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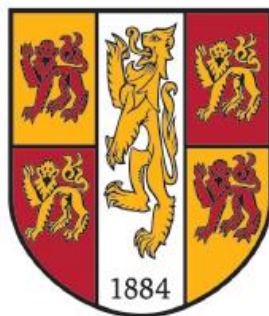

A thesis submitted in partial fulfilment of the requirements for the Degree of
Doctor of Philosophy
in September 2016 by:

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Contents

Thesis Abstract

The relationship between self-efficacy (a situation or task specific form of confidence) and performance has long been accepted as positive and reciprocal. However, recent challenges in the literature have demonstrated that it is only under certain conditions that the relationship remains positive, and that a number of boundary conditions affect the direction of the relationship when examined at the within-person level of analysis. One consistent factor throughout the within-person research is that overconfidence (confidence levels above that of actual performance), is related a decrease in effort, which in turn may contribute to poorer performance. Thus, a negative relationship between self-efficacy and performance at the within-person level is observed. Despite the surge in research examining the within-person relationship between self-efficacy and performance and moderating variables, the potential moderating role of the self (e.g., individual differences) seems to have been neglected and the role of effort is yet to be fully understood. Thus, the aims of the thesis are twofold. The primary aim of the thesis is to explore the role of the self within the within-person self-efficacy and performance relationship. In chapter 2, participants performed a golf putting task in front of an on-looking peer, in order to examine the positive bias often found in self-predictions of performance (but not in peer predictions). Contrary to previous research, results revealed that the self was no more biased than the on-looking peer, perhaps due to the presence of objective performance feedback. Chapter three examined subclinical narcissism as a moderator of the within-person relationship between self-efficacy and performance, since individuals high in subclinical narcissism have demonstrated overly positive views of the self. Results revealed that narcissism moderated the relationship between previous performance and subsequent self-efficacy but not the relationship between self-efficacy and subsequent performance. Chapters three and four addressed the secondary aim of the thesis, to further explore the role of effort. Chapter three adopted a

psychophysiological measure of effort, and found tentative evidence that individuals high in subclinical narcissism may have engaged in ego-protecting strategies (under-reporting their self-report effort). Chapter four sought to find evidence for the argument that the relationship between preparatory self-efficacy and preparatory effort would be an inverted 'U' (Feltz et al., 2008), however no evidence was found. Overall, the results demonstrate the importance of considering the role of the self within the self-efficacy and performance relationship, and suggests that advances in the measurement of effort are needed in order to understand the role of effort as an underlying mechanism further.

Thesis format

The format of this thesis was designed to facilitate the development of the candidate, and therefore does not necessarily follow a traditional thesis format. Chapter 1 offers a general introduction to the self-efficacy literature, chapters 2, 3 and 4 consist of independent research, and chapter 5 summarises the thesis results and implications. In this approach, the independent study chapters are in a publishable format. Further, where appropriate, the independent study chapters are written in the first-person plural in order to reflect the co-authorship of the research. Chapters 1 and 5 are written in the first-person singular. Due to the thesis format, there is inevitably some repetition of content, however this has been kept to a minimum where possible.

1

Thesis Introduction

1.1 Self-efficacy.

From the first known human ritual of sacrificing spearheads to a stone python in the Tsodilo Hills, to the order of which superstitious athletes get changed into their kit, for thousands of years, humans have endeavoured to exert control over future events. Human agency is vitally important, since 'unless people believe they can produce desired effects by their actions, they have little incentive to act' (Bandura, 1997, p. 3). Bandura's social cognitive theory (1986) describes humans as active agents in their cognition regulation, rather than as reactors to their environment. Thus, human functioning involves self-regulation and self-reflection in an ongoing process to move towards one's goals.

One theory embedded in social cognitive theory that is pertinent to this whole thesis is self-efficacy theory (Bandura, 1977; 1997). Self-efficacy is a situation or task specific form of confidence, that acts as a major basis for the initiation and execution (or the avoidance and disengagement) of behaviour. To be self-efficacious, is to have the 'beliefs in one's ability to organise and execute the courses of action required to produce given attainments' (Bandura, 1997, p. 3). Importantly, self-efficacy is not the level of skill that one believes they have, rather it is one's belief in their ability to use those skills in the desired way.

Self-efficacy is a crucial variable regarding human functioning. Should an individual have a strong sense of efficacy, they may choose to pursue a dream career, invest effort in a sport competition, or learn a new skill. If an individual has a low sense of efficacy, they may choose not to apply to a job due to the belief they are incapable of obtaining it, they may withdraw effort during a sport performance due to an expectancy to lose, or not even attempt to learn a new skill as they believe their efforts will be wasted. Therefore, self-efficacy plays a major role in one's life path.

1.2 Self-efficacy antecedents.

Self-efficacy beliefs are not present de novo, they are developed across time with experiences. Bandura (1997) outlined four main sources of efficacy beliefs. In order of most to least influential, the main antecedents of self-efficacy are previous mastery experience, vicarious experience, verbal persuasion, and perceived physiological and affective state. The antecedents are not the focus of the thesis, and thus are described in brief.

Previous mastery experience is concerned with how an individual has performed on the same (or a similar) task in the past, and has repeatedly demonstrated a positive relationship with self-efficacy (e.g., Beattie, Lief, Adamoulas & Oliver 2011; Sitzmann & Yeo, 2013; Vancouver, Thompson & Williams 2001; Yeo & Neal, 2004). Bandura argues that if an individual has performed well on a task in the past, then their subsequent self-efficacy will increase. Conversely, if an individual has performed poorly on the same (or a similar) task in the past, their subsequent self-efficacy will decrease. The second most powerful antecedent to self-efficacy is vicarious experience (also referred to as modelling). Vicarious experience is the appraisal of one's own capabilities against the attainments of others (Bandura, 1997), and are more influential in forming self-efficacy appraisals when an individual lacks previous mastery experience (Takata & Takata, 1976). Self-efficacy varies depending on the ability level of the individual used for social comparison (Bandura & Jourden 1991). The third most effective antecedent is verbal persuasion (Bandura, 1997). Verbal persuasion can also be considered as social persuasion (e.g., a coach convincing an athlete they are capable of learning a new skill). One study by Wise and Trunnell (2001) examined the effects of previous accomplishment, observation (vicarious experience), and a verbal message upon participants self-efficacy to perform a bench-press task. Results supported Bandura's prediction that verbal persuasion is the third most effective source of efficacy beliefs behind vicarious experience (second) and performance accomplishment

(first). Wise and Trunnell (2001) also demonstrated that verbal persuasion was most effective in strengthening self-efficacy when it followed a performance accomplishment. Finally, perceived physiological and affective states, that is, the perception of one's state of physiological arousal, is considered the fourth most powerful antecedent of self-efficacy beliefs (Bandura, 1977; Chowdhury, Endres, & Lanis, 2002). Symptoms of physiological arousal may include an increased heart rate, 'butterflies' in the stomach, or sweaty palms. If an individual considers these symptoms to facilitate performance, then self-efficacy should increase. However, if an individual considers these symptoms to be a hindrance to performance, self-efficacy should decrease. The perception of one's physiological state is considered a more powerful source of efficacy when the task is physical, for example in sport (Feltz & Riessinger, 1990). Loo and Choy (2013) examined the relationships between the main antecedents of self-efficacy, and their direct effects upon academic performance. Results revealed that the four sources of self-efficacy were interrelated, and were all positively correlated with academic achievements. Further, hierarchical regression demonstrated that previous mastery experience was the strongest predictor of academic achievements.

1.3 Measuring self-efficacy.

Due to the task specific nature of self-efficacy, there is no one validated inventory that is used across studies. Instead, researchers must tailor their measure toward the task. Bandura (1997) recommended that self-efficacy inventories include measures of both magnitude and strength. Bandura (1997) stated that 'the range of perceived capability for a given person is measured against levels of task demands that represent varying degrees of challenge or impediment to successful performance' (p. 42). The level of task demand is referred to as self-efficacy magnitude, and concerns the level of performance an individual believes they

can achieve. Self-efficacy magnitude is measured in conjunction with self-efficacy strength, which measures how confident an individual is that they can achieve the level of performance stated. Self-efficacy strength is typically measured on a 100-point scale, where low values indicate low confidence (0 is equal to 'can not do') and high values indicate high confidence levels (100 is equal to 'certain can do'). Each magnitude level reported has an associated strength value.

For example, if one were to ask a high jump athlete to state their level of self-efficacy, one would ask for their self-efficacy levels for several different heights (magnitude levels), and how sure they are of clearing each height (self-efficacy strength). The high-jumper may indicate that they believe they are capable of clearing 2.1m, 2.2m, and 2.3m. This provides information regarding one's self-efficacy level of performance within the same task. Further, the high-jumper may state that they are 100% certain that they can clear 6.1m, 50% certain they can clear 6.2m, but only 10% certain they can clear 6.3m. Thus, it is important to gauge both self-efficacy magnitude and strength, since beliefs can vary on both of these dimensions, and therefore may have different implications for performance.

1.4 Between-person self-efficacy research.

It has generally been accepted that self-efficacy posits a positive relationship with performance (e.g., Bandura, 1997; Stajkovic & Luthans, 1998), and there is plentiful evidence to suggest that such a relationship exists across a variety of domains. For example, Stajkovic and Luthans (1998) compiled a meta-analysis of 114 studies of self-efficacy and work related performance, and reported an average positive significant correlation of .38. Multon, Brown, and Lent (1991) performed a meta-analysis with thirty-six studies on self-efficacy and academic performance. Multon et al. (1991) reported an average effect size of .38 for the effect of self-efficacy on performance. Further, a meta-analysis conducted by

Moritz, Feltz, Fahrbach and Mack (2000) on forty-five studies examined the relationship between self-efficacy and sport performance, and revealed a significant average positive correlation of .38.

Self-efficacy has also demonstrated a positive relationship with a host of desirable outcomes aside from performance. For instance, Walker, Greene & Mansell (2006) demonstrated that self-efficacy uniquely contributed to higher levels of task engagement in college students. Lee and Bobko (1994) demonstrated that self-efficacy was positively related to self-set goals and task performance. In addition, Chase (2001) examined the relationships between self-efficacy, intended effort, persistence, choice, and future self-efficacy in children within physical education and sport. Children with higher levels of self-efficacy were more likely to choose to participate, attribute failure to a lack of effort (as opposed to ability), and have higher levels of self-efficacy in the future compared to those with low self-efficacy. Further, Bouffard-Bouchard (1990) examined self-efficacy and performance on a problem solving task in college students. Results revealed that higher levels of self-efficacy were associated with more efficient problem-solving. Finally, an increase in self-efficacy has been associated with an increase in pain tolerance (Litt, 1988), persistence (Cervone & Peake, 1986; Hapler & Vancouver, 2016), higher levels of task engagement (Walker, Greene & Mansell, 2006), higher level goals (Bouffard-Bouchard, 1990; Chase, 2001), and reductions in anxiety (Williams, 1992). Thus, it seems evident that higher levels of self-efficacy is a desired commodity.

1.5 Criticisms of the between-person self-efficacy and performance research.

Despite the overwhelming evidence supporting the positive effects of self-efficacy (Bandura, 1997), the research is not without criticism. Vancouver et al. (2001) argued that there has been 'an over-reliance on cross-sectional, correlational designs' (p. 605). Cross-

sectional, correlational designs present the strength of an association between two variables at one time point, which is useful in identifying that individuals with higher levels of self-efficacy generally perform better than individuals with lower levels of self-efficacy in one-off events. However, between person designs do not allow a researcher to disentangle the relationships between previous performance and subsequent self-efficacy, and the relationship between self-efficacy and subsequent performance. Further, individuals with higher self-efficacy levels also tend to have a more advance skill set (contributing to the positive self-efficacy and performance relationship).

Vancouver et al. (2001) stated that in order to address these criticisms, one must conceptualise change as occurring within a person over time, as opposed to between people. Thus, Vancouver et al. (2001) adopted a within-person repeated measures research design to examine the self-efficacy/performance relationship. This approach allows one to separately examine the relationships between performance mastery effects and subsequent efficacy beliefs, and self-efficacy effects upon subsequent performance.

In addition, Vancouver et al. (2001) argued that 'self-efficacy may decrease, not increase, the amount of resources allocated to performance' (p. 605). This prediction is grounded in the negative feedback loop system of control theory (Powers, 1973; 1991). Control theory states that when an individual creates a goal, a discrepancy is produced between the current and desired level of performance. If the discrepancy is large, an individual will allocate the resources needed towards the task in order to reduce the discrepancy. However, if performance level is ambiguous (e.g., if no performance feedback is available), an individual may rely on subjective accounts of their current performance level, such as self-efficacy, in order to gauge the amount of resources one needs to invest in performance. In such circumstances, high levels of self-efficacy may positively bias one's perceptions of goal progress, and performance may suffer as a result of a decrease in the

resources allocated towards a task. Thus, Powers (1991) did not argue that self-efficacy would play a key role in control, instead, he stated this effect would likely be weak or non-existent, and as such self-efficacy would not always have a positive effect on performance. This adds further rationale for a within-person approach, since without disentangling the self-efficacy/performance relationship, a strong, positive relationship between pervious performance and subsequent self-efficacy could overshadow any weak or non-existent relationship between self-efficacy and subsequent performance.

1.6 Within-person self-efficacy research.

In order to test control theory's predictions and address the abovementioned criticisms, Vancouver et al. (2001) conducted a repeated measures experiment, using a within-person multilevel analysis. Fifty-six participants completed ten trials (two practice and eight experimental) of a computerized version of the game Mastermind. Mastermind is an analytical game, where individuals must guess the colour and position of four pegs in a row. Participants make a prediction by placing the pegs in a row on the screen. When a guess is complete, participants click the appropriate button to receive feedback regarding which pegs are correct. Participants continue guessing until the correct solution is found or they run out of attempts (ten attempts per game). Self-efficacy magnitude was assessed by asking participants to state how many attempts they believed it would take them to find a solution in the upcoming game. Self-efficacy strength was assessed by asking participants to state how likely they were to find a solution on a scale from 1 (extremely unlikely) to 6 (extremely likely), for each row from 1 to 10. Results at the between-person level of analysis (between person correlations), supported the majority of previous self-efficacy research and revealed a positive correlation between self-efficacy and performance (i.e., higher efficacy was related to higher performance). At the within-person level of analysis, results revealed a significant

and positive relationship between past performance and subsequent self-efficacy, but a significant and negative relationship between self-efficacy and subsequent performance occurred. Study two in the same paper replicated these results. Therefore, Vancouver et al. (2001) found support for control theory's prediction that self-efficacy is not always positively related to performance at the within-person level.

However, making causal statements regarding self-efficacy's effect upon performance is still difficult, since only the type of analysis has differed from that of previous research, and an experimental research design (e.g., manipulating self-efficacy) has not yet been conducted. Further, Vancouver et al. (2001) did not test for any underlying mechanisms of the negative relationship. Thus, in order to address these outstanding issues, Vancouver, Thompson, Tishcner, and Putka (2002) conducted two follow up experiments using the same Mastermind task and self-efficacy measures as Vancouver et al. (2001). The first study included a manipulation to increase self-efficacy on several trials, thus, the effects of an increase in self-efficacy upon subsequent performance could be tracked. In order to increase self-efficacy, Vancouver et al. (2002) reconfigured the correct answers to display the correct guess on the third attempt of the second practice trial, and on trials two, five, and seven of the experimental trials. Results at the within-person level of analysis demonstrated that the manipulation had a significant positive effect on self-efficacy, which in turn led to a negative relationship with performance on the next trial. However, the manipulation had no effect on the between-person relationship of self-efficacy and performance, providing evidence that the between-person results are not influenced by efficacy changes across time. The difference in the results from the between- and within-person analyses was attributed to a 'boomerang' effect. That is, two games after the positive self-efficacy manipulation, self-efficacy decreased but performance improved. Thus, it seems that individuals may have invested more

effort (although effort was not directly measured) in a quest to compensate for their drop in performance and efficacy beliefs.

The second study was devised in order to find further evidence for the causal influence of self-efficacy upon performance, and to examine the role of logic errors as an underlying mechanism of the negative effect. A logic error was measured by comparing a participant's final guess (a row of four pegs) against the feedback they had received for the current game so far. Vancouver et al. predicted that if self-efficacy is low, one is more likely to consider the feedback more carefully and are therefore at less risk of making mistakes. However, if self-efficacy is high, one may not accurately consider the performance feedback available, and therefore be at the risk of making logic errors which accumulate into poorer performance. Vancouver et al. revealed that individuals who had just won a game easily had (consequently) an inflated sense of efficacy, therefore they were less reliant on past performance information. This resulted in an increase in logic errors, which at least in part explains the decrease in subsequent performance.

