, *2*(4), 177–187.

Collier A. (1994). *Critical Realism: An introduction to Roy Bhaskar's philosophy*. London: Verso.

Darlaston-Jones, D. (2007). Making Connections: The relationship between epistemology and research methods. *The Australian Community Psychologist*, 19(1), 19–27.

Duckworth, A. L., Tsukayama, E., & May, H. (2010). Establishing causality using longitudinal hierarchical linear modeling: An illustration predicting achievement from self-control. *Social Psychological and Personality Science*, *1*, 311–317.

Edwards, A. L. (1953). The relationship between the judged desirability of a trait and the probability that it will be endorsed. *Journal of Applied Psychology*, *37*, 90–93.

Felzmann, H. (2009). Ethical issues in school-based research. *Research Ethics Review*, *5*(3), 104–109.

Flook, L., Smalley, S. L., Kitil, M. J., Galla, B. M., Locke, J., Ishijima, E., ... & Kasari, C. (2010). Effects of mindful awareness practices on executive functions in elementary school children. *Journal of Applied School Psychology, 26*, 70–95.

Gailliot, M. T., Baumeister, R. F., DeWall, C. N., Maner, J. K., Plant, E. A., Tice, D. M., ... & Schmeichel, B. J. (2007). Self-control relies on glucose as a limited energy source: Willpower is more than a metaphor. *Journal of Personality and Social Psychology*, *92*, 325–336.

Greco, L. A., Baer, R. A., & Smith, G. T. (2011). Assessing mindfulness in children and adolescents: Development and validation of the Child and Adolescent Mindfulness Measure (CAMM). *Psychological Assessment*, *23*(3), 606–14.

Hagger, M. S., Wood, C., Stiff, C., & Chatzisarantis, N. L. D. (2010). Ego depletion and the strength model of self-control: A meta-analysis. *Psychological Bulletin*, *136*, 495–525.

Inzlicht, M., & Schmeichel, B. J. (2012). What is ego depletion? Toward a mechanistic revision of the resource model of self-control. *Perspectives on Psychological Science*, *7*(5) 450–463.

Kabat-Zinn, J. (1990). *Full catastrophe living: Using the wisdom of your body and mind to face stress, pain and illness*. New York: Delacorte.

Kahneman, D. (2011). *Thinking, fast and slow*. New York: Farrar, Straus and Giroux.

Lawlor, M. S., Schonert-Reichl, K. A., Gadermann, A. M., & Zumbo, B. D. (2013). A validation of the Mindful Attention Awareness Scale adapted for children. *Mindfulness*. Retrieved March 16, 2014, from http://link.springer.com/article/10.1007%2Fs12671-013-0228-4#

Masicampo, E. J. and Baumeister, R. F. (2007). Relating mindfulness and self-regulatory processes. *Psychological Inquiry*, *18*(4), 255–258.

Moffitt, T. E., Arseneault, L., Belsky, D., Dickson, N., Hancox, R. J., & … Caspi, A. (2011). A gradient of childhood self-control predicts health, wealth and public safety. *Proceedings of the National Academy of Sciences in the United States*, *108*(7), 2693–2698.

Muraven, M., Shmueli, D., &Burkley, E. (2006). Conserving self-control strength. *Journal of Personality and Social Psychology, 91*(3), 524–537.

Muraven, M., Tice, D. M., & Baumeister, R. F. (1998). Self-control as a limited resource: Regulatory depletion patterns. *Journal of Personality and Social Psychology*, *74*, 774–789.

Naglieri, J. A., & Das, J. P. (1997). *Cognitive Assessment System*. Chicago: Riverside Publishing.

Paulhaus, D. L., & Reid, D. B. (1991). Two-component models of socially desirable responding. *Journal of Personality and Social Psychology*, *46*, 598–609.

Price, D. A., & Yates, G. C. R. (2010). Ego depletion effects on mathematics performance in primary school students: why take the hard road? *Educational Psychology: An International Journal of Experimental Educational Psychology*, *30*(3), 269–281.

Price, D. A., & Yates, G. C. R. (2013). Impact of a brief ego depletion procedure on creative behaviour in the upper primary classroom. *Educational Psychology: An International Journal, 0*, 1–13.

Robson, C. (2002). *Real world research: A resource for social scientists and practitioner researchers* (Second Edition). London: John Wiley and Sons.

Rogers A. & Pilgrim D. (2005). *A sociology of mental health and illness* (Third Edition). Berkshire: Open University Press.

Ron A. (2002). Regression analysis and the philosophy of social science: a critical realist view. J*ournal of Critical Realism*, 1, 119–142.

Sayer A. (2000). *Realism and social science*. London: Sage Publications.

Schuler, H. (1982). Ethical problems in psychological research. New York: Academic Press.

Vitaro, F., Brendgen, M., Larose, S., & Tremblay, R. E. (2005). Kindergarten disruptive behaviors, protective factors, and educational achievement by early adulthood. *Journal of Educational Psychology*, 97(4), 617–629.

5. Appendices

5.1 Appendix 1: Mindful Attention Awareness Scale – Children (MAAS-C)

"Hello, thanks for agreeing to take part in my university project. For the next 30 minutes I'm going to ask you to take part in a 'thinking activity' and a 'letter search activity.' I'd also like to ask you to complete two short questionnaires. Taking part is voluntary, which means you can choose not to take part at any time, without giving a reason. You can also skip questions in the questionnaire if you don't want to answer them. You can ask me any question, at any time.

The information you write down will be stored safely in a locked cabinet and won't be shared with anyone else. It won't have your name on it, so no one will be able to work out that the information came from you. After you've finished the activities and questionnaires I'll tell you more about why I'm carrying out this project."

	Almost never	Not very often at all	Not very often	Somew hat often	Very often	Almost always
I could be feeling a certain way and not realize it until later	1	2	3	4	5	6
I break or spill things because of carelessness, not paying attention, or thinking of something else	1	2	3	4	5	6
I find it hard to stay focused on what's happening in the present moment	1	2	3	4	5	6
Usually, I walk quickly to get where I'm going without paying attention to what I experience along the way	1	2	3	4	5	6
Usually, I do not notice if my body feels tense or uncomfortable until it gets really bad	1	2	3	4	5	6
I forget a person's name almost as soon as I've been told it for the first time	1	2	3	4	5	6
It seems that I am doing things automatically without really being aware of what I am doing	1	2	3	4	5	6
I rush through activities without being really attentive to them	1	2	3	4	5	6
I focus so much on a future goal I want to achieve that I don't pay attention to what I am	1	2	3	4	5	6

doing right now to reach it						
I do jobs, chores, or schoolwork automatically without being aware of what I'm doing	1	2	3	4	5	6
I find myself listening to someone with one ear, doing something else at the same time	1	2	3	4	5	6
I walk into a room, and then wonder why I went there	1	2	3	4	5	6
I can't stop thinking about the past or the future	1	2	3	4	5	6
I find myself doing things without paying attention	1	2	3	4	5	6
I snack without being aware that I'm eating	1	2	3	4	5	6

5.2 Appendix 2: Self-Report Questionnaire

Please read each sentence and then circle **one answer** that shows how you feel.

1. Was the thinking activity:

Very easy	Quite easy	Average	Quite hard	Very hard

2. How enjoyable was the thinking activity?

Very enjoyable	Quite enjoyable	Okay	Only a little bit	Not at all

3. Was the 'find the letters' activity:

Very easy	Quite easy	Average	Quite hard	Very hard

4. How enjoyable was the 'find the letters' activity?

Very enjoyable	Quite enjoyable	Okay	Only a little bit	Not at all

5. How tired do you feel today?

Not tired at all	A little bit	In the middle	Quite tired	Very tired

5.3 Appendix 3: Head Teacher Gatekeeper Letter

Address

Date

Dear _____,

I am a trainee educational psychologist studying at Cardiff University. As part of my doctorate I am carrying out a study into how mindfulness is related to attention in primary school children. I am writing to you to ask whether you would be willing to provide permission for pupils to participate in this study. Little research in this area has been carried out with children and the information gathered may help Educational Psychology Services and schools to support pupils' learning.