Bandura and Locke (2003) were quick to criticise the theoretical arguments and research design of Vancouver and colleague's work. First, Bandura and Locke argued that the notion that having belief in one's capabilities is self-debilitating is nonsensical, and that nine large scale meta-analyses is evidence that self-efficacy contributes positively and significantly to performance. Second, Bandura and Locke criticised the use of the Mastermind task, stating that performance was the result of guess work and not the result of learning of a skill. Third, Bandura and Locke highlighted the fact that Vancouver et al. (2001; 2002) did not measure goals in any of their studies when testing control theory (Powers, 1973). This is a limitation, since Powers (1973; 1991) regarded goals as a vital part of control theory, since the negative feedback loop needs a goal in order to create the discrepancy that drives behaviour.

The debate about whether increasing levels of self-efficacy can have a debilitating effect on performance (and perhaps, other variables) has been a prominent feature of the research area for the past fifteen years. However, whether one errs on the side of control theory or social cognitive theory, the relationship between self-efficacy and performance does appear to be more complex than many originally thought.

The results of the Vancouver et al. studies (2001; 2002) and subsequent retort from Bandura and Locke (2003), led to an abundance of within-person research, which aimed to address Bandura's criticisms and explore potential moderators and mechanisms of the self-efficacy and performance relationship. For instance, Yeo and Neal (2006) expanded the findings of Vancouver et al. (2001; 2002) and addressed Bandura and Locke's (2003) criticism of the Mastermind task, by using a task that allowed for learning across trials. Participants completed a computerised air traffic control task, where two aircraft would appear on a computer screen and start moving towards each other. Participants had to state whether they believed that the aircraft were on a collision course or not, and were presented with 120 possible collisions across thirty trials of two minutes each. Points were awarded to participants for both the speed of their response and if the response was correct. Points were deducted, however, when responses were incorrect or not made. Self-efficacy was measured by asking participants to state how confident they were in achieving a range of possible performance levels, which were determined from pilot testing. The performance levels were easy, moderate, and difficult, which corresponded to the 10th percentile, the mean, and the 90th percentile of performance from pilot testing. Participants were asked 'How confident are you of achieving a score of X in the upcoming trial?' and answered on an 11-point likert scale from 0 (not at all) to 10 (extremely confident). Results revealed that performance improved across trial, therefore demonstrating that learning had taken place and thus addressed the criticism from Bandura and Locke (2003). In support of self-efficacy theory, a

positive between-person relationship between self-efficacy and performance was revealed. However, in support of the findings of Vancouver et al. (2001; 2002), a significant negative within-person relationship between self-efficacy and subsequent performance occurred. Yeo and Neal further supported Vancouver et al. by suggesting that the negative relationship between self-efficacy and performance was a result of participants not fully considering the performance feedback available at the time.

In addition, Richard, Diefendorff, and Martin (2006) conducted two studies to examine whether self-efficacy has a positive or negative causal effect on performance, using two different tasks that allowed learning across trials. The first study used exam performance of undergraduate students as the performance variable. Students sat a total of four multiple choice exams that were worth one hundred points each, and were administered during the 4th, 8th, 12th, and 16th weeks of two different courses. Self-efficacy was measured one week before each exam, by asking participants to rate their degree of confidence in performing several behaviours necessary for successful exam performance, on a scale of 1 (no confidence at all) to 5 (complete confidence). An example behaviour is 'I feel confident in my ability to learn statistics'. Further, performance feedback was given to participants within a week of completing each exam. Between-person results revealed a positive correlation between self-efficacy and performance that ranged between .28 and .40 across trials. At the within-person level, past performance was significantly and positively related to self-efficacy, and self-efficacy was negatively (though non-significantly) related to subsequent performance. The second study utilised a computerized chemical reactor task, where participants had to maintain the temperature of a chemical reactor by inputting fuel pellets. Participants had to add fuel pellets to the reactor in order to bring the temperature as close to 6,000 degrees as possible. Self-efficacy was measured as the strength of a participant's self-efficacy for each performance round, by asking participants to answer on a 7-point likert scale from 1 (strongly

disagree) to 7 (strongly agree) to several statements such as, 'I feel confident in my ability to perform well on the next block'. Performance was defined as the distance between the current and target temperature. The between-person analysis supported social cognitive theory in revealing a positive correlation between self-efficacy and performance. The within-person analysis revealed that previous performance was again, positively related to subsequent self-efficacy, and that self-efficacy was positively but non-significantly related to subsequent performance. Thus, Richard et al. found mixed results, which only fuelled more speculation around which circumstances self-efficacy displays a positive or negative relationship with performance.

1.7 Moderators of the within-person self-efficacy and performance relationship.

Research examining the within-person relationship between self-efficacy and subsequent performance thus far has demonstrated mixed results. Therefore, researchers began to ask questions regarding specific environments that a positive, negative, or null relationship would be found.

For instance, Schmidt and DeShon (2009) argued that there was plentiful research examining the beneficial effects of self-efficacy in challenging situations, but less so in low challenging situations. According to Schmidt and DeShon, it is these situations where complacency can set in, especially when one has high levels of self-efficacy. Thus, Schmidt and DeShon proposed that the within-person relationship between self-efficacy and performance could be moderated by one's degree of past success or failure, such that it will be positive following insufficient progress, and negative following above-standard performances. The study used the same task as the Vancouver et al. (2001; 2002) studies, Mastermind, due to the multi-trial design. However, Schmidt and DeShon allowed participants to take as many rows as they needed to find the correct solution. To measure self-

efficacy, Schmidt and DeShon asked participants to state the likelihood that they would find a solution for each row. Within-person analyses revealed that following a poor performance, self-efficacy was positively related to performance on the next trial. However, following a good performance, the relationship between self-efficacy and subsequent performance was negative. Thus, Schmidt and DeShon supported their hypothesis that when self-efficacy increased following a good performance, subsequent performance decreased. Likewise, following a poor performance and decrease in self-efficacy, subsequent performance increased. The findings also support previous research that challenges the previous assumption that self-efficacy has a positive relationship with performance.

In a follow up study, Schmidt and DeShon (2010) directly tested Bandura's (1997) prediction, that 'efficacy beliefs cannot operate as a regulative influence in an informational vacuum' (p. 66). In other words, self-efficacy beliefs cannot be influential if an individual is lacking information, such as task requirements or current performance level. This is also predicted by control theory, which states that performance ambiguity is a key component of the negative self-efficacy effects. Thus, Schmidt and DeShon hypothesised that performance ambiguity would moderate the relationship between self-efficacy and performance, such that under conditions of high performance ambiguity the relationship would be negative, however it would be positive under conditions of low performance ambiguity. Further, the moderating effects would be mediated by effort, that is, the negative relationship hypothesized in the high ambiguity condition would be underpinned by the onset of complacency. Participants completed an anagram task, where they had to make words from jumbled groups of letters. The high task ambiguity group were not informed of the number of possible solutions for each anagram, whereas the low task ambiguity group were. Self-efficacy was measured by asking participants to rate how confident they were in achieving ten performance levels ranging from 10% of solutions to 100% of solutions, on a scale of 1 to 10. Results supported

the hypotheses, and revealed a negative relationship between self-efficacy and subsequent performance for individuals in the high task ambiguity group, and a positive relationship under conditions of low task ambiguity. Further, individuals with high levels of self-efficacy in the high ambiguity group, attempted less solutions (had lower levels of effort) than those with high self-efficacy in the low ambiguity group.

Beattie et al. (2011) argued that thus far, the only studies that actually satisfy Bandura and Locke's (2003) recommendation that learning must take place across trial are the aforementioned chemical reactor (Richard et al. 2006) and air traffic control tasks (Yeo & Neal, 2006). The exam based studies do not satisfy the need for learning since the material will change between performance trials. Thus, the primary purpose of Beattie et al. (2011) was to examine the within-person self-efficacy and performance relationship in a task where continuous learning could occur across trials using a golf putting task. A secondary aim was to extend the research into sport, where self-efficacy has been identified as an important variable for performance (e.g., Feltz, Chow, & Hepler, 2008). Participants were required to attend one testing session, and complete two practice and eight experimental trials of twenty golf putts, 225cm from the target hole. To increase complexity, participants had to hit golf balls over a slope of 22º (90cm long and started 72cm from the starting point). Beattie et al. (2011) assessed self-efficacy magnitude by asking participants to respond 'yes' or 'no' to the statement 'I have the skills and resources to successfully putt 1-2 balls', 'I have the skills and resources to successfully putt 3-4 balls' repeating in the same intervals up to 19-20 balls. Self-efficacy strength was assessed by asking participants to rate how confident they were at each magnitude level they answered 'yes' to, on a scale of 0-100%. The percentages were then summed across magnitude levels, such that a self-efficacy strength score was recorded between 0-1000. Results at the between-person level revealed a positive and significant relationship between self-efficacy and performance. At the within-person level, performance

significantly improved across trial, satisfying Bandura and Locke's (2003) recommendation for learning to occur. Also at the within-person level, previous performance positively and significantly predicted subsequent self-efficacy, and in support of Vancouver et al. (2001; 2002) self-efficacy demonstrated a weak non-significant negative relationship with subsequent performance.

In a second study, Beattie et al. (2011) replicated the first but using a more refined measure of self-efficacy, and a more difficult task. The self-efficacy measure now asked participants to response 'yes' or 'no' to the statements 'I have the skills and resources to successfully putt 1 ball', 'I have the skills and resources to successfully putt 2 balls', in increasing intervals of 1 ball up to 20. In addition, the task was made more difficult by using four different starting positions. The first was 20cm in front of the original starting place in study 1, and the second was 20cm behind. Starting points three and four were 20cm either side of the original starting position. Thus, participants had to adjust to different distances and approach the slope from different angles. Between-person results displayed a positive correlation between self-efficacy (magnitude and strength) and performance. Within-person analyses demonstrated that previous performance had a significant and positive relationship with subsequent self-efficacy, and self-efficacy had a marginally significant and negative relationship with subsequent performance.

However, according to Beattie, Fakehy, & Woodman, (2014), one limitation of the above study is that although putting performance significantly improved across trials, in comparison to other golf putting studies (that demonstrate that learning continues over the course of 400 putts e.g., Masters, 1992), there may not have been enough putts made (200) for participants to soundly base their self-efficacy judgments upon. In other words, mastery experiences may not have been sufficient enough to substantially change efficacy beliefs.

Therefore, Beattie and colleagues further explored task experience as a moderating variable of the self-efficacy/performance relationship.

Beattie et al. (2014) sought to expand the findings of Beattie et al. (2011), by increasing the number of golf putts participants performed. The number of putt attempts increased from a total of two-hundred in one session in Beattie et al. (2011), to a total of eight-hundred split into four sessions of two-hundred putts per session (two sessions on day one and two sessions the following day). In addition to time spent on task, Beattie et al. (2014) examined task complexity as a moderator, in order to address further limitations highlighted by Bandura and Locke (2003). Task complexity was examined based on a further criticism of Bandura and Locke (2003) on the within-person research, who stated that even if learning occurs across trial, negative effects may still be observed if the task difficulty remains stable. Previous studies examining the within-person relationship have typically utilised multi-trial designs, however the task demands have remained the same across trials. First, Beattie et al. (2014) predicted that a negative relationship between self-efficacy and performance would be observed at the within-person level during early trials due to a lack of mastery experience. However, a positive relationship would be observed in the later stages of learning as mastery experiences increased. Second, Beattie et al. predicted that a negative relationship would occur when task difficulty was low, and a positive relationship would occur when task difficulty was high, because easy tasks induce complacency (cf. Bandura & Locke, 2003). Self-efficacy was measured in a similar way to Beattie et al. (2011), in that participants had to respond 'yes' or 'no' to the statements 'I have the skills and resources to beat my previous score by 1 point', in increasing one point intervals up to 10 points. Participants could record self-efficacy magnitude scores of above 10 if they wished. Self-efficacy strength was assessed by asking participants to state on a scale of 0-100% how confident they could achieve each magnitude level they answered 'yes' to. All strength

percentages were summed across magnitude levels. Results revealed a positive relationship between self-efficacy and performance improvement at the between-person level (apart from session three in the easy task condition). Within-person analyses revealed a slight negative relationship between self-efficacy and performance during the early stages of learning. A positive relationship emerged across all trials (as hypothesised). In the easy task condition, self-efficacy had no relationship with performance, however the relationship was positive and significant in the difficult task condition. Thus, a significant interaction of self-efficacy and task difficulty upon performance improvement was revealed. That is, when the task was dynamic and somewhat challenging, self-efficacy had a positive relationship with performance. But when the task was easy and simple, self-efficacy had a negative relationship with subsequent performance.

Finally, Beattie, Woodman, Fakehy, and Dempsey (2015) extended the research concerning the role of ambiguity in negative self-efficacy/performance relationships. Beattie et al. (2015) highlighted the fact that much of the within-person literature had neglected to inform participants of their performance level across trials (failed to provide adequate feedback). Since high performance ambiguity has been identified as a moderator of the negative relations (Schmidt & DeShon, 2010), Beattie et al. (2015) sought to examine whether the amount of performance feedback one receives has the same effect. Across three studies, participants engaged in either a driving simulator or a golf putting task. Studies one and two both utilised the driving simulator task, which consisted of thirteen trials (three practice and ten experimental), with two laps of a driving circuit per trial. Study one split participants into either a high or low feedback condition. In the low performance feedback condition, in order to limit learning, participants practiced on a different circuit to the one they completed the experimental trials on. To further increase performance ambiguity, participants received performance information regarding only the current trial (no record of

previous trials were mentioned to the participants). In the high feedback condition, participants completed the practice and experimental trials on the same circuit, and received performance information concerning their best baseline trial (best practice) and the current trial. Self-efficacy was measured via a single item self-efficacy measure, which asked how fast participants thought they could complete the upcoming trial (in seconds), and how confident they were as a percentage (0-100%). A single item measure was used in order induce an element of performance ambiguity, by purposefully avoiding participants using previous performance as a reference point. Results revealed a significant and positive relationship between self-efficacy and subsequent race time performance at the within-person level, indicating that the more confident an individual was, the worse they performed (higher race times indicate a poorer performance). Further, there was also support for the moderator hypothesis, such that the relationship between self-efficacy and performance was negative in the low feedback condition, and positive in the high feedback condition.

Beattie et al. (2015) stated that the self-efficacy measure adopted in study 1 (and indeed, previous research) may have contributed to performance ambiguity, since it only addressed one magnitude level (which reflects a form of low levels of task feedback) and did not consider previous performance. Therefore, the second study replicated the high feedback condition procedure from study one, but replaced the self-efficacy measure. The self-efficacy measure used in study two allowed for several magnitude levels of differing strengths, and asked participants to state *yes* or *no* to the statement 'I am confident in my ability to reduce my baseline time by one second'. The statement repeated in one second intervals up to thirty seconds. This time, results revealed a significant and negative relationship between self-efficacy and race time performance (indicating a positive relationship between self-efficacy and performance). In order to further confirm and extend the above findings, and address a limitation concerning the self-efficacy measure of Beattie et al. (2014), Beattie et al. (2015)

conducted a third study using a golf putting task. The golf putting task was similar to that of Beattie et al. (2014), where participants completed ten trials of twenty putts 240cm from the target. Recall that Beattie et al. (2014) found a negative self-efficacy/performance relationship, which may have partly been due to the single item self-efficacy measure, and lack of performance feedback. Thus, the third Beattie et al. (2015) study partly replicated Beattie et al. (2014), the main difference being that participants in the Beattie et al. (2015) study received performance feedback after every trial. Feedback concerned how many points participants achieved on the current trial, and all previous trials up to that point (high feedback). Further, self-efficacy was assessed by asking participants to respond 'yes' or 'no' to the statement 'I'm confident in my ability to beat my baseline score by 1 point' increasing in 1 point intervals up to 40 points. Results revealed that higher levels of self-efficacy led to better putting performance. Thus, results across three studies confirmed the hypotheses that performance feedback moderates the relationship between self-efficacy and performance, such that minimum feedback was associated with a negative relationship, and higher amounts of feedback induced a positive relationship.