Research suggests that children vary in the degree to which they are aware of, or attend to, their thoughts, feelings and bodily sensations with a non-judgmental and accepting stance (mindfulness). The aim of this research is to explore the relationship between mindfulness and attention in pupils. This research is being supervised by Gillian Rhydderch, Academic Director of the DEdPsy Programme at Cardiff University. This study has been scrutinised by, and ethical approval obtained from, the School of Psychology Research Ethics Committee.

If you decide to participate, and consent has been given by the pupils' parents, I would like to visit the school at a convenient time/day for a 30-minute session with a whole year 6 class. Participation will involve the completion of two activities and two brief questionnaires, which will be administered to a whole class of pupils at the same time and can take place in the classroom. In the first activity, pupils will be asked to spend two-minutes thinking about what they might see on a school trip. In the second activity, pupils will be asked to complete a visual search task that will last up to two-minutes.

Each pupil will also be asked to complete the Child and Adolescent Mindfulness Scale, which explores the degree to which a child is aware of, or pays attention to, his/her thoughts, feelings and bodily sensations. In addition, each child will be asked to complete a five-item questionnaire to provide feedback about the activities. The activities are designed to be enjoyable and will pose no risk to the pupils beyond what would be expected in a normal school day.

If you feel it would be possible for your school to be involved, informed consent will be sought from parents for their children to participate. Following this process, those pupils for whom there is parental consent to participate will receive a consent form informing them that they can withdraw from the study at any time, without giving a reason, and that any information they provide will be held confidentially in a locked cabinet so that only the researcher can trace this information back to them individually. The information provided will be anonymised

one week after the data have been collected. No individual will be identified in the final written report. The anonymised data will be stored securely until July 2015 when it will be deleted/destroyed. At the end of the study, all participating pupils and their parents will be provided with a debriefing form that provides additional information about the purpose of the study.

Taking part in this study has few risks; however, you may feel comfortable discussing any concerns you may have Gillian Rhydderch, who is supervising this study. Contact details can be found at the end of this information sheet.

If you have any questions or would like further information please do not hesitate to contact me.

Yours sincerely,

Paul Greenhouse

Trainee educational psychologist

Researcher:
Paul Greenhouse
Trainee Educational Psychologist
School of Psychology
Cardiff University
Tower Building
Park Place
Cardiff
CF10 3AT
Telephone: 029 2087 5393
Email: SouthardC@cf.ac.uk

Research Supervisor:
Gillian Rhydderch
Academic Director
School of Psychology (DEdPsy)
Cardiff University
Tower Building
Park Place
Cardiff
CF10 3AT
Telephone: 029 208 75493
Email: RhydderchGA@cardiff.ac.uk

In case of complains, please contact:

The Ethics Committee
School of Psychology
Cardiff University
Tower Building
Cardiff
CF10 3AT
Telephone: 02920 875393

5.4 Appendix 4: Parent Consent Form

Dear Parent/guardian,

I am a trainee educational psychologist studying at Cardiff University. As part of my doctorate I am carrying out a study into how mindfulness is related to attention in primary school children. I am writing to you to ask whether you would be willing to provide consent for your child to participate in this study. Little research in this area has been carried out with children and the information gathered may help Educational Psychology Services and schools to support pupils' learning.

Research suggests that children vary in the degree to which they are aware of, or attend to, their thoughts, feelings and bodily sensations with a non-judgmental and accepting stance (mindfulness). The aim of this research is to explore the relationship between mindfulness and attention in pupils. This research is being supervised by Gillian Rhydderch, Academic Director of the DEdPsy Programme at Cardiff University. This study has been scrutinised by, and ethical approval obtained from, the School of Psychology Research Ethics Committee.

Participation in this study will last approximately 30-minutes and will involve the completion of two activities and two brief questionnaires. In the first activity, pupils will be asked to spend two-minutes thinking about what they might see on a school trip. In the second activity, pupils will be asked to complete a visual search task that will last up to two-minutes.

Each pupil will also be asked to complete the Child and Adolescent Mindfulness Scale, which explores the degree to which a child is aware of, or pays attention to, his/her thoughts, feelings and bodily sensations. In addition, each child will be asked to complete a five-item questionnaire to provide feedback about the activities. The activities are designed to be enjoyable and will pose no risk to the pupils beyond what would be expected in a normal school day.

If you agree to your child participating in this study, any information provided by your child will be held confidentially in a locked cabinet so that only the researcher can trace this information back to your child individually. The information provided will be anonymised one week after the data have been collected.No individual will be identified in the final written report. The anonymised data will be stored securely until July 2015 when it will be deleted/destroyed. Participation in this study is voluntary and you can withdraw your child from the study at any point without giving a reason. Your child can also withdraw from the study at any point without giving a reason. You can request access to the information that your child has provided, and for this information to be deleted/destroyed, at any time up until the data have been anonymised.

At the end of the study you and your child will be provided with a debriefing form that provides additional information about the purpose of the study.

Taking part in this study has few risks; however, you may feel comfortable discussing any concerns you may have Gillian Rhydderch, who is supervising this study. Contact details can be found at the end of this information sheet. If you have any questions or would like further information please do not hesitate to contact me.

Yours Sincerely,

Paul Greenhouse

Trainee Educational Psychologist
Researcher:
Paul Greenhouse
Trainee Educational Psychologist
School of Psychology
Cardiff University
Tower Building
Park Place
Cardiff
CF10 3AT
Telephone: +44(0)29 2087 5393
Email: SouthardC@cf.ac.uk

Research Supervisor:
Gillian Rhydderch
Academic Director
School of Psychology (DEdPsy)
Cardiff University
Tower Building
Park Place
Cardiff
CF10 3AT
Telephone: +44(0)29 208 75493
Email: RhydderchGA@cardiff.ac.uk

In case of complains, please contact:
The Ethics Committee
School of Psychology
Cardiff University
Tower Building
Cardiff
CF10 3AT
Telephone: 02920 875393

I, _____ (NAME) consent to my child's participation in the study conducted by Paul Greenhouse, School of Psychology, Cardiff University with the supervision of Gillian Rhydderch.

Signed:…….. **Date:…….**

5.5 Appendix 5: Pupil Consent Form

I understand that Paul Greenhouse is interested in finding out whether the way pupils pay attention to their thoughts and feelings can help them with their learning. I understand that taking part in this project will involve a thinking activity and a search activity. I understand that I will also complete two short questionnaires. This will last about 30 minutes.

I understand that taking part in this study is entirely voluntary and that I can withdraw from the study at any time without giving a reason. I understand that I can skip questions in the questionnaire if I do not want to answer them.

I understand that I am free to ask any questions at any time.

I understand that the information I give will be stored safely in a locked cabinet and will not be shared with anyone else. I understand that it will not have my name on it so no one will be able to work out that the information was from me.

I also understand that at the end of the study I will be given more information about why the study is being done.

I, _____(PLEASE PRINT NAME) consent to take part in the study conducted by Paul Greenhouse, School of Psychology, Cardiff University with the supervision of Gillian Rhydderch.

5.6 Appendix 6: Parent Debrief Form

Research title: **The impact of trait mindfulness upon self-control in children**

Thank you for allowing your child to participate in the study.