1.8 Self-efficacy and resource allocation.

Based on the differing results of previous research, Vancouver, More, and Yoder (2008) stated that although it has long been recognised that the relationship between self-efficacy and motivation are nonmonotonic, the nature of the nonmonotinicity is not agreed upon. Vancouver et al. (2008) sought to further understand the relationship between self-efficacy and resource allocation. Vancouver et al. (2008) stated that 'the specific effect that different levels of self-efficacy have on behaviour is unclear' (p. 35). Thus, Vancouver et al. (2008) argued that in order to further understand the relationship between self-efficacy and resource allocation, we must first examine the different relationship between self-efficacy and

different goal processes, and second, how differences in design, measurement, and analyses can influence results. Therefore, Vancouver et al. (2008) conceptualised and compared four different models regarding the relationship between self-efficacy/expectancy and the motivation to act. The first was a positive model, based on previous research that provides evidence for the premise that the higher the belief is, the higher the motivation to act toward the behaviour. The second model was a negative model, which reflected Bandura's (1997) prediction that high levels of efficacy in a preparatory context would reduce the motivation to prepare. For example, an athlete who feels particularly confident about an upcoming competition, may neglect to prepare appropriately in the days prior to the competition, and experience a decrease in performance as a consequence. The third model reflected an inverted-U, which was based on achievement motivation theory (Atkinson, 1957). Achievement motivation theory predicts that success on difficult tasks is appealing, and so an individual will be motivated to try and achieve the task aims. However, there is no joy in completing tasks when there is no challenge, or indeed much motivation to act if the task is so difficult it appears beyond the possibilities of achievement. Finally, Vancouver et al. (2008) presented a discontinuous model, based on Kukla's (1972) model of attributions and performance. Kukla predicted that one would only invest as much effort as is needed, in proportion to one's level of ability. That is, individuals would invest effort in order to compensate for their ability, so long as the task was important. Thus, when ability is low, no motivation is exhibited. However, as perceived ability increases, there will be a point where an individual deems effort investment worthwhile, and will then engage with the task. At high levels of ability, motivation is low because individuals' believe effort is not necessary. In order to examine each of these models, Vancouver et al. used a computerized task called the 'hurricane game'. During the game, participants had to click on ('nail down') as many squares ('flying boards') as they could whilst they jumped around the computer screen. In

order to manipulate self-efficacy, the squares varied in size to offer varying levels of difficulty. Further, half of the participants received the easiest (largest) squares first, whilst the other half received the hardest (smallest) squares first. Results demonstrated both discontinuity and nonmonotonicity within the same context and thus supported the discontinuous model (the fourth model described above, based on Kukla's theory). Vancouver et al. (2008) argued that such an effect was observed, because self-efficacy positively relates to motivation during goal-choice processes, but is negatively related to motivation during goal planning. That is, goal choice creates positive discontinuity (since self-efficacy is likely positively associated with motivation), whereas goal planning creates a negative effect (because easier goals require less resource allocation).

The research reviewed thus far consistently displays a positive between-person correlation between self-efficacy and performance, supporting the original predictions of Bandura's social cognitive theory. However, the within-person analyses reveal a different story. At the within-person level of analysis, positive, negative, and non-significant relationships came to light, which support Vancouver's argument that increasing levels of self-efficacy do not always results in increases in performance.

1.9 Clarifying the within-person debate.

In light of the conflicting findings displayed in the within person self-efficacy and performance relationship, Sitzmann and Yeo (2013) conducted a meta-analysis with two main aims. The first was to compare the strength of the relationships between past performance and subsequent self-efficacy, and self-efficacy and subsequent performance. The second aim was to determine whether the relationship between self-efficacy and subsequent performance is positive, negative, or null. Sitzmann and Yeo collated thirty-eight studies (ten unpublished) that analysed self-efficacy and performance at the within-person

level. Regarding causality, the relationship between previous performance and subsequent self-efficacy was stronger (a correlation of .40 was revealed) than the relationship between self-efficacy and subsequent performance (a correlation of .23 was revealed, but this was reduced to .06 when controlling for trial). Regarding the direction of the relationship, analyses revealed that at best, self-efficacy had a moderately positive effect on performance (ρ ranged from -.02 to .33). However, this relationship was reduced to being negative or null when controlling for covariates such as linear trajectory (i.e., trial number) and previous performance. These findings infer that the often reported between-person positive relationship between self-efficacy and performance is misrepresentative of the actual relationship. That is, the stronger relationship between previous performance and subsequent self-efficacy has masked the weaker, perhaps more malleable, relationship between self-efficacy and subsequent performance.

In sum, the within-person research thus far provides evidence that the relationship between self-efficacy and performance is much more complicated than originally thought. Further, a recurring theme within the research is that the negative relationships are underpinned by a decrease in the amount of resources invested in the task, often associated with task or performance ambiguity. This is predicted in both self-efficacy theory with reference to the preparatory context (Bandura, 1997), and control theory (Powers, 1991) with reference to goal discrepancy reduction. Thus, the role of complacency when self-efficacy is *too* high (with reference to actual ability, i.e., when an individual is overconfident) is an important part of both theories. However, the premise that overconfidence is a common and robust part of human functioning does not seem to have been acknowledged within the self-efficacy research so far. Therefore, based on the literature presented, this thesis aims to examine the following areas.

2. Thesis Purpose.

The aim of the research in this thesis is to examine the roles of bias, personality, and effort, upon the self-efficacy and performance relationship. Each of these areas are outlined, below.

2.1 Overconfidence: Positive bias in human functioning.

Overconfidence is defined as 'a bias towards exaggerated personal qualities and capabilities, an illusion of control over events, and invulnerability to risk' (Johnson & Fowler, 2011, p. 317). Overconfidence is also prevalent in social comparison, since people typically believe that they are better than average when compared to others (Alicke, 1985; Kruger, 1998b), and demonstrate a positive bias when judging their own characteristics (Dunning, Heath, & Suls, 2004) and capabilities (Helzer & Dunning, 2012). Overconfidence is considered a robust phenomenon (Fischhoff, 1982) and may have been prevalent in human functioning throughout evolution.

In an attempt to explain why overconfidence is rife amongst the general population, Johnson and Fowler (2011) presented an evolutionary model that demonstrated overconfidence as a necessary component for survival. They argued that, when human functioning centred on day to day survival, overconfidence initiates the effort investment required in the necessary risk taking of winning resources needed to survive (e.g., food, territory). Indeed, as Johnson and Fowler (2011) state, 'if overconfidence is both a widespread feature of human psychology and causes costly mistakes, we are faced with an evolutionary puzzle as to why humans should have evolved or maintained such a damaging bias.' (p. 317). It is thought that overconfidence still exists, because so long as it is beneficial most of the time, it is the best strategy to boost 'ambition, morale, resolve, persistence, or the credibility of bluffing' (p. 317).

That said, society tends to view overconfidence as an undesirable trait. So much so, that it has been suggested that self-monitoring be made part of the school curriculum so that students could learn to be more accurate in self-perceptions (Beyth-Marom & Dekel 1983; Cavnanaugh & Borkowski, 1980). Further, Professor and Nobel Laureate Daniel Kahneman expressed a stark warning against the dangers of overconfidence. The 'danger' is particularly prevalent when overconfidence is present in individuals in positions of power. For instance, the kind of overconfidence that convinces governments that wars are quickly winnable and that capital projects are on budget (Shariatmadari, 2015). Indeed, overconfidence has been blamed for such disasters as the war in Iraq (Johnson, 2004), the lack of preparation surrounding Hurricane Katrina (Johnson & Levin, 2009), and the 2008 financial crisis (Akerlof & Shiller, 2009). Thus, overconfidence can have devastating outcomes on a global scale when those in positions of power make decisions based on inaccurate perceptions.

Regarding the day to day life of individuals who do not hold such global responsibilities, overconfidence has been demonstrated when predicting future exam performance (Crandall, Solomon, & Kelleway, 1955; Helzer & Dunning, 2012), the amount of time it will take to complete a task (Buehler, Griffin, MacDonald, 1997), and when judging one's desirable characteristics such as intelligence and humour (Dunning, Heath, & Suls, 2004). In addition, athletes have reported more positive perceptions of their performance level compared to their coaches (Felson, 1981), and college students bear a weak resemblance between their perception of performance and their actual level of performing (Lew, Alwis, & Schmidt, 2010).

Thus, the first empirical chapter of the thesis (chapter two), examines the role of overconfidence (positive bias) in self-efficacy judgements. In some circumstances, could it be that the negative relationship is a function of one's subconscious tendency to hold overly positive views of the self? However, Bandura (1997) would disagree with plans to eliminate

an over-positive view of one's self, he instead holds the view that erring on the side of optimism in self-efficacy judgments is an adaptive feature of human functioning, and not a cognitive failing that needs eradicating. Despite the overwhelming evidence that over predicting one's capabilities is a common phenomenon, it is still unclear whether overconfidence is facilitative or debilitative of psychological well-being (Helzer & Dunning, 2012), or indeed performance.

2.2 Individual differences: Narcissism.

The above section outlined the natural tendency for humans to be positively biased. However, there is one personality type that displays positive bias above that of the general human bias - narcissism. Despite the surge in research exploring moderators of the within-person self-efficacy and performance relationship, moderators have primarily centred on task or contextual manipulations (e.g., high and low feedback, Beattie et al., 2015; high and low task ambiguity, Schmidt & DeShon, 2010) and have ignored the possible role that individual differences may play. This is despite evidence that demonstrates that self-views are often fraught with error and positive bias reflecting overconfidence (e.g. Dunning, Heath, & Suls, 2004). In some cases, one's display of narcissistic behaviours can be considered serious to the point where psychological help is sought. However, this thesis is concerned with subclinical narcissism, that is, a 'milder' form of narcissism found in the general population.

It has been shown that individuals with subclinical levels of narcissism display a positive bias through overly optimistic views of past and current performances (Robins & Beer, 2001), are generally overconfident (e.g., Campbell et al., 2004), tend to rely on external validation to feed their positive self-image, and seek to deny negative experiences and overemphasize positive experiences (Rhodewalt & Morf, 1995; Tracy, Cheng, Martens & Robins, 2011). However, despite such grandiose beliefs, the link between narcissism and self-

confidence is complex (e.g., Campbell, Goodie & Foster, 2004; Wallace & Baumesiter, 2002; Woodman, Roberts, Hardy, Callow & Rogers, 2011).

Narcissism is often described as having two forms, grandiose and vulnerable. This thesis is more concerned with grandiose narcissism, which 'primarily reflects traits related to grandiosity, aggression, and dominance' (Miller, Hoffman, Gaughan, Gentile, Maples, & Campbell, 2011, p. 1013), in contrast to vulnerable narcissism which is associated with 'a defensive and insecure grandiosity that obscures feelings of inadequacy' (Miller et al., 2011, p. 113). Grandiose narcissism is a personality disposition that displays exceptional positive self-bias, and hence, may partly explain the negative self-efficacy and performance relationships described thus far.

There are several studies that bestow the idea that narcissism may moderate the relationship between self-efficacy and performance. For example, Farwell and Wohlwend-Lloyd (1998) found over a series of studies that narcissism correlated with overly positive assessments of current performance, and self-enhancing attributions of past events. If previous mastery experiences are the strongest antecedent to self-efficacy and narcissists have a positive bias in recalling past experience, their self-efficacy will be based only on good performances. Thus, their current self-efficacy beliefs may be positively biased as a result. Further, Campbell et al. (2004) examined the relationship between narcissism, overconfidence, and decision making on a general knowledge-betting quiz. They found that narcissism positively related to overconfidence and that overconfidence stemmed from an inflated sense of self and a perceived grand ability. In support of the Farwell and Wohlwend-Lloyd (1998) study mentioned above, the results from Campbell et al. (2004) demonstrate that narcissists based their future performance predictions on future expectations, rather than past performance. In other words, narcissists partially base their ability estimates on factors not grounded in actual performance levels. High narcissists were also more willing to bet on

their answers (due to greater overconfidence and a greater willingness to bet), a high risk strategy. Therefore, due to the potential combination of inflated self-belief not grounded in performance, and a risk taking strategy not necessarily backed up by ability levels, the performance of a narcissist may suffer.

Another reason narcissism may negatively moderate the relationship between self-efficacy and performance is concerning control theory's (Powers, 1991) prediction regarding the role of effort. As mentioned, one reason self-efficacy may demonstrate a negative effect upon subsequent performance is through the withdrawal of effort (e.g., Vancouver & Kendall, 2006). Effort may be withdrawn when self-efficacy is high, and in circumstances where goal progress is deemed to be more advanced than it actually is (e.g., when there is ambiguity surrounding performance level; Beattie et al., 2015), performance may suffer. Thus, if narcissists are more prone to holding overly positive performance level views, they may be more prone to inflated levels of self-efficacy, and actual performance may suffer as a function of withdrawn effort. Therefore, the second empirical chapter in this thesis (chapter three) explores the possible moderating effect of subclinical narcissism upon the within-person self-efficacy and performance relationship.

2.3 The role of effort.

Finally, the thesis further explores the role and measurement of effort. The use of self-report measures is potentially problematic, since they are vulnerable to self-presentational influences (Rhodewalt & Fairfield, 1991) and introspection abilities are limited (Wilson, 2002). In particular, narcissists may not accurately report their levels of effort when engaging in ego-protecting strategies (Rhodewalt et al., 2006; Roberts, Woodman, Lofthouse, & Williams, 2014). Therefore, we supplemented a self-report measure of effort with a measure of heart rate variability (HRV). HRV is influenced by sympathetic and parasympathetic

branches of the autonomic nervous system, and several studies have associated an increase in mental effort and workload with decreases in HRV (e.g., Aasman, Mulder & Mulder, 1987; Capa, Cleeremans, Bustin, Bouquet, & Hensenne, 2011; De Rivecourt, Kuperus, Post, & Mulder, 2008; Mulder, 1992). Importantly, the measurement of HRV is objective and continuous and thus, not subject to the social desirability bias inherent in self-report measures.

Finally, the third empirical chapter (chapter four) explores the relationship between self-efficacy and effort within a preparatory context. Specifically, the chapter examines the possibility that the relationship between preparatory self-efficacy and subsequent performance is mediated by effort in practice, but only at moderate levels of self-efficacy. That is, effort will act as a mediator within a conditional indirect effect model. Research thus far has demonstrated that the relationship between self-efficacy/expectancy and motivation to act is continuous and nonmonotonic (Vancouver et al., 2008), yet convincing evidence of a particular model is currently elusive.

3. Thesis Outline

3.1 Chapter 2.

In chapter 2, the positive self-bias phenomenon at a general level is explored. As mentioned, the relationship between one's prediction of future behaviour and actual behaviour has been described as modest at best (Dunning, Heath, & Suls, 2004; Zell & Krizan, 2014). Self-predictions are often fraught with error containing a positive bias, reflecting overconfidence (Dunning, 2005; Dunning et al., 2004), which has been attributed to the valuing of information available when forming efficacy judgments. Individuals prefer to utilise their performance aspirations as opposed to past performance feedback (Helzer & Dunning, 2012; recall the most influential antecedent of self-efficacy is previous mastery

experience) in order to form their judgments of future performance. Thus, the primary aim of the second chapter is to examine whether the negative self-efficacy and performance relationship is a function of a natural positive self-bias.

However, the positive bias displayed when judging the self is more prevalent when compared to the judgments of a peer (Helzer & Dunning, 2012). Therefore, the positive self-bias in efficacy judgments were compared to the performance judgments of an on looking peer. As mentioned, the self prefers to utilise performance aspirations over past performance information, however, a peer (an individual observing the task performer) prefers to utilise past performance feedback (Helzer & Dunning, 2012). Therefore, peer predictions tend to be more accurate due to the information they base their efficacy judgments on. Thus, the secondary aim of the third chapter is to explore whether a peer is more accurate in efficacy judgments, and how any differences in bias are related to the utilisation of information available (i.e., do peers utilise previous performance information more so than the self?).

3.2 Chapter 3.

The third empirical chapter of the thesis examines the role of sub-clinical narcissism upon the relationship between self-efficacy and performance. Narcissism is a personality disposition known for exceptional positive self-bias. Narcissists hold overly optimistic views regarding their previous performances, and consistently overrate their current performances (Robins & Beer, 2001). Campbell, Goodie, and Foster (2004) demonstrated that narcissists display greater levels of overconfidence, due to their higher levels of confidence but no greater accuracy. Thus, if an individual displays high levels of subclinical narcissism, and is therefore more overconfident than the average person, then they may be more prone to displaying negative self-efficacy and performance relationships.