The aim of this study is to investigate the relationship between mindfulness and attention in children.

Research suggests that children vary in the degree to which they are aware of, or attend to, their thoughts, feelings and bodily sensations with a non-judgmental and accepting stance. This is often referred to as mindfulness. Pupils constantly apply self-control in order to carry out mental tasks at school, such as making decisions, setting goals, completing work tasks, and adapting to the varying demands of the school day. Research suggests that the exertion of self-control can temporarily make it more difficult for pupils to carry out a subsequent mental task that requires attention. I am interested in finding out whether greater mindfulness helps children to pay greater attention in these tasks.

The information gathered in this study will be used in the researcher's doctoral thesis. The findings will be used to inform the practice of educational professionals, including educational psychologists.

The information provided by your child will be held confidentially in a locked cabinet that only the researcher can access. All data will be collected and stored anonymously so that it will be impossible to trace this information back to your child in the final report.

If you have any further questions regarding the study, please contact the researcher at:

Researcher:
Paul Greenhouse
Trainee Educational Psychologist
School of Psychology
Cardiff University
Tower Building
Park Place
Cardiff
CF10 3AT
Telephone: +44(0)29 2087 5393
Email: SouthardC@cf.ac.uk

Research Supervisor:
Gillian Rhydderch
Academic Director
School of Psychology (DEdPsy)
Cardiff University
Tower Building
Park Place
Cardiff
CF10 3AT
Telephone: +44(0)29 208 75493
Email: RhydderchGA@cardiff.ac.uk

In case of complains, please contact:
The Ethics Committee
School of Psychology

Cardiff University
Tower Building
Cardiff
CF10 3AT
Telephone: 02920 875393

5.7 Appendix 7: Pupil Debrief Form

Research title: **The impact of trait mindfulness upon self-control in children.**

Thank you for taking part in this study.

I am trying to find out whether the way pupils pay attention to their thoughts and feelings can help them to concentrate on activities like school work.

Some children pay more attention to what is happening in the moment and are less distracted by thoughts about other things, such as what they did the day before or what they are going to do later that day. I want to find out if children who pay more attention to what is happening in the moment find it easier to concentrate on activities like school work.

I will use the information I collect to write a university project. This project will not contain any names, and no one will be able to tell which were your answers and scores. The information will be stored somewhere safe so that only Paul Greenhouse is able to see it.

If you have any more questions about the study, please contact the researcher at:

Researcher:
Paul Greenhouse
Trainee Educational Psychologist
School of Psychology
Cardiff University
Tower Building
Park Place
Cardiff
CF10 3AT
Telephone: +44(0)29 2087 5393
Email: SouthardC@cf.ac.uk

Research Supervisor:
Gillian Rhydderch
Academic Director
School of Psychology (DEdPsy)
Cardiff University
Tower Building
Park Place
Cardiff
CF10 3AT
Telephone: +44(0)29 208 75493
Email: RhydderchGA@cardiff.ac.uk

In case of complains, please contact:

The Ethics Committee
School of Psychology
Cardiff University
Tower Building
Cardiff
CF10 3AT
Telephone: 02920 875393