In addition, this chapter also examines how subclinical narcissism moderates the relationships between self-efficacy and effort, and effort and performance. This allows a further investigation into the potential role of complacency, and the role that individual differences may play. Further, we supplemented self-report effort with a physiological measures in heart rate variability, since decreases in heart rate variability have been associated with increases in cognitive effort (e.g., De Rivecourt, Kuperus, Post, & Mulder, 2008; Mulder, 1992). This allowed a fuller examination of the role of effort.

3.3 Chapter 4.

The fourth chapter explores the role of effort in practice within the preparatory self-efficacy and performance relationship. One criticism of self-regulation theories is that the role of complacency is often ignored (Vancouver et al., 2001). However, in self-efficacy theory, Bandura (1997) does indeed acknowledge the role of complacency regarding the preparatory context. Bandura argues that high levels of self-efficacy during preparation for a task or performance may induce complacency in practice, and subsequent performance may suffer as a result of ill preparation. Feltz, Short, and Sullivan (2008) implied that a curvilinear relationship may in fact exist between self-efficacy and effort in the preparation phase of performance. In line with self-efficacy theory (Bandura, 1997), if self-efficacy is high, there is little reason to invest much time and effort into preparation. If self-efficacy is low, an individual may disengage from preparation altogether while holding the belief that investing any amount of effort in preparation is not going to positively impact their chances of a good performance. Thus, as found by Woodman et al. (2010), some self-doubt (depleted self-efficacy) may be advantageous, since it provides the incentive needed to acquire the knowledge and skills, or invest the right amount of effort, needed for performance. This

chapter looks for evidence of a curvilinear relationship between self-efficacy and effort in a

preparatory context.

3.4 Chapter 5.

Finally, chapter 5 concludes the thesis by drawing together the findings of chapters 2,

3, and 4. Chapter 5 offers a more detailed discussion regarding how the results contribute to

the existing research body, the theoretical and applied implications, limitations of the

research, and suggested future directions.

2

Bias in self-efficacy: A comparison of self and peer predictions of future performance [1]

4.1 Abstract

Research has shown that humans have a natural tendency to overestimate their own abilities (Dunning et al., 2004). That is, self-predictions are often fraught with a positive bias that reflects overconfidence when predicting the outcome of future self events (e.g., Dunning, 2005). However, positive biases are less prevalent in peer predictions (e.g., another person's rating of the self; Helzer & Dunning, 2012). Research has demonstrated that self views contain more positive bias because individuals ground their self-evaluations in performance aspirations (what they believe they can achieve), rather than past performance (what they have achieved; Helzer & Dunning, 2012). Positive self-bias is also prevalent in the self-efficacy and performance research (e.g., Beattie, Lief, Adamoulas, & Oliver 2011), however, research has thus far neglected to examine the role that positive bias plays in the reciprocal self-efficacy and performance relationship. In the present study, fifty same sex pairs took part in a golf putting experiment of eight trials. We compared bias in self-efficacy and peer predictions with regards to upcoming performances. Contrary to previous research, the level of bias in self-efficacy and peer predictions was similar. The relationships between previous performance and subsequent self-efficacy for the self and peer were also not significantly different. The relationship between self-efficacy (and performance predictions) and subsequent performance was non-significant and positive for the self, but significant and positive for the peer. However, the coefficients were not significantly different. Further, bias did not moderate the relationship between self-efficacy and performance. The discussion centres on the difference in research designs, which may account for the different results in the present study compared to previous research.

Keywords: *Overconfidence, self-evaluation, peer evaluation, self-efficacy.*

4.2 Introduction

In life, humans are often required to think about and plan for future events, such as going to college, or get a better job, or to obtain a more prosperous life. However, the relationship between one's prediction of future behaviour compared to actual behaviour has been described modest at best (Dunning, Heath, & Suls, 2004; Zell & Krizan, 2014). Research has shown that self-predictions are often fraught with error containing a positive bias that reflects overconfidence (e.g., Dunning, 2005; Dunning et al., 2004). Overconfidence has been described as a robust phenomenon (Fischhoff, 1982), and has been linked to unrealistic optimism regarding future exam performance (Crandall, Solomon, & Kelleway, 1955; Helzer & Dunning, 2012), the amount of time it will take to complete a task (Buehler, Griffin, MacDonald, 1997), and predicting performing in novel sport tasks (Beattie, Lief, Adamoulas, & Oliver, 2011). However, when examining peer predictions, (i.e., an informants predication of another's future behaviour), the positive bias that is often observed in self-predictions is reduced (Helzer & Dunning, 2012).

Research on the accuracy of self-evaluations is vast. For example, Zell and Krizan (2014) conducted a meta-synthesis of twenty-two meta-analyses examining the relationship between self-evaluation (e.g., perceived knowledge, self-confidence, self-concept, and self-efficacy) and objective performance. Zell and Krizan observed an average between-person correlation of .29, and therefore concluded that people have only a moderate insight into their own ability. However, one limitation of the meta-synthesis noted by Dunning and Helzer (2014) is that there are two important ways to assess self-evaluations, and Zell and Krizan (2014) only focussed on one. The first assessment of self-evaluation is termed 'discrimination', and is the correlation between predicted and actual behaviour (used by Zell & Krizan, 2014). The second is termed 'bias', and is the average error in one's predictions regarding future performance. Measuring bias in self-predictions distinguishes whether an

individual holds a negative bias (i.e., under confident) or a positive bias (i.e., over confident). Dunning and Helzer (2014) argue that it is particularly pertinent to examine both of these measures, since a strong bias (reflecting inaccuracy) can still exist in the presence of strong discrimination.

While exploring possible explanations for self-report bias, Helzer and Dunning (2012; Study 1) asked undergraduates several performance related questions about an upcoming exam (e.g., how much effort they planned to invest, how important it was for them to reach their goal, and what percentage they believed they would achieve). The undergraduate then selected which information to give to a yoked peer, with the aim of encouraging the most accurate exam prediction possible (termed the information giving phase). The same questions were also made available to the yoked peer, who then selected which answers they wanted to see in order to make an accurate prediction about the target's future performance (information wanting phase). Results from the information giving phase demonstrated that participants would rather give out their performance aspiration than their past performance grades, indicating that they believed their aspirations would be the most diagnostic predictor of future performance. Further, in the information wanting phase, the peers requested past performance information over performance aspirations to aid their predictions. However, when the roles were reversed, the same individuals who requested previous performance to aid their predictions of a peer, gave out performance aspiration information to elicit accurate predictions from others.

Helzer and Dunning (2012) conducted a second study to examine whether the target and peer would demonstrate the same tendency toward using performance aspirations or past performance respectively, when given access to *all* the information about the upcoming exam. That is, participants supplied their past exam performance and a target score to a yoked peer, before they both made predictions about the target individual's upcoming exam

performance. Results revealed that self and peer predictions correlated equally with performance (equal discrimination). Further, the self and peer demonstrated a positive bias in their predictions, such that they both predicted that the target individual would perform better than they actually did. However, the self-predictions displayed significantly more positive bias than the peer. The increased accuracy of the peer was again attributed to the fact that they valued past performance information more than performance aspiration information when making performance predictions.

Self-bias presentations have also been noted in self-efficacy and performance research (e.g., Beattie et al., 2011; Vancouver, Thompson, & Williams, 2001; Vancouver, Thompson, Tischner, & Putka, 2002). Self-efficacy is defined as "beliefs in one's capabilities to organise and execute courses of action required to produce given attainments" (Bandura, 1997, p. 3). Vancouver et al. (2001) used multilevel modelling to examine the reciprocal relationship between self-efficacy and performance. The advantage of this method is that one can examine the independent effects of previous performance upon subsequent efficacy beliefs. Further, one can also examine the relationship between self-efficacy and subsequent performance (while controlling for past performance). Beattie et al. (2011) used this method to examine the reciprocal effects of self-efficacy and performance in a golf putting task. Across two studies, Beattie et al. consistently found a positive bias in self-efficacy beliefs. That is, on average, participants consistently believed they could perform at a higher level than they were actually obtaining, even though participants had access to performance related information showing them that they were not obtaining the performance standards that they thought they were capable of achieving (demonstrating a positive bias in efficacy beliefs). Further, across both studies, self-efficacy had a slight negative relationship with subsequent performance (possibly demonstrating some level of overconfidence).

Similar to the general self-evaluation literature mentioned above (e.g., Dunning, 1999; Helzer & Dunning, 2012), the information that one has available in order to make self-efficacy judgments has been attributed to how self-efficacy relates to subsequent performance. For example, Beattie, Woodman, Fakehy, and Dempsey (2015) found that task feedback moderated the relationship between self-efficacy and performance. They found that a lack of feedback regarding previous performance led to a negative relationship between self-efficacy and performance. However, when one had access to previous performance information a positive relationship emerged. In addition, Schmidt and DeShon (2010) demonstrated that task ambiguity moderated the self-efficacy and performance relationship. That is, a negative relationship between self-efficacy and performance was observed under conditions of high task ambiguity, but a positive relationship emerged under conditions of low ambiguity. Further, Hapler and Vancouver (2016) revealed that self-efficacy was unrelated to performance on a hand-grip persistence task when feedback was ambiguous. Thus, it seems apparent that when one lacks information regarding current performance levels or task demands, there is a risk that positive bias in efficacy beliefs may become more prevalent, leading to negative self-efficacy and performance relationships. However, self-efficacy bias scores were not reported in the above research, only the relationship between self-efficacy and performance which is more a reflection of the 'discrimination' approach.

Thus, the purpose of the current study was to examine self-bias within a self-efficacy framework, and whether any positive bias in self-efficacy ratings (e.g., Beattie et al., 2011) are also present in peer predictions of future performance (e.g., Helzer & Dunning, 2012). Another purpose of the study was to examine how bias in self-efficacy beliefs (both self and peer) are related to actual performance. Thus, we predicted the following. First, we expect a positive correlation (discrimination) for self-efficacy and performance at the between person level of analysis for the self and the peer (supporting previous research e.g., Beattie et al.,

2011; Helzer & Dunning, 2012; Vancouver et al., 2001). Second, by using a within-person approach, we were able to examine how much the self or the peer utilised previous performances to infer subsequent self-efficacy judgments. That is, if the self values previous performance information less than the peer to inform subsequent efficacy beliefs, then there should be a stronger relationship between previous performance and subsequent efficacy beliefs for the peer. Third, the self will demonstrate a larger positive bias (e.g., Helzer & Dunning, 2012) in their self-efficacy judgments about future performances compared to the peer. Fourth, the presence of a positive bias in self-efficacy predictions will result in a negative relationship between self-efficacy and performance (e.g., Beattie et al., 2011).

4.3 Method

Participants

One hundred participants volunteered to take part in the study, which created 50 same sex pairs (68 males; M_{age} 21.19 years, $SD = 3.82$). All participants were right-handed and had little or no golf experience. Participants received an information sheet prior to taking part, and signed a consent form upon arrival to agree to participate. Ethics for the study was granted via an internal University ethics board.

Apparatus

A putting task was designed for this study where putting was performed on a 12ft x 10ft Huxley flat putting surface green (http://www.huxley golf.co.uk) using a standard Prosimmon KT25 putter, and standard Slazenger Raw Distance 432 dimple pattern golf balls.

Task

Participants completed a lab-based golf-putting task on a flat indoor putting green, with a putting distance of 240cm. Five concentric circles were highlighted around the hole, which was 10.5cm in diameter. Participants received five points for putting the ball, four

points if they missed by up to 5cm, three points if they missed by 5cm to 10cm, two points if they missed from 10cm to 15cm, one point if they missed by 15cm to 20cm, and zero points if the target was missed by more than 20cm. If the ball was deemed to have stopped on the line between scoring zones, the higher number of points was awarded. Each participant had three practice and eight experimental trials of twenty putts per trial, thus the maximum number of points that could be achieved on each trial was one hundred, and total putts completed 220 (160 experimental). The data collect during the practice trials was not used in any of the reported analyses. In order to maintain incentive throughout the study, a cash prize was available. Participants were informed that the three individuals with the highest scores across the experiment would receive a cash prize, with first place receiving £30, second place receiving £20 and third place receiving £10.

Measures

Raw Performance: Performance was the total number of points scored per trial.

Performance Improvement: Performance improvement was the change in performance from the previous to the current trial. For example, if one scores 50 points on a previous trial then 60 on the next, the subsequent performance improvement score would be 10. Further, if a participant scored 50 points and then 40 on the next trial, the subsequent performance improvement score would be -10.

'Self' Performance Evaluations

Self-efficacy magnitude: Self-efficacy magnitude was measured by asking participants two questions. The first asked participants to answer 'yes' or 'no' to the following statement; 'I believe I have the skills and resources to beat my last performance'. If participants answered 'yes' they would proceed to the second question, which asked participants to indicate how many putts they believed they could improve by. The statement 'I have the skills and resources to beat my last score by 1 point' was repeated in increasing one point

intervals up to 30 points. If the participant answered 'no' to the first question, a self-efficacy score of 0 was recorded. Participants were informed they could record a magnitude score of beyond 30 should they wish to, by continuing on the same sheet of paper.

Self-efficacy strength: Self-efficacy strength was measured by asking participants to rate the degree of confidence (on a scale of 0-100%) they had in their ability to perform at each magnitude level they answered 'yes' to. We obtained a single strength score for each trial by summing the strength percentages reported for each magnitude level per trial. The self-efficacy measure for the self can be found in Appendix A.

Bias: Bias in self-efficacy judgments was the difference between what the participant believed they could achieve, and what they actually subsequently achieved. We calculated this by first adding the previous performance score to the current self-efficacy magnitude score, in order to gain a 'predicted score'. We then subtracted this value from the subsequent performance score to reveal any bias. For example, if the previous performance score was 50 points and an individual recorded a self-efficacy magnitude of 10, this resulted in a predicted score of 60 (e.g., I can beat my previous score of 50 by 10 points). If the individual then actually only scored 55 points on their subsequent trial, the bias score would be +5. Thus, a positive bias would indicate that the individual was over confident (in this case by 5 points). If the same individual had a previous performance score of 50 points, and recorded a self-efficacy magnitude of +10, this (again) gave a predicted score of 60. If the individual then scored 65 points on their subsequent trial, the bias score would be -5. Thus, a negative bias would indicate that the individual was under confident (in this case by 5 points).

'Peer' Performance Evaluations

Peer prediction magnitude: The prediction measurement for the observer was the same as the self-efficacy magnitude measure for the self, however, 'I' was replaced accordingly with 'they' or 's/he' where appropriate. Thus, the peers were first asked to

indicate 'yes' or 'no' if they agreed with the following statement; 'I believe they have the skills and resources to beat their last performance'. If participants answered 'yes', they would proceed to indicate by how many putts they believed the target could improve by. The statement 'S/he has the skills and resources to beat their last performance by 1 point' was repeated in increasing one-point intervals up to 30 points. If the participant answered 'no' to the first statement, a self-efficacy score of 0 was recorded. Participants were informed they could record a magnitude score of beyond 30 should they wish to, by continuing on the same sheet of paper.

Peer prediction strength: Peer prediction strength was measured and calculated in the same way as self-efficacy strength. The self-efficacy measure for the peer can be found in Appendix B.

Peer bias: The bias in peer predictions was again obtained in the same way, however the self-efficacy magnitude score was substituted with the peer prediction magnitude score.

Procedure

Participants attended one testing session in same sex pairs. Upon arrival, we briefed participants about the procedure upon which they signed a consent form to confirm their agreement to take part. Participants decided between themselves who would putt first and who would observe. Participants were responsible for placing each ball on the starting point (marked with an 'X') for each putt. After each putt attempt, the experimenter removed any balls that would obstruct subsequent attempts. To reduce monotony, participants completed ten putts from two different starting points equidistant from the hole (240cm). Immediately following each trial, we presented the putter and observer with performance feedback consisting of the total number of points scored for each trial, including the trial just completed. The performance feedback was further broken down to include the number of points scored per putt attempt (that is, which scoring boundary the ball stopped in, e.g., 0-5cm

for 4 points). At this point, the participant completed the self-efficacy questionnaire. Finally, we explained to the participants that they must not confer or share their predictions. The process was repeated until all three practice and eight experimental trials were completed by the putter.

4.4 Results

Table 1a displays the descriptive statistics, bivariate correlations, and intraclass correlations for the self. The intraclass correlations (ICC) for the self ranged from .001 to .56, which indicates that between .1% and 56% of the variance was accounted for at the between-person level. Table 1b displays the same information for the peer, where between-person variance ranged from .01% to 41%. The fact that the ICC for subsequent performance improvement displayed almost no between-person variance (.01%), may be problematic. With almost all of the variance in subsequent performance improvement accounted for at the within-person level, there is no justification to adopt a multi-level analysis when examining this particular variable (Aguinis, Gottfredson, & Culpepper, 2013). Although subsequent performance improvement would be our preferred performance variable due to its concordance with the self-efficacy measure, the ICCs suggest that using the raw performance score would be more suitable. Thus, for hypotheses that examine performance, we report two analyses. One that uses the raw performance score, and another that uses the subsequent performance improvement score. We encourage the reader to interpret any model using subsequent performance improvement with caution.