5.8 Appendix 8: Receptive Attention Subtest Stimuli

EB	bb	TR	nb	RA	eR	nA	rr	An	AA
EE	bN	NR	eT	Tb	TT	EN	bT	rE	ne
rt	RR	ta	Tr	EE	bE	NE	BB	Te	Rn
Rb	nr	aT	NN	aE	aa	tr	Ne	ee	br
er	Ar	tn	tt	na	rB	nn	ar	rT	bt
ra	EE	te	rN	nB	aR	Nt	tt	Ea	tB
rb	et	bb	Tn	TT	nR	ee	TE	Nb	BB
aa	rn	Br	Ae	RE	rA	Nr	AA	Be	TN
AB	tE	nn	Bn	Er	ab	rr	BA	TT	eb
AR	En	bn	rr	eB	aN	AE	NT	bR	eN
tR	nn	EE	Ta	NB	rr	At	tN	ER	NN
ea	tt	ET	bb	RT	tb	Ab	BN	BB	re
AA	nt	at	BE	Ra	AT	en	Na	Bt	an
nT	EA	TA	ae	nn	RN	Ba	AA	NA	ee
RR	be	aB	AN	TB	Eb	BT	Rb	ba	tt
Rt	ta	aa	bA	Re	nE	EE	eA	bb	bE
NE	Te	Rn	TT	Rb	nr	aT	aE	tr	NN
ee	Ne	br	er	Ar	RR	tn	tt	Be	na
rB	Et	ar	rT	bt	ra	te	rN	BB	nB
aR	Nt	NN	Ea	BR	aa	tB	rb	et	RR

5.9 Appendix 9: Receptive Attention Subtest Directions

DIRECTIONS ■ AGES 8 – 17 ■

Sample C

Expose Sample C in the Response Book for Ages 8–17 and say:

Look at these pairs of letters. (Point to Sample C.) **Some of these look the same and others do not. Let's underline the ones that look exactly the same, like this.**

Point to the first letter pair (t B) and say:

These don't look the same, so I won't underline them.

Then point to the second letter pair (T T) and say:

Here is a T (point to the first letter T) **and here is another T** (point to the second letter T). **They look the same, so I'll underline them.** (Demonstrate.)

Give the child the red pencil and say:

Now do the rest of these. Underline the pairs of letters that look the same. (Point to the rows from left to right and top to bottom.)

If necessary, provide a brief explanation. Correct all errors. The correct letter pairs are: T T, e e, R R, n n, B B, and a a.

With Sample C still exposed say:

I'll show you another page with many pairs of letters on it. Underline the pairs of letters that look exactly the same. Do these (point to the top row in a sweeping motion from left to right), **then these** (point to the second row from left to right), **and so on without skipping any.**

Work as quickly as you can. If you make a mistake, cross it out and keep going. Remember, underline the pairs of letters that look the same and tell me when you're finished.

Ready? (Provide a brief explanation if necessary.)

Item 5

Expose Item 5 and say:

Begin. (Start timing.)

Record the time to completion. If the child is still working after 120 seconds say:

Stop. (Record 121 seconds.)

5.10 Appendix 10: SPSS Output of the One-Way Analysis Tests for Hypothesis 1.

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Attention Difficulty	Between Groups	1.743	1	1.743	2.594	.111
	Within Groups	58.481	87	.672		
	Total	60.225	88			
Attention Enjoyment	Between Groups	.369	1	.369	.511	.477
	Within Groups	62.912	87	.723		
	Total	63.281	88			
Attention Score	Between Groups	.608	1	.608	.059	.809
	Within Groups	899.366	87	10.338		
	Total	899.973	88			

5.11 Appendix 11: SPSS Output of the Hierarchical Multiple Regression Analyses for Hypothesis 2.

Model Summary[c]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics	
					R Square Change	F Change
1	.175[a]	.031	.008	3.20206	.031	1.349
2	.230[b]	.053	-.005	3.22292	.022	.634

a. Predictors: (Constant), Fatigue, Gender

b. Predictors: (Constant), Fatigue, Gender, Experimental Condition, MindfulnessXDepletion_centred, Mindfulness Score

c. Dependent Variable: Attention Score

Model Summary[c]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics	
					R Square Change	F Change
1	.215[a]	.046	.024	.821	.046	2.052
2	.349[b]	.122	.068	.802	.076	2.350

a. Predictors: (Constant), Fatigue, Gender

b. Predictors: (Constant), Fatigue, Gender, Experimental Condition, MindfulnessXDepletion_centred, Mindfulness Score

c. Dependent Variable: Receptive Attention Difficulty

Model Summary[c]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics	
					R Square Change	F Change
1	.181[a]	.033	.010	.848	.033	1.447
2	.285[b]	.081	.025	.842	.048	1.429