Preliminary Analyses.

Tables 1a and 1b display the means, standard deviations, bivariate correlations, and intraclass correlations between variables for the self and peer, respectively. Of note, is the similarity in bias scores for the self (9.05) and the peer (8.44), which indicates that all participants were overconfident in their predictions of future performance. Further, bias was

negatively and significantly correlated with subsequent performance improvement, which indicates that overconfidence was more prevalent at lower levels of performance. Finally, self-efficacy had a positive and significant relationship with bias, which indicates that higher levels of self-efficacy were associated with higher levels of overconfidence (positive bias).

Main Analyses.

Between-person analyses.

Hypothesis 1: *The self and the peer will display positive relationships between self-efficacy and performance at the between-person level of analysis.*

Raw Performance.

At the between person level of analysis (in order to examine 'discrimination'), there was a significant and positive correlation between self-efficacy and performance for the *self* (magnitude: $r = .13$, $p < .05$; strength: $r = .13$, $p < .05$), but a non-significant positive correlation for the *peer* (magnitude: $r = .10$, $p > .05$; strength: $r = .06$, $p > .05$).

Subsequent Performance Improvement.

When using subsequent performance improvement (the change in performance from the previous to current trial), the relationship strengthened for the *self* (magnitude: $r = .23$, $p < .001$; strength: $r = .26$, $p < .001$), and strengthened and became significant for the *peer* (magnitude: $r = .30$, $p < .001$; strength: $r = .32$, $p < .001$). Thus, results support a plethora of previous research that presents a positive correlation between self-efficacy and performance (e.g., Beattie et al., 2011, Vancouver et al., 2001; 2002), and previous research that states the relationship will be stronger if the self-efficacy and performance measures are concordant (Bandura, 1997; Moritz, Feltz, Fahrbach, & Mack, 2000).

Table 1a: *Means, standard deviations, bivariate correlations, and intraclass correlations for the self.*

Variable	Mean (SD)	Bivariate Correlations (ICCs in bold)					
		1	2	3	4	5	6
1. Previous Performance	44.46 (15.53)	**.44**					
2. Self-efficacy (magnitude)	9.73 (8.45)	-.11*	**.56**				
3. Self-efficacy (strength)	727.51 (728.62)	-.15**	.97**	**.54**			
4. Raw Performance	45.00 (15.41)	.42**	.13*	.13*	**.39**		
5. Subsequent Performance Improvement	.54 (16.65)	-.54**	.23**	.26**	.53**	**.0001**	
6. Bias	9.05 (16.59)	.48**	.28**	.24**	-.45**	-.87**	**.11**

*p < .05; **p < .001.

Table 1b: *Means, standard deviations, bivariate correlations, and intraclass correlations for the peer.*

Variable	Mean (SD)	Bivariate correlations (ICCs in bold)					
		1	2	3	4	5	6
1. Previous Performance	44.95 (15.54)	**.41**					
2. Performance Prediction (magnitude)	9.02 (7.41)	-.22**	**.39**				
3. Performance Prediction (strength)	625.35 (573.31)	-.28**	.94**	**.30**			
4. Raw Performance	45.49 (15.38)	.43**	.10	.06	**.38**		
5. Subsequent Performance Improvement	.54 (16.58)	-.54**	.30**	.32**	.53**	**.0001**	

| 6. Bias | 8.44
(16.26) | .46** | .15** | .10 | -.49** | -.89** | **.001** |

*p < .05; **p < .001.

To investigate further, we examined the between person correlations (discrimination) for each individual trial for the self and peer (see Appendix C for the self and Appendix D for the peer). The self displayed no significant correlations between self-efficacy and performance, and the peer only displayed one (Trial 7). When using subsequent performance improvement, the self displayed two significant positive correlations (Trials 3 and 5), however, the peer demonstrated five significant correlations between self-efficacy and subsequent performance improvement (Trials 3, 4, 5, 7 and 8). Thus, the peer demonstrated a more accurate prediction between self-efficacy and subsequent performance than the self (especially when subsequent performance was examined).

Within-person analyses.

We used Hierarchical Linear Modeling (HLM; Raudenbush & Bryk, 2002) to examine within person effects for hypotheses 2, 3, and 4. All variables were group mean centered and we used a random intercept and slopes model. Level-1 variables were self-efficacy magnitude and strength, peer prediction magnitude and strength, raw performance, subsequent performance improvement, and bias. Level-2 variables were participant (hypothesis 2) and bias (hypothesis 4). Level-1 variables were group mean centered, whereas Level-2 variables were grand mean centered.

Regarding the self, self-efficacy magnitude and strength decreased slightly (non-significantly) across trial (magnitude: γ_{10} = -.08, p = .58; strength: γ_{10} = -5.71, p = .63). Performance increased significantly across trial (γ_{10} = .65, p = .02), and subsequent performance improvement increased slightly but non-significantly across trial (γ_{10} = .12, p = .60). This reflects that as performance improved, participants believed there was less room for them to continue to improve in later trials (suggesting a learning effect). The bias in the

self-predictions decreased slightly (non-significantly) across trial ($\gamma_{10} = -.21$, $p = .42$).

Showing that participants may have been becoming slightly more accurate with their

predictions across time. All gamma values, significance, and variance values for the self are

in Table 2a below.

Table 2a. *Within-person analyses for the self.*

	γ	SE (robust)	Total Variance (%)
DV = Self-efficacy Magnitude			
Trial	-.08	.15	5.97
Previous Performance	-.28**	.03	53.78
DV = Self-efficacy Strength			
Trial	-5.71	11.91	2.34
Previous Performance	-25.13**	2.85	56.10
DV = Subsequent Performance			
Trial	.65	.27	2.43
Previous Performance	-.11*	.05	5.78
a. SEM	-.09	.14	6.72
b. SES	-.0001	.001	6.06

*$p < .05$; ** $p < .001$.

Regarding the peer, peer prediction magnitude and strength decreased (non-

significantly) across trial (magnitude: $\gamma_{10} = -.22$, $p = .14$; strength: $\gamma_{10} = -23.26$, $p = .07$). The

bias in peer prediction decreased slightly (non-significantly) across trial ($\gamma_{10} = -.30$, $p = .21$).

These results tend to mirror those of the self. All gamma values, significance, and variance

values for the peer are in Table 2b below.

Table 2b. *Within-person analyses for the peer.*

	γ	SE (robust)	Total Variance
DV = Peer Prediction Magnitude			
Trial	-.22	.15	5.85
Previous Performance	-.31**	.03	59.33
DV = Peer Prediction Strength			
Trial	-23.26	12.36	7.26
Previous Performance	-24.53**	2.91	61.60
DV = Subsequent Performance			
Trial	.69*	.26	2.14
Previous Performance	-.13*	.05	5.55
a. Peer Prediction Magnitude	-.18	.13	7.10
b. Peer Prediction Strength	-.002	.001	7.30

*$p < .05$; ** $p < .001$.

Hypothesis 2: *The relationship between previous performance and self-efficacy (performance predictions for the peer), will be stronger for the peer compared to the self at the within-person level of analysis (because the peer will place higher value on previous performance information when formulating their efficacy judgments).*

Regarding the *self*, after controlling for trial (see Sitzman & Yeo, 2013), the relationship between previous performance and subsequent self-efficacy was negative and significant (magnitude: γ_{20} = -.28, p < .01. Figure 1a; strength: γ_{20} = -25.13, p < .001). For the *peer*, after controlling for trial, the relationship between previous performance and performance predictions was also significant and negative (magnitude: γ_{20} = -.31, p < .001. Figure 1b; strength: γ_{20} = -24.53, p < .001). That is, as performance improved across trials, participants efficacy expectations (both self and peer) regarding improving upon previous performances reduced (showing a learning effect). The coefficients were not significantly different from each other (magnitude: t_{757} = .71, p > .05; strength: t_{757} = .15, p > .05). Thus, as previous performance increased, both the self and the peer believed that the self could not improve by the same amount in subsequent trials. Consequently, hypothesis 2 was not supported.
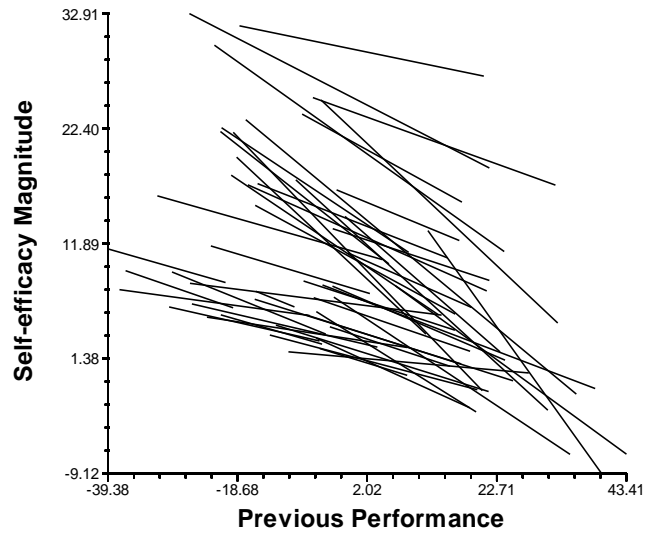
Figure 1a: *The relationship between previous performance and self-efficacy magnitude for the self.*
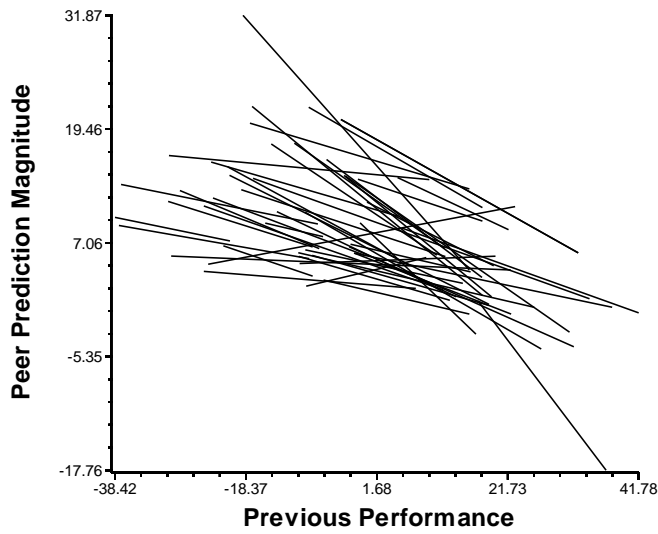
Figure 1b: *The relationship between the previous performance of the putter, and performance prediction magnitude of the peer.*

Hypothesis 3: *Any positive bias in self-efficacy beliefs will be significantly higher for the self, compared to the peer.*

In order to examine the difference in bias between the self and peer at the within-person level, we created a model in HLM (Raudenbush & Bryk, 2002) with bias as the outcome variable, and participant group as the predictor variable at level 2 (with the self coded as 0, and the peer coded as 1). Results revealed that participant group did not predict bias (γ_{01}= .81, p = .56), and only accounted for 1.29% of the variance.

To study further, we examined whether the change in bias across time was different for the self and peer. We entered bias as the outcome variable and trial as the predictor variable both at level 1, with participant group at level 2. Results demonstrated no moderating effect of participant group on bias across trial (γ_{11} = -.04, p = .90).

Hypothesis 4: *Positive bias (overconfidence) will moderate the within-person relationship between self-efficacy (peer prediction) and subsequent performance, for both the self and peer.*

Raw Performance.

First, we examined the main effect between self-efficacy and subsequent performance at level-1. For the *self* and when using performance as the outcome variable, self-efficacy magnitude and strength displayed a non-significant negative relationship with subsequent performance when controlling for trial and previous performance[2] (magnitude: γ_{30} = -.09, p = .52, Figure 2a; strength: γ_{30} = -.0001, p = .96). The main effect for the *peer* also demonstrated a non-significant negative relationship (magnitude: γ_{30} = -.18, p = .16, Figure 2b; strength γ_{30}

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[2] In accordance with the recommendations of Bandura and Locke (2003), the residual of previous self-efficacy and previous performance was used as a covariate. This controls for any effect of the lagged self-efficacy variable on the subsequent self-efficacy and performance relationship.

= -.002, p = .17). Further, there was no significant difference between the regression

coefficients of the self and peer (magnitude: t_{757} = .68, p = .49; strength: t_{757} = .04, p = .96).

Next, we added self-bias at level-2 as a moderator. Results revealed no moderating

effect for the *self* (magnitude: γ_{31} = -.01, p = .52; strength: γ_{31} = -.0001, p = .38) or *peer*,

although the p value was close to significance regarding peer prediction strength (magnitude:

γ_{31} = -.01, p = .26; strength: γ_{31} = -.0001, p = .12).

Subsequent Performance Improvement.

When using subsequent performance improvement as the outcome variable (and

controlling for trial and previous performance), the *self* displayed a non-significant positive

relationship (magnitude: γ_{30} = .12, p = .41; strength: γ_{30} = .002, p = .16). The *peer* displayed a

significant and positive relationship (magnitude: γ_{30} = .31, p < .05; strength: γ_{30} = .004, p <

.05). The regression coefficients for the self and peer were not significantly different

(magnitude: t_{757} = .93, p = .35; strength: t_{757} = .71, p = .48).

Results revealed no moderating effect of bias for the *self* (magnitude: γ_{31} = -.004, p =

.54; strength: γ_{31} = -.0001, p = .39), or *peer* (magnitude: γ_{31} = -.001, p = .35; strength: γ_{31} = -

.0001, p = .28).
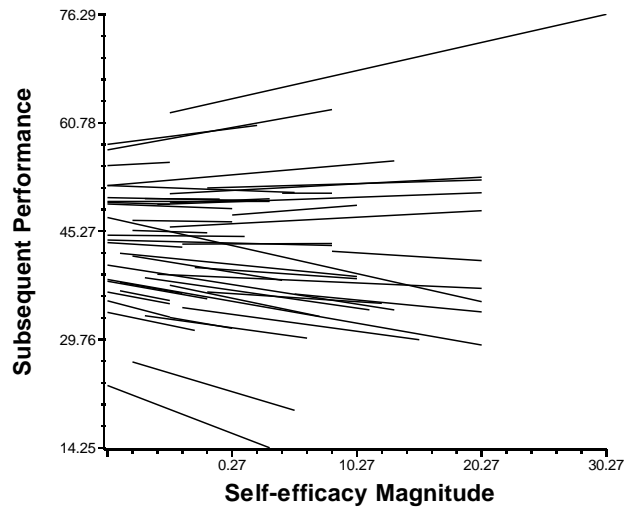
Figure 2a: *The relationship between self-efficacy magnitude and subsequent performance for the first putter.*
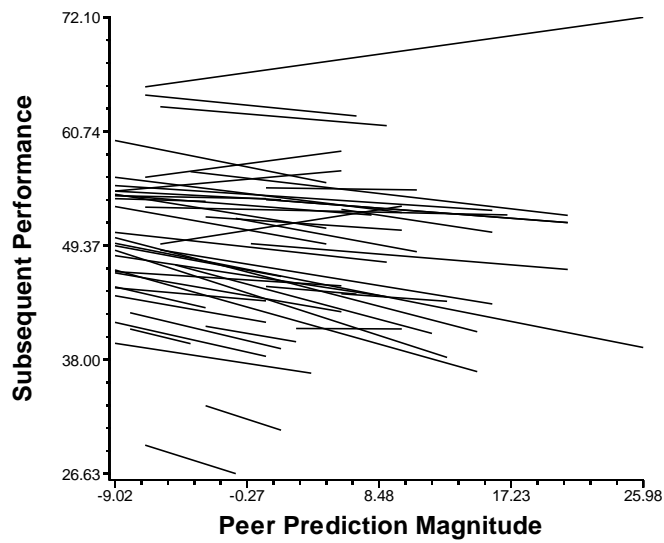
Figure 2b: *The relationship between peer prediction magnitude and subsequent performance improvement for the on looking peer.*

4.5 Discussion

Previous research has indicated that when predicting future performance, self and peer predictions display a positive bias, yet peer predictions display less positive bias (and therefore increased accuracy) than the individual completing the task (e.g., Helzer & Dunning, 2012). A positive bias in self-evaluations has also been prevalent in the within-person self-efficacy and performance research (e.g. Beattie, et al., 2011). Thus, the primary purpose of the study was to examine bias within a self-efficacy framework. Specifically, we expected a positive bias in self-views to explain, at least in part, the negative relationship between self-efficacy and performance. Thus, we examined the role of bias on the within-person self-efficacy and performance relationship, and further, in comparison to peer predictions.