a. Predictors: (Constant), Fatigue, Gender

b. Predictors: (Constant), Fatigue, Gender, Experimental Condition, MindfulnessXDepletion_centred, Mindfulness Score

c. Dependent Variable: Receptive Attention Affect

5.12 Appendix 12: Raw Data.

Participant #	Group (1 = experimental, -1 = control)	MAAS-C Score	Receptive Attention Subtest Score	Receptive Attention Subtest Completion Time (Seconds)	Receptive Attention Subtest Targets Underlined	Receptive Attention Subtest Distractors Underlined	Pupil Ratings of Receptive Attention Subtest Difficulty	Pupil Ratings of Receptive Attention Subtest Enjoyment	Pupil Ratings of Fatigue	Pupil Ratings of Task 1 Difficulty	Pupil Ratings of Task 1 Enjoyment
1	1	4.80	9.80	181	42	0	1	1	5	1	1
2	1	3.40	5.40	127	26	0	2	2	3	1	1
3	1	5.33	10.75	181	44	0	2	2	3	5	4
4	1	5.67	4.08	181	27	5	2	1	1	1	2
5	1	4.47	6.04	141	29	0	3	3	4	4	2
6	1	3.80	7.62	181	37	2	3	3	3	2	3
7	1	3.73	8.71	167	38	1	2	2	5	4	3
8	1	3.47	3.39	159	23	1	1	2	2	4	2
9	1	4.40	3.98	103	20	3	1	1	4	4	2
10	1	3.13	8.03	181	38	0	4	3	4	1	3
11	1	2.93	8.90	181	40	1	3	3	3	2	2
12	1	3.47	1.51	156	15	0	2	2	4	5	1
13	1	3.60	6.44	181	34	0	3	1	1	3	1
14	1	2.87	15.46	156	49	0	3	2	2	4	3
15	1	3.47	5.36	181	31	0	3	3	5	5	1
16	1	3.47	5.08	135	26	0	3	3	3	4	2
17	1	3.67	3.51	181	25	0	3	3	4	2	1
18	1	4.40	3.51	181	25	0	3	4	2	2	3
19	1	4.67	15.52	143	47	0	2	1	1	2	1
20	1	3.47	7.83	124	31	0	3	3	1	1	3
21	1	3.60	8.51	162	37	0	2	2	1	1	2
22	1	4.13	11.75	181	46	0	5	2	4	4	3
23	1	4.33	6.08	170	32	0	3	3	4	4	3
24	1	4.00	10.27	181	43	0	3	2	2	3	2
25	1	3.60	10.27	181	43	0	3	2	3	4	3
26	1	3.60	4.70	181	29	0	3	1	3	4	5
27	1	4.13	6.82	181	35	1	4	2	4	3	2
28	1	3.47	4.39	181	28	2	2	2	3	2	1
29	1	3.07	3.79	181	26	1	4	3	2	3	2
30	1	3.87	4.39	181	28	1	3	2	1	2	1
31	1	4.40	8.03	181	38	0	1	1	1	2	1
32	1	5.00	9.15	176	40	0	3	2	1	4	2
33	1	4.00	4.62	172	28	0	2	2	1	1	2
34	1	3.47	8.90	181	40	0	2	1	1	2	3
35	-1	5.13	2.49	181	21	0	3	5	1	Missing	Missing
36	-1	3.67	3.51	181	25	0	2	1	1	Missing	Missing
37	-1	5.20	6.89	141	31	2	2	2	2	Missing	Missing
38	-1	3.93	8.03	181	38	0	2	3	2	Missing	Missing