Hypothesis 1 predicted that the self and peer would both display a positive between-person relationship between self-efficacy and performance. Results supported our predictions, such that higher levels of self-efficacy were associated with higher levels of performance for both the self and peer. This was the case when using raw performance scores and subsequent performance improvement scores. The relationships were stronger for the self and peer when using subsequent performance improvement, since concordant measures typically demonstrate stronger relationships between variables (Bandura, 1997; Moritz et al., 2000). The positive relationship between self-efficacy and performance supports a host of previous self-efficacy research (e.g. Beattie et al., 2011; Helzer & Dunning, 2012) and self-efficacy theory's predictions (Bandura, 1997).

Hypothesis 2 examined the within-person relationship between previous performance and self-efficacy. We predicted that the relationship would be stronger for the peer, as the peer would value past performance information more so than the self when formulating their predictions. Both the self and peer revealed negative and significant relationships, which

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indicate that as previous performance improved, both the self and peer believed that the self could not improve by as much on the next trial. This demonstrated a learning effect, and has been present in other similar studies (e.g. Beattie et al., 2011). The peer demonstrated a slightly stronger relationship (-.28 compared to the self, -.31), however, the coefficients were not significantly different from each other. This was contrary to our expectations.

We expected a stronger relationship for the peer, based on previous research that has demonstrated that peers place more value in past performance information than the self (Helzer & Dunning, 2012). This may have been due to either the self having a stronger than expected relationship between previous performance and self-efficacy, or, the peer having a weaker relationship than expected. First, the self may have had a stronger relationship because we did not ask them to consider a performance goal, as was the case in Helzer and Dunning (2012). Without prompting the putter to consider their performance aspiration, they may have placed equal (to the peer) value on the performance feedback in front of them. In light of this, our method is different to Helzer and Dunning's (2012), and as such one limitation of the study is that we failed to measure goals. Thus, we cannot know whether the self held a stronger relationship between self-efficacy and goal (compared to self-efficacy and previous performance). Alternatively, the self may have under reported their self-efficacy in light of the behaviour (golf putting) being highly observable. Gosling, John, Craik, and Robins (1998) demonstrated that less observable acts are more likely to elicit over reporting, and that self-enhancement was greatest for behaviours that are difficult to observe. Second, the peer may have demonstrated a weaker than expected relationship between previous performance and performance predictions. The peers had no experience of the task that they were observing, therefore it may have been difficult to accurately gauge the performance of the putter with no appreciation for the task difficulty level. In addition, novice performances

can be somewhat inconsistent (Fitts & Posner, 1967), which may have also contributed to poor peer prediction.

However, the most likely explanation concerns the presence of the performance feedback after each trial. Feedback plays an important role in self-evaluations, and has been shown to positively moderate the relationship between self-efficacy and performance (Beattie et al., 2015), decrease overconfidence (Arkes, Christensen, Lai, & Blumer, 1987; Stone & Opel, 2000), and improve calibration (Lichtenstein & Fischhoff, 1980). Thus, with all performance feedback available to both the self and peer throughout the experiment, it seems as though all participants were basing their efficacy judgments on the same information (previous performance).

Hypothesis 3 predicted that the self would display a larger positive bias in their self-efficacy judgments compared to the peer. Both the self and peer displayed a positive bias that reflected overconfidence in performance predictions. However, the difference in self and peer bias was less than 1 point (the self over predicted by 9.05 points, and the peer by 8.44), therefore somewhat unsurprisingly, the difference between the bias scores was not significant. Again, these results may also be attributed to the role of feedback. As mentioned, objective performance feedback can 'de-bias' an individual's prediction regarding future performance (e.g., Arkes et al., 1987; Beattie et al., 2015; Stone & Opel, 2000), and the results of hypothesis 2 suggest that the self and peer utilised the previous performance information similarly when forming self-efficacy and performance predictions over time.

Further evidence to suggest that the performance feedback contributed to more accurate performance predictions, can be seen when the bias in this study is compared to the bias present in Beattie et al. (2011). We used a very similar procedure to that of Beattie et al. (2011), however, one key difference is that we provided performance feedback after each trial. Beattie et al. (2011) demonstrated that individuals consistently over-predicted how well

they would perform, by approximately 3-4 putts each trial. The mean bias for the self and peer in this study was 9.05 and 8.44 respectively, which equates to under 2 putts. Thus, the performance measure in the current study was more sensitive. If Beattie et al. had used the same performance measure as the current study, this would equate to 15-20 points. Thus, feedback and perhaps a more sensitive performance measure seem to have played a role in reducing the bias for both the self and peer.

Finally, hypothesis 4 predicted that bias would moderate the within-person relationship between self-efficacy and subsequent performance, such that higher levels of positive bias would contribute to a more negative self-efficacy and performance relationship. We also predicted that this would be particularly prevalent for the self, due to their increased susceptibility to positive bias. When using raw performance as the dependant variable, results revealed negative and non-significant relationships for both the self and peer. When using subsequent performance improvement as the dependant variable, the self demonstrated a non-significant positive relationship, however the peer demonstrated a significant positive relationship[3]. Thus, when using subsequent performance improvement (the concordant performance variable), the results were slightly more in line with our predictions. These results demonstrate that as self-efficacy increased, performance improved. The self was slightly more overconfident, since performance improved at a lesser rate for every unit increase in self-efficacy compared to the peer. However, the coefficients were not significantly different from one another, and bias did not moderate any of the self-efficacy/performance relationships, and so our predictions were not fully supported.

The predictions of hypothesis 4 were deemed to be reliant on the self demonstrating more positive bias than the peer, however this was not the case as the self and peer displayed

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[3] It is important to remind the reader at this point, to interpret these results with caution, due to the low ICC which can inflate alpha (Aguinis et al., 2013).

similar amounts of bias (hypothesis 3). As mentioned, this may largely be due to availability of performance feedback, which may have decreased bias levels for the self (and also perhaps the peer). Therefore, another limitation of the study is that there is no second condition that withholds feedback. With this second condition, it would have been possible to prove (or disprove) our arguments surrounding the use of feedback.

Another consideration for the similarity in the levels of bias for the self and peer, may be the repeated measure design. Previous research (e.g. Helzer and Dunning, 2012; Buehler et al., 1997; and Buehler et al., 1994) reports that individuals displayed overconfidence in future performance predictions when asking participants about a one-off upcoming task. However, the current study asked participants to predict future performance over a series of trials and provided directly relevant feedback between each trial. This repeated measures design allows the participants to make any corrective actions, such as invest more effort or alter their task execution. Thus, one may expect to see increased accuracy over the course of repeated measures. To support this idea one may turn to the results of Beattie et al. (2014) who found that time on task moderated the self-efficacy/performance relationship. A negative relationship emerged in early trials, yet a positive relationship emerged in later trials. Beattie et al. stated that 'negative self-efficacy effects may be in part due to experimental studies where learning is limited by a short time frame' (p. 609).

It is important to remind the reader of the limitation regarding the subsequent performance improvement measure, which was alluded to in the results section. In order to examine the relationship between self-efficacy and performance it is important to ensure the measures are concordant (Bandura, 1997), as concordance moderates the strength of the relationship between self-efficacy and performance (Moritz et al., 2000). Our self-efficacy measure asked participants to state how much they believed they could improve by from the previous trials, and thus our performance measure should be performance improvement.

However, the low ICC signifies that almost all of the variance is accounted for at the within-person level. Thus, there is a lack of between-person variance. As a result, a multi-level analysis such as hierarchical linear modelling (with observations clustered within people) is arguably not suitable with this variable. We recommend future research re-examine these relationships with an alternative self-efficacy measure, for example 'I have the skills and resources to successfully putt 1 ball' (as used by Beattie et al., 2011), since a raw performance score may offer more between-person variance. Indeed, in the current study, raw subsequent performance had an ICC of .39 for the self and .39 for the peer, indicating that 39% of the variance is accounted for at the within-person level. Thus, the remaining 61% may be accounted for by level-2 variables.

Thus, to conclude, we acknowledge a number of limitations in the current study. However we hope that future research will further explore the role of positive bias in the self-efficacy and performance relationships, and therefore in the future be able to recognise any difference in genuine overconfidence and a subconscious positive bias. This may be an important differentiation to make, since attempts to decrease genuine overconfidence may be important to reduce the chances of complacency, yet attempts to decrease a novice's 'accidental' positive bias may have negative effects on subsequent effort and performance. We would encourage future research to address the limitations identified and explore further variables which may contribute to positive bias in self and peer predictions.

3

The moderating role of subclinical narcissism on the reciprocal relationship between effort, self-efficacy and performance.[4]

5.1 Abstract

We examined the role of subclinical narcissism – a personality variable associated with overconfidence – upon the relationship between self-efficacy, performance and effort. Participants (N = 87) completed ten experimental trials on a driving simulator. Hierarchical linear modelling demonstrated that self-efficacy had a significant and negative relationship with subsequent performance. Subclinical narcissism moderated the relationships between previous performance and subsequent self-efficacy, self-efficacy and self-reported effort, and between self-reported effort and subsequent performance. Heart rate variability data was not moderated by subclinical narcissism, which may suggest that individuals high in levels of subclinical narcissism underreported their effort by way of an ego-protection mechanism. The results add to the growing body of research that examines the within-person relationship between effort, self-efficacy, and performance, and provides some of the first evidence that personality is an important moderator of these relationships.

Keywords: *Self-efficacy, performance, narcissism, effort, heart rate variability.*

5.2 Introduction

Developed within the framework of social cognitive theory (Bandura, 1986), self-efficacy is defined as a "belief in one's capabilities to organise and execute courses of action required to produce given attainments" (Bandura, 1997, p. 3). Self-efficacy research has traditionally revealed that individuals with higher levels of self-efficacy enjoy cognitive and behavioural benefits compared to those with low levels of self-efficacy (Bandura, 1997). For example, higher levels of self-efficacy are associated with improved problem solving (Bouffard-Bouchard, 1990), increased adherence to exercise (Desharnais, Bouillon, & Godin, 1986), increased sport performance (Moritz, Feltz, Fahrbach, & Mack, 2000), and an increase in effort, exertion and persistence (Bandura, 1997).

Despite a wealth of research that has demonstrated a positive relationship between self-efficacy and performance (e.g., Moritz et al., 2000; Stajkovic & Luthans, 1998; Woodman & Hardy, 2003), recent theorizing suggests that one should interpret these findings with caution. For example, Vancouver, Thompson, and Williams (2001) stated that an overreliance on cross-sectional correlational research has concealed the true complexity of the self-efficacy/performance relationship. Furthermore, Vancouver et al. (2001) stated that the role of complacency within self-regulation theories is often ignored, and increasing levels of self-efficacy may lead one to decrease the amount of resources allocated to a task, which in turn might harm performance. Vancouver et al. used control theory (Powers, 1973; 1991) to explain the reduction in resource allocation when self-efficacy is high. According to control theory, the discrepancy between a current and a desired state drives the motivation to act (i.e., to reduce goal discrepancy). However, control theory also proposes that high levels of self-efficacy might lead one to overestimate their perceptions of goal progress, which in turn might lead them to believe that they are closer to their goal than they are in reality. Consequently, effort is reduced and performance suffers.

Vancouver et al. (2001; Vancouver, Thompson, Tischner, & Putka, 2002) conducted a series of studies to examine the reciprocal relationship between self-efficacy and performance using the analytical task, Mastermind. Results revealed a significant positive relationship between past performance and subsequent self-efficacy; and a significant negative relationship between self-efficacy and subsequent performance. However, subsequent research testing Vancouver et al.'s predictions have revealed mixed results. For example, several studies have revealed significant negative relationships between self-efficacy and performance (e.g., Vancouver & Kendall, 2006; Woodman, Akehurst, Hardy, & Beattie, 2010; Yeo & Neal, 2006); non-significant relationships (e.g., Beattie, Lief, Adamoulas & Oliver, 2011; Richard, Diefendorff, & Martin, 2006); and significant positive relationships (e.g., Beattie, Fakehy, & Woodman, 2014; Seo & Ilies, 2009).

More recently, research has examined potential moderators of the self-efficacy and performance relationship (e.g., Beattie et al., 2014; Schmidt & DeShon, 2010). Results demonstrate a negative relationship between self-efficacy and performance when individuals display a positive bias (i.e., overconfidence) in their self-assessment of ability. For example, Beattie et al. (2011) demonstrated that participants repeatedly over-estimated golf putting performance on the next trial, by an average of just over three putts. One possible explanation for the positive self-bias demonstrated in Beattie et al.'s results, is a persistent human error in self-judgments. Research has shown that self-views are often fraught with error and a positive bias that reflects overconfidence (e.g. Dunning, Heath, & Suls, 2004). It may also be the case that that certain personality dispositions are more prone to suffering from positive self-bias effects than others, for example, narcissism.

Narcissism is often described as having two forms, grandiose and vulnerable. This thesis is more concerned with grandiose narcissism (at a subclinical level), which 'primarily reflects traits related to grandiosity, aggression, and dominance' (Miller, Hoffman, Gaughan,

Gentile, Maples, & Campbell, 2011, p. 1013). This is in contrast to vulnerable narcissism which is associated with 'a defensive and insecure grandiosity that obscures feelings of inadequacy' (Miller et al., 2011, p. 1013). Grandiose narcissism is a personality disposition that displays exceptional positive self-bias, and hence, may partly explain the negative self-efficacy and performance relationships described thus far.

As stated, subclinical narcissism could account for the negative self-efficacy and performance relationship, but in a number of ways. For example, previous research has revealed that subclinical narcissism have displayed a positive bias through over optimistic views regarding their previous performances, and consistently overrate their current performances (Robins & Beer, 2001). Further, over a series of studies, Farwell and Wohlwend-Lloyd (1998) found that narcissism correlated with overly positive assessments of current performance, and self-enhancing attributions of past events. In addition, Campbell et al. (2004) examined the relationship between narcissism, overconfidence, and decision making on a general knowledge-betting quiz. Campbell et al. found that narcissism positively related to overconfidence, and that overconfidence stemmed from an inflated sense of self and a perceived grand ability. Individuals high in subclinical narcissism were also more willing to bet on their answers (due to greater overconfidence and a greater willingness to bet), and based their future performance predictions on performance expectations rather than past performance. That is, individuals high in subclinical narcissism partially base their ability estimates on factors not grounded in actual performance levels. Thus, one might expect that subclinical narcissism will moderate the often-observed positive relationship between past performance and subsequent efficacy beliefs, such that individuals who score high in narcissism may demonstrate a weak or no relationship between previous performance and subsequent self-efficacy beliefs. This prediction forms our first hypothesis.

There is also evidence to suggest that subclinical narcissism will contribute to the negative relationship between self-efficacy and subsequent performance (e.g., Vancouver et al., 2001). Based on the aforementioned research that demonstrates that individuals high in subclinical narcissism have a selective memory for self-flattering past events (Rhodewalt & Eddings, 2002), and hold overly optimistic views of current performance and performance achievements (Farwell & Wohlwend-Lloyd, 1998; Robins & Beer, 2001), it is possible that these individuals will also report inflated levels of self-efficacy. That is, due to a tendency to consider only good past performance and over rate current performance, individuals high in subclinical narcissism may be more susceptible to having an inflated level of self-efficacy (i.e., show positive self-bias). Indeed, Campbell et al., (2004) reported that individuals higher in narcissism were significantly more over confident than those low in narcissism. Further, Gabriel, Critelli, and Ee (1994) demonstrated that individuals high in subclinical narcissism view themselves and their accomplishments as superior to others and objective measures of performance. This evidence forms our second hypothesis, that subclinical narcissism negatively moderates the relationship between self-efficacy and subsequent performance. That is, we expect individuals higher in subclinical narcissism to reveal no or a negative relationship between self-efficacy and subsequent performance. Conversely, given that those low subclinical narcissism do not demonstrate the same biased attention towards only positive previous performance accomplishments, the relationship between self-efficacy and performance should be a positive one for low subclinical narcissists.

A secondary purpose of the study was to examine the role of effort in conjunction with the predicted subclinical narcissism effects. Specifically, we sought to examine the effect of subclinical narcissism upon the relationships between self-efficacy and effort, and effort and performance. Based on control theory's prediction that increasing levels of self-efficacy may induce complacency, subclinical narcissism may partly explain the negative

relationship observed between self-efficacy and performance due to reduced resources (i.e., effort) allocated toward a task. As mentioned above, one reason why self-efficacy may have a negative effect upon subsequent performance is through the withdrawal of effort (e.g., Vancouver & Kendall, 2006). For example, Vancouver and Kendall (2006) examined the relationship between self-efficacy, exam performance, and effort (study time). Results revealed that as self-efficacy for an upcoming exam increased by a grade (e.g., from a B+ to an A-), average study time decreased by 15mins. Therefore, higher self-efficacy levels were associated with a reduction in effort. Hence, we further examine the role of effort and explore the moderating role that narcissism may play on the relationships between self-efficacy and effort, and effort and performance.

Finally, we acknowledge that the use of a self-report effort measure may be problematic, since self-report measures of effort are vulnerable to self-presentational influences (Rhodewalt & Fairfield, 1991) and introspection abilities are very limited (Wilson, 2002). This may be particularly problematic when examining narcissism, where those higher in subclinical narcissism may be more likely to under report effort investment in order to enhance the ability implications of success (Jones & Berglas, 1978). Therefore, we adopted a psychophysiological approach to measuring effort, and supplemented our self-report measure of effort (Zijlstra, 1993) with a measure of heart rate variability (HRV). HRV is influenced by sympathetic and parasympathetic branches of the autonomic nervous system, with several studies associating an increase in mental effort and workload with a decrease in HRV (e.g., Aasman, Mulder & Mulder, 1987; Capa, Cleeremans, Bustin, Bouquet, & Hensenne, 2011; De Rivecourt, Kuperus, Post, & Mulder, 2008; Mulder, 1992). Importantly, the measurement of HRV is objective and continuous and thus, not subject to the social desirability bias inherent in self-report measures.

To summarise, the aim of the present study was to examine the potential moderating role that subclinical narcissism may have on the relationships between self-efficacy, effort, and performance. The hypotheses were as follows:

Hypothesis 1: If individuals high in subclinical narcissism do not fully rely on past experiences in order to inform subsequent self-efficacy beliefs, then subclinical narcissism will negatively moderate the relationship between previous performance and subsequent efficacy beliefs. Specifically, participants low in subclinical narcissism will demonstrate a positive relationship between previous performance and subsequent self-efficacy, and individuals high in subclinical narcissism will demonstrate a weak or no relationship between previous performance and subsequent self-efficacy.

Hypothesis 2: If individuals high in subclinical narcissism hold overly positive views of current performance, then subclinical narcissism will negatively moderate the relationship between self-efficacy and subsequent performance. Therefore, we first predicted that individuals high in subclinical narcissism would display a more positive bias in their self-efficacy compared to those low in subclinical narcissism (more overconfidence; Campbell et al., 2004). Second, we predicted that individuals high in subclinical narcissism would display a negative relationship between self-efficacy and performance, and those low in subclinical narcissism would demonstrate a positive relationship.

Hypothesis 3 and 4: Hypothesis 3 predicts that, if individuals high in subclinical narcissism do under report the effort invested in the current task, then subclinical narcissism will negatively moderate the relationship between self-efficacy and effort. That is, there will be a negative relationship between self-efficacy and effort for individuals high in subclinical narcissism, but a positive relationship between self-efficacy and effort for those low in subclinical narcissism. Hypothesis 4 predicts that there will be no (or perhaps a negative) relationship between effort and performance for individuals high in subclinical narcissism,

and a positive relationship between effort and performance for those low in subclinical narcissism.

5.3 Method

Participants

Eighty-seven participants (M_{age} = 22.45 years, SD = 3.51 years; 59 men, 28 women) volunteered to take part in the study. All participants had limited or no previous experience of driving simulator games (less than two hours per week). The University ethics board granted ethical approval and all participants provided informed consent before participating in the study.

Apparatus

Participants drove a custom designed racing circuit on Gran Turismo 5 for the PlayStation 3, viewed on a Hewlett Packard w2207h LCD – TFT 22 inch widescreen TV, using a driving simulator (Logitech G25 game seat, steering wheel, pedals, and gear stick). We custom made the track to ensure that none of the participants had previous experience. Each participant used a Mazda MX5 car in automatic drive. The circuit was 2.89 miles long (the longest straight section was 0.48 miles) and had seven corners of varying difficulty[5]. No other cars were on the track.

Procedure

Pilot testing. In order to instil a sense of competition and motivation for the participants, we partly fabricated a leader board where participants could win cash prizes depending upon performance (see below). We piloted the study with five volunteers (who were not part of the final study). These five volunteers completed five trials of the racing circuit, with the fastest driver occupying the number one position (with a trial time of 251 seconds) on the leader board. The worst driver occupied position ten (with a trial time of 280

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[5] The circuit can be obtained from the author, and is presented in Appendix E.

seconds). We then fabricated five further track times and inserted them between the top and bottom positions on the leader board. The leader board was on display to the participants at all times, where the times changed accordingly.

Experimental study. Participants attended one testing session. Upon arrival, we informed participants of the study procedure and obtained consent. Before the testing began, participants completed the NPI-16 (see below for measures). After this, participants sat in the driving simulator chair, and made any necessary adjustments to the positions of the foot pedals and steering wheel to ensure they were comfortable. Participants received instructions regarding how to use the equipment, including the brake pedal, accelerator pedal, and reverse button.

We introduced the participants to the leader board displayed on the wall above the TV screen (which consisted of the trial times from pilot testing). To motivate the participants, we then stated that the top ten fastest trials would win a cash prize (£50 for first place, £40 for second place, £30 for third place, £20 for fourth place, and £10 for fifth to tenth place). We then briefed participants on how to use the mental effort and self-efficacy scales (see below). After which they were ready to begin the first trial.

Practice trials. In order for participants to familiarise themselves with the procedure and gain some experience of the equipment and track, participants completed three practice trials. On completion of the first trial, the game stopped and the participant completed the mental effort scale (RMSE; Zijlstra, 1993) followed by the self-efficacy questionnaire. Participants were informed of their trial time (combined time of two consecutive laps) before stating their effort and self-efficacy levels.

Competitive trials. Before starting the first of 10 competitive trials, we informed the participants of their best practice trial time. Participants used this time as the standard that they should improve upon over the coming competitive trials. In order for participants to

judge their efficacy beliefs accurately, we provided them with a performance log of each trial time up to that point (e.g., Beattie, Woodman, Fakehy, & Dempsey, 2016). In other words, participants had access to feedback for each previous trial before they completed the self-efficacy questionnaire for the subsequent trial. The competitive trials followed the same procedure as the practice trials. Following the final trial, we thanked participants for their time and informed them that they would be contacted if they had won a cash prize.

Measures

Performance. We recorded performance as the improvement (in seconds) from baseline to the current trial. For example, a baseline of 300 seconds and a current trial time of 290 seconds would yield a performance improvement of 10.

Self-Efficacy. Following Beattie et al. (2011), we assessed self-efficacy magnitude by asking participants to answer *yes* or *no* to 20 statements: "I have the skills and resources to improve my baseline performance by one second", "I have the skills and resources to improve my baseline performance by two seconds", increasing in one second intervals up to "I have the skills and resources to improve my baseline performance by 20 seconds". Participants were also given the opportunity to continue the scale if they wished (e.g., 21 seconds, 22 seconds, etc.). The total magnitude score was obtained by summing the number of *'yes'* answers (e.g., if the participant answered '*yes*' up to 15 seconds and "no" thereafter, his/her self-efficacy magnitude score was 15). Self-efficacy strength was recorded by asking participants to rate their degree of confidence in their ability to achieve that time (0-100%) for each magnitude level to which participants had answered '*yes*' to. Total self-efficacy strength score for each trial was obtained by summing the strength percentages for every

magnitude level that was answered with a '*yes*[6]'. The self-efficacy measure is presented in Appendix F.

Bias: Bias in self-efficacy was the difference between what the participant believed they could achieve, and what their actual subsequent performance was. This was calculated by subtracting self-efficacy magnitude (how many seconds they believed they could beat their baseline performance by) from their baseline score. This gave us the number seconds of that the participant believed they could complete the next trial in. This value was then subtracted from subsequent performance. If the value was positive then the participant had been overconfident (performed worse than they stated), whereas negative values indicate that the participant had been under confident (performed better than they stated). For example, if a participant had a baseline performance of 285 seconds, and recorded a self-efficacy magnitude score of 5 seconds, they are stating that they can perform the next trial in 280 seconds. If the participant then subsequently performed the next trial in 287 seconds, they have been over confident by 7 seconds. Thus, their bias score is 7.

Self-report effort. We used Zijlstra's (1993) Rating Scale Mental Effort (RSME) to assess the level of mental effort exerted, which asks participants 'how much mental effort did you exert during the trial that you have just completed?' Participants rated the effort that they invested by marking a cross on a continuous 150mm line. The line displayed anchor points every 10mm, which stated "no effort at all" at 0mm, up to "extreme effort" at 150mm. The scale has a test-retest reliability correlation coefficient of .78 (Zijlstra, 1993). The RMSE is presented in Appendix G.

Heart rate variability: Heart rate variability (HRV) was calculated as the standard deviation of the R-wave to R-wave intervals (SDNN) of the electrocardiogram. SDNN is a

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[6] The current data set demonstrated identical results when using self-efficacy magnitude or strength in the analysis. Thus, for ease of interpretation, only self-efficacy magnitude results are presented.

time domain index of the spectral power in the 0.04 Hz to 0.15 Hz frequency band (Carrasco, Gaitan, Gonzalez, & Yanez, 2001) and has been used as a psychophysiological marker of effort in previous research (e.g., Cooke et al., 2010; Mulder, 1992). A decreases in SDNN has been associated with increases in cognitive effort. Each trial lasted an average of 4 minutes and 39 seconds (ranging from 4 minutes and 17 seconds to 5 minutes and 9 seconds), during which the recording of HRV was continuous. The electrocardiogram was recorded using silver/silver chloride electrodes (Ambu Blue Sensor SP) on the right clavicle, left clavicle, and lower left rib, connected to a Powerlab 16SP (AD Instruments) data acquisition system and PC running Lab Chart 7 software. We retained the mean heart rate variability for each trial to use in the relevant analyses.

Subclinical Narcissism: Subclinical narcissism was measured using the Narcissistic Personality Inventory-16 (NPI-16; Ames, Rose, & Anderson, 2006), which is a shorter version of the NPI-40 (Raskin & Terry, 1988). The NPI-16 contains two statements per item and asks the participant to choose which statement (A or B) more closely matches their personality. For example, 'I don't mind following orders' (A) or 'I like having authority over people' (B). Jones and Figueredo (2013) reported an alpha coefficient of .77 for the scale. Cronbach's alpha in the current study was .80. The NPI-16 is viewable in Appendix H.

5.4 Results

We used Hierarchical Linear Modeling (HLM; Raudenbush & Bryk, 2002) to examine the within person level effects. HLM allows the examination of individual relationships between Level-1 variables (performance trial, self-efficacy beliefs, and effort) and the Level-2 variable (participant and subclinical narcissism). We used a random intercept and slopes model, where all Level-1 variables were group mean centered, and Level-2 variables were grand mean centered. Table 1 displays the means, standard deviations,

intraclass correlations, and bivariate interclass correlations for the Level-1 variables. The intraclass correlations for previous performance, subsequent performance, self-efficacy magnitude, self-report effort and SDNN[7] were .46, .51, .74, .77, and .69, respectively. These values indicate that 46-77% of the variance was accounted for at the between-person level.

Table 1. *Means, standard deviations, intraclass correlations (ICC), and bivariate correlations of all Level-1 variables and narcissism.*

Variable	Mean	SD	1	2	3	4	5	6
1. Previous performance	2.92	7.13	**.46**					
2. Subsequent performance	3.64	7.57	.63***	**.51**				
3. Self-efficacy magnitude	7.77	5.74	.51***	.40***	**.74**			
4. SDNN	64.37	25.79	-.02	.13*	-.10*	**.69**		
5. Effort	81.88	27.86	.13*	.24**	.05	-.20**	**.77**	
6. Bias	6.69	9.43	-.16**	-.08*	.68**	.05	-.07	**.21**
7. Subclinical Narcissism	3.68	3.32	-.02	-.02	.04	-.07	-.12*	.02

*$p < .05$; **$p < .01$; ***$p < .001$. ICCs for level-1 variables are in bold.

At the within-person level, self-efficacy magnitude significantly increased over time ($\gamma_{10} = .27, p < .001$). This indicates that on average, participants believed that they could continue to improve on their baseline performance by approximately a quarter of a second with each trial. Performance also significantly improved across time ($\gamma_{10} = .57, p < .001$), indicating that on average, participants continued to improve upon their baseline performance by just over half a second per trial. Further, subclinical narcissism at level 2 did not predict self-efficacy ($\gamma_{01} = 1.53, p = .66$) or performance improvement ($\gamma_{01} = -.62, p = .85$) at level 1.

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[7] Due to the availability of equipment, we were only able to obtain complete HRV data for 66 participants; hence analyses involving HRV used a sub-sample of 66.

The first hypothesis predicted that subclinical narcissism would moderate the relationship between previous performance and subsequent self-efficacy. Previous performance had a significant and positive effect on subsequent self-efficacy magnitude (γ_{20} = .19, $p < .001$) whilst controlling for trial. Further, results marginally supported the moderating effect of subclinical narcissism (γ_{21} = -.22, $p = .08$; see Figure 1[8]). Simple slopes analysis revealed that the slope for high subclinical narcissism was flat and not significant (γ = -.009, $p = .93$) but the slope for low subclinical narcissism was positive and significant (γ = .381, $p = .001$). This indicates that there is a positive relationship between previous performance and subsequent self-efficacy for high subclinical narcissism only. Specifically, although there was a weak and negative relationship between previous performance and subsequent self-efficacy for those high in subclinical narcissism, there was a strong and positive relationship between previous performance and self-efficacy for individuals low in subclinical narcissists. All gamma values, significance, and variance values for all analyses are in Table 2.

Table 2. *Main and moderating effects between Level-1 and Level-2 variables.*

	γ	SE (robust)	Total Variance
DV = Self-efficacy			
Level 1			
Step 1: Trial	.27	.07***	46.94
Step 2: Previous performance	.19	.03***	62.10
Level 2			
Step 3: Subclinical narcissism	-.22	.12[a]	62.17
DV = Subsequent performance			

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[8] Following the recommendations of Snijders and Bosker (1999), cross-level interactions were accepted at $p < .1$ due to reductions in parameter reliability in multilevel modelling.