39	-1	3.07	5.65	172	31	0	2	3	4	Missing	Missing
40	-1	5.20	10.75	181	44	0	2	2	2	Missing	Missing
41	-1	3.07	7.62	181	37	0	3	2	5	Missing	Missing
42	-1	1.87	3.32	149	22	0	3	2	4	Missing	Missing
43	-1	3.00	8.03	181	38	0	3	3	4	Missing	Missing
44	-1	3.67	4.39	181	28	1	3	2	4	Missing	Missing
45	-1	4.27	9.45	162	39	1	3	2	2	Missing	Missing
46	-1	4.00	11.05	153	41	0	2	2	1	Missing	Missing
47	-1	4.33	5.71	170	31	0	3	2	2	Missing	Missing
48	-1	4.33	6.65	128	29	1	2	1	2	Missing	Missing
49	-1	3.93	10.27	181	43	0	2	2	1	Missing	Missing
50	-1	4.27	10.10	144	38	0	2	1	2	Missing	Missing
51	-1	4.60	10.71	143	39	0	2	1	1	Missing	Missing
52	-1	2.53	4.39	181	28	0	4	3	2	Missing	Missing
53	-1	3.53	2.98	181	23	1	2	1	2	Missing	Missing
54	-1	4.40	4.67	170	28	0	2	2	1	Missing	Missing
55	-1	4.27	10.07	137	37	0	2	2	2	Missing	Missing
56	-1	3.40	9.01	153	37	1	3	2	4	Missing	Missing
57	-1	4.13	10.82	164	42	1	2	2	2	Missing	Missing
58	-1	4.33	4.08	181	27	1	2	3	3	Missing	Missing
59	-1	3.93	14.13	144	45	0	2	1	2	Missing	Missing
60	-1	3.47	7.88	108	29	2	2	2	3	Missing	Missing
61	-1	4.53	10.27	181	43	0	2	2	2	Missing	Missing
62	-1	3.13	7.72	160	35	2	3	3	4	Missing	Missing
63	-1	3.87	9.13	143	36	1	2	2	2	Missing	Missing
64	-1	3.73	6.27	165	32	0	2	2	1	Missing	Missing
65	-1	3.53	13.54	157	46	1	2	2	2	Missing	Missing
66	-1	4.13	6.44	181	34	1	3	3	2	Missing	Missing
67	-1	3.87	9.80	181	42	0	1	2	4	Missing	Missing
68	-1	5.13	4.84	176	29	1	2	1	4	Missing	Missing
69	-1	3.33	8.90	181	40	0	4	2	4	Missing	Missing
70	-1	3.67	4.39	181	28	0	4	3	3	Missing	Missing
71	-1	4.40	11.24	181	45	0	3	3	4	Missing	Missing
72	-1	4.80	11.09	160	42	0	2	1	1	Missing	Missing
73	-1	3.60	6.32	117	27	0	2	2	4	Missing	Missing
74	-1	4.93	8.46	181	39	0	2	2	2	Missing	Missing
75	-1	4.27	5.69	103	24	0	1	1	4	Missing	Missing
76	-1	4.87	4.35	146	25	0	1	3	4	Missing	Missing
77	-1	4.93	3.24	181	24	0	3	2	3	Missing	Missing
78	-1	4.00	13.14	135	42	0	3	4	2	Missing	Missing
79	-1	4.33	8.59	152	36	1	2	2	2	Missing	Missing
80	-1	5.13	12.22	119	38	0	2	3	2	Missing	Missing
81	1	3.93	7.62	181	37	0	3	3	2	4	1
82	1	4.53	12.78	181	48	0	2	1	3	2	1
83	1	2.93	8.50	171	38	0	4	3	4	3	2
84	1	3.80	9.61	176	41	0	2	1	5	1	1

85	1	3.60	11.24	181	45	0	4	3	5	4	2
86	1	2.47	6.44	181	34	1	1	1	1	1	1
87	1	3.13	4.24	127	23	0	2	1	1	2	1
88	1	4.40	12.82	145	43	0	3	1	2	1	3
89	1	5.07	11.94	178	46	0	3	1	3	4	2