Level 1

Step 1: Trial	.57	.09***	22.02
Step 2: Previous performance	.01	.04	22.68
Step 3a: Self-report effort	.16	.01***	40.99
Step 3b: SDNN	-.09	.02***	30.50
Step 4: Self-efficacy	-.20	.06**	41.61

Level 2

Step 3ai: Subclinical narcissism	-.19	.06**	41.48
Step 3bi: Subclinical narcissism	-.02	.08	30.61
Step 4: Subclinical narcissism	.15	.31	41.62

DV = Effort

Level 1

Step 1: Trial	.78	.25**	20.91
Step 2: Previous performance	.01	.09	20.96
Step 3: Self-efficacy	-.38	.20	21.78

Level 2

Step 4: Subclinical narcissism	-1.67	.96	21.91

DV = SDNN

Level 1

Step 1: Trial	.87	.26**	12.97
Step 2: Previous Performance	.07	.11	13.57
Step 3: Self-efficacy	.22	.19	13.91

Level 2

| Step 4: Subclinical narcissism | -1.49 | 1.20 | 13.87 |

Figure 1. *The moderating effect of subclinical narcissism on the relationship between previous performance and self-efficacy.*

Hypothesis 2 predicted that subclinical narcissism would moderate the relationship between self-efficacy and subsequent performance. After controlling for trial, previous performance, and self-report effort, the model revealed a significant negative relationship between self-efficacy magnitude and performance (γ_{40} = -.20, p = .002). That is, as self-efficacy increased by 1 second, driving performance worsened on average by a fifth of a second per trial (see Figure 2 for individual regression slopes). Subclinical narcissism at Level-2 did not predict bias in self-efficacy scores at Level-1 (γ_{01} = .93, p = .71), thus, higher levels of subclinical narcissism did not predict overconfidence. Subclinical narcissism at Level-2 did not moderate the relationship between self-efficacy and subsequent performance at Level-1 (γ_{41} = .15, p = .64).
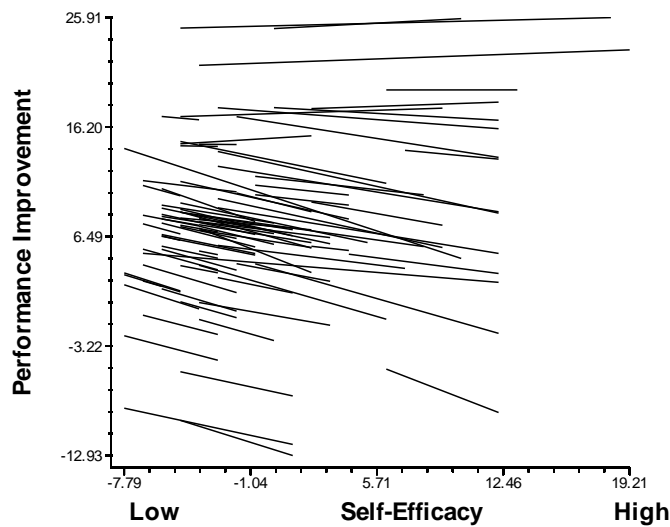
Figure 2. *Individual regression slopes showing the relationship between self-efficacy and performance improvement.*

Hypothesis 3 predicted that subclinical narcissism would moderate the relationship between self-efficacy and self-reported effort. After controlling for trial and previous performance, self-efficacy had a negative and marginally non-significant relationship with self-reported effort (γ_{30} = -0.38, p = .07). In other words, as self-efficacy increased, self-reported effort decreased (showing some support for Vancouver & Kendal, 2006). Further, subclinical narcissism significantly moderated this relationship (γ_{31} = -1.67, p = .086). Simple slopes analysis revealed that the high subclinical narcissism slope was significant and negative (γ = -2.11, p = .03), however the slope for low subclinical narcissism was not significant but in the expected direction (γ = 1.41, p = .16). This indicated that self-efficacy had a significant negative relationship with self-report effort when subclinical narcissism was high. That is, for individuals high in subclinical narcissism, increasing levels of self-efficacy led to a decrease in self-reported effort. For those individuals low in subclinical narcissism, increasing levels of self-efficacy led to an increase in self-reported effort (see Figure 3).

When self-report effort was replaced with HRV (SDNN), the main effect relationship between self-efficacy and HRV was non-significant ($\gamma_{30} = .22$, $p = .26$). Further, subclinical narcissism did not moderate the relationship between self-efficacy and HRV (SDNN; $\gamma_{31} = -1.49$, $p = .22$).
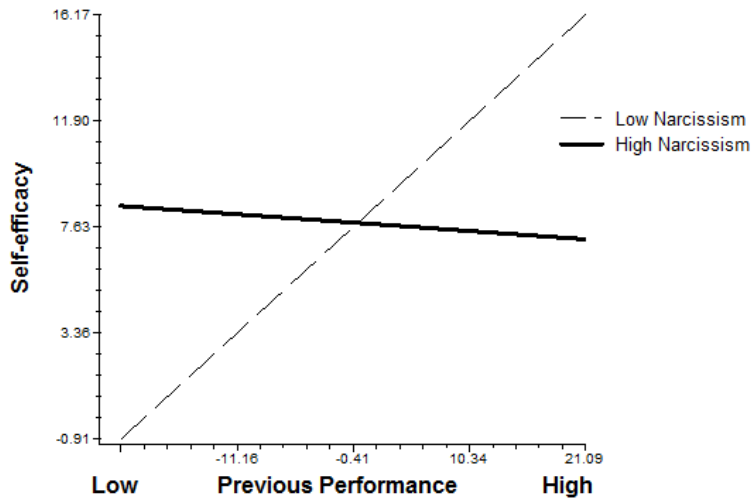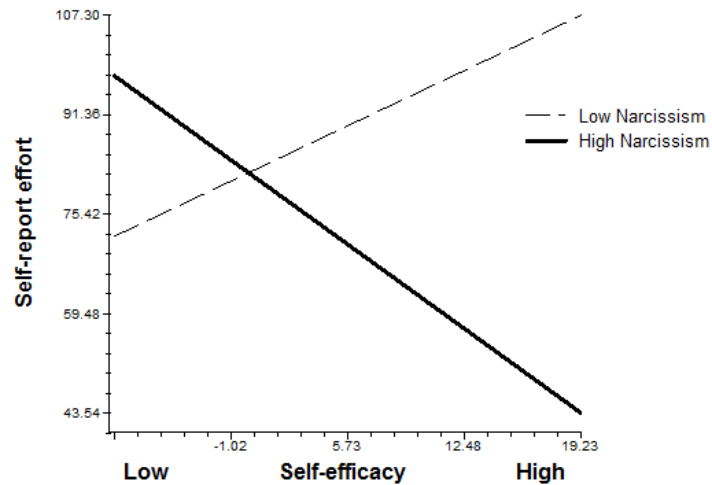

Figure 3. *The moderating effect of subclinical narcissism on the relationship between self-efficacy and self-reported effort.*

Hypothesis 4 predicted that subclinical narcissism would moderate the relationship between self-report effort and performance. After controlling for trial and previous performance, self-reported effort had a significant and positive relationship with subsequent performance ($\gamma_{30} = 0.17$, $p < .001$; as noted above). Subclinical narcissism significantly moderated this relationship ($\gamma_{31} = -.19$, $p = .002$). Simple slopes analysis revealed that the high subclinical narcissism slope was not significant ($\gamma = -.004$, $p = .94$) but the slope for low subclinical narcissism was positive and significant ($\gamma = .352$, $p < .001$). This indicated that self-report effort had a significant positive relationship with performance under conditions of low subclinical narcissism. That is, self-reported effort had no relationship with performance for high subclinical narcissists. However, for low subclinical narcissists, as self-reported

effort increased, performance increased (Figure 4). Finally, after controlling for trial and previous performance and replacing self-report effort with HRV (SDNN), increasing levels of effort were again related to an increase in performance ($\gamma_{30} = -.09$, $p < .001$). However, subclinical narcissism did not moderate this relationship ($\gamma_{31} = -.02$, $p = .75$).
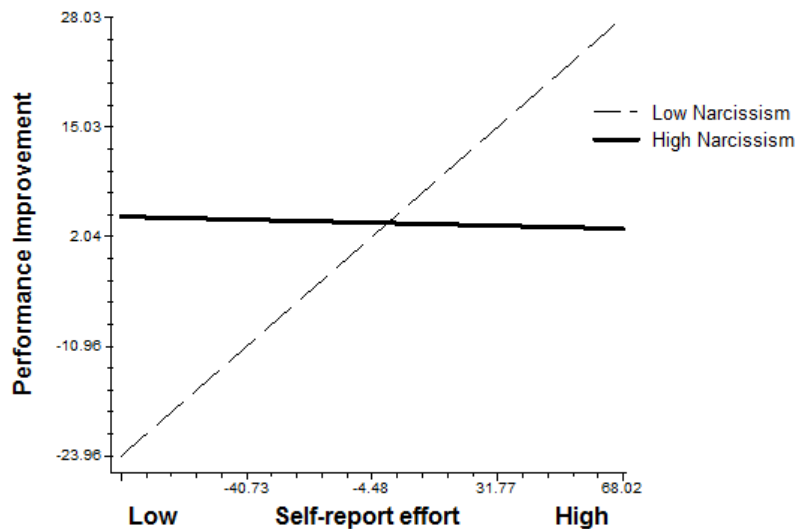
Figure 4. *The moderating effect of subclinical narcissism on the relationship between self-report effort and performance.*

5.5 Discussion

Research examining the relationship between self-efficacy and performance at the within person level has moved beyond main effects and toward methodological and contextual moderators (e.g., Beattie et al., 2014; 2016; Schmidt & DeShon, 2010). Our results have furthered the research by being the first to examine the role of personality, specifically narcissism. Due to key differences in the predictions of social cognitive theory (Bandura, 1997) and control theory (Vancouver, 2001; Powers, 1991), we also examined the role of effort.

In their meta-analysis, Sitzmann and Yeo (2013) highlighted the fact that research tends to focus upon the self-efficacy and subsequent performance relationship at the expense of the previous performance and subsequent self-efficacy relationship. Therefore, the first hypothesis set out to address this issue. The first hypothesis revealed a positive relationship between previous performance and subsequent self-efficacy beliefs (supporting Bandura's 1997 predictions and a host of other research, e.g., Beattie et al., 2011; Vancouver et al. 2001; 2002). Further, subclinical narcissism moderated this relationship in that, previous performance only had a positive relationship with self-efficacy beliefs when subclinical narcissism was low. This seems to support previous research that subclinical narcissists (in part) do not base their performance predictions on past performance and instead base their future performance expectations on aspirations rather (e.g., Campbell et al., 2004). This moderating effect may also be evidence that subclinical narcissists are selective in which past events they tend to remember (Rhodewalt & Eddings, 2002), and only view feedback as accurate and diagnostic if it is positive (Kernis & Sun, 1994).

The second hypothesis examined the relationship between self-efficacy and performance, which has previously demonstrated positive, negative, and null relationships (Stizmann & Yeo, 2013). Results found support for a control theory perspective (Powers, 1991) where self-efficacy had a negative relationship with subsequent performance. However, there was no support for subclinical narcissism as a moderator of this relationship. Thus, despite previous research providing evidence that narcissists are overconfident (e.g., Campbell et al., 2004) and hold overly optimistic views of previous performance accomplishments (Robins & Beer, 2001), our results demonstrated that subclinical narcissists were not more confident or positively bias in their self-efficacy views compared to low subclinical narcissists. This may have contributed to the lack of a moderating effect upon the relationship between self-efficacy and performance.

One potential reason why subclinical narcissism did not moderate the self-efficacy and performance relationship, is that on average, all participants were overconfident by almost seven seconds. It is well documented that novices over predict their performance level (e.g., Kruger & Dunning, 1999). Since we adopted a novel task (driving simulator), any moderating subclinical narcissism effect based on overly positive self-perceptions, may have been lost in a novice over-rating effect that occurred across all participants. Therefore, subclinical narcissism may moderate the relationship between self-efficacy and performance at more advanced stages of the learning continuum, where over rating may be more a function of personality than a failure to recognise one's own incompetence. This may be a worthwhile consideration for future research.

Another potential reason why subclinical narcissism did not moderate this relationship, is that task engagement for narcissists is partly moderated by the opportunity for self-enhancement (e.g., Wallace & Baumeister, 2002; Woodman et al., 2011). The current study did not set out to test such a moderator and used only a leader board to promote an opportunity for glory. Previous research that has demonstrated that subclinical narcissists invest more effort when there is an opportunity for glory, has included publicising performance results and increasing task difficulty (e.g. Wallace & Baumeister, 2002; Woodman, Roberts, Hardy, Callow & Rogers, 2011), a strategy we failed to adopt in this study. In addition, subclinical narcissism did not correlate with performance or self-efficacy (see Table 1).

The third and fourth hypothesis predicted that subclinical narcissism would moderate the relationships between self-efficacy, performance and self-report effort. Bandura (1997) argued that individuals with high levels of self-efficacy will set more challenging goals, which drives individuals to persist in their effort to obtain such goals. In the present study, self-efficacy had a marginal positive significant relationship with self-report effort. Further,

subclinical narcissism moderated this relationship. That is, low subclinical narcissists demonstrated a positive relationship between self-efficacy and self-report effort, supporting social cognitive theory (Bandura, 1986). However, high subclinical narcissists demonstrated a negative relationship between self-efficacy and self-report effort, which would support a control theory perspective (Powers, 1991; Vancouver et al., 2001; 2002). Despite the apparent differences in effort exerted, there was no difference in performance levels when comparing high and low subclinical narcissists. Further, when self-report effort was substituted with HRV, there was no relationship between self-efficacy and HRV, and subclinical narcissism had no moderating effect. These results are discussed below.

Interestingly, the predicted interactions were present for self-reported effort but not when using HRV. We measured HRV to give a multidimensional account of on-task effort to supplement the self-report measure of effort, since self-report measures are susceptible to self-presentation bias (Rhodewalt & Fairfield, 1991). The moderating effect of subclinical narcissism for self-reported effort but not HRV may be evidence that subclinical narcissists fabricated their self-report effort responses. Indeed, it may be that subclinical narcissists may have a motive to under report effort, in order to protect a positive self-image (Rhodewalt & Fairfield, 1991).

Individuals higher in subclinical narcissism are more likely to engage in self-handicapping compared to those low in subclinical narcissism (e.g., Rhodewalt et al., 2006). Previous research has shown that individuals are willing to use self-handicapping techniques (such as under reporting the amount of effort invested in a task) to protect themselves from failure, but are less willing to employ such techniques to enhance success (Rhodewalt, Morf, Hazlett & Fairfield, 1991). Thus, if a subclinical narcissist has performed lower than expected on a given trial, they have the opportunity post-trial to claim that they did not invest as much effort as they actually did. Thus, a subclinical narcissist could attribute a poor performance to

a lack of effort rather than a lack of ability. Therefore, if we interpret HRV as a measure of effort, then the results demonstrate that although subclinical narcissists claim to invest less effort, they are in fact investing the same amount of effort as low narcissists.

Although the above explanation makes theoretical sense, the results should be interpreted with caution for the following reasons. When mental effort is invested a number of cardiovascular characteristics demonstrate change. For example, heart rate and blood pressure increase, and a more regular heart beat (decreased HRV) is observed (Fairclough & Mulder, 2012). Although a decrease in HRV has been associated with increased effort (e.g., Aasman et al., 1987; Capa et al., 2011; De Rivecourt et al., 2008; Mulder, 1992), a reduction in HRV is not exclusively effected by effort. For example, Veldhuizen van Zanten, De Boer, Harrison, Carroll, and Willemsen (2002) measured HRV at rest and during a competitive remote control car-racing task, and demonstrated that the competitive trials had a lower HRV than the less competitive trials. However, the decrease in HRV was also associated with increases in self-report competitiveness, level of excitement, and task difficulty. Thus, it is somewhat difficult to confidently infer the HRV results of the current study as a pure measure of effort, and further research is needed to conclude this interpretation.

There are some limitations to the current study, which have been alluded to earlier in the discussion. First, the opportunity for self-enhancement may not have been enough to motivate those high in subclinical narcissism to invest effort. Although there was an opportunity to win a cash prize and earn a place on the leader board, the results of the fastest trial times did not appear publically and the task difficulty remained constant. Subclinical narcissists are motivated to invest more effort when their performance is going to be publically evaluated (Wallace & Baumeister, 2002; Woodman et al., 2011). Thus, future research may wish to consider re-testing the potential moderating effect of subclinical narcissism on the relationship between self-efficacy and performance with a more

pronounced opportunity for self-enhancement in a two-condition design (high and low opportunity for glory). Second, we concede that HRV is not a strong measure of on task mental effort, and we therefore encourage future research to explore alternative physiological measures of mental effort. For example, it is thought that changes in mental effort are more accurately measured via sympathetic nervous system mechanisms such as pre-ejection period and systolic blood pressure (Wright, 1996). Pupil dilation has also been identified as a measure of on task effort (Kahnemann, 1973; Alnaes, Sneve, Espeseth, Endestad, van de Pavert, Laeng, 2014). Thus, we recommend that future studies measuring cognitive effort via a physiological approach to avoid the self-presentation bias in self-report measures (such as those apparent with narcissists) adopt one of these measures to shed further light on this finding.

In conclusion, we extended research regarding the reciprocal relationship between self-efficacy and performance by examining the moderating role of subclinical narcissism on the relationship between previous performance and self-efficacy, and self-efficacy and subsequent performance. We also highlight the importance of a psychophysiological approach when examining the role of effort, which may be susceptible to manipulative personalities, such as narcissism. Further, the data demonstrate that researchers interested in the narcissism-effort-performance relationship would do well to go beyond self-report measures and include a set of psychophysiological assessments, such as those mentioned above. The current results also add to an existing body of research that demonstrates subclinical narcissists engage in ego-protecting strategies.

4

Self-efficacy, preparation, and performance:

Exploring the mediating role of effort.

6.1 Abstract

Despite plentiful evidence that self-efficacy has a positive association with performance, there remains some doubts that increasing one's level of self-efficacy is beneficial for performance all of the time. Bandura (1997) stated that high levels of self-efficacy in preparation may have a negative effect on performance, since individuals do not see the need to invest effort in preparing for a task they feel confident for. Thus, a small amount of self-doubt may be beneficial for performance, since it provides the impetus one needs to acquire the skills needed in training. However, too much self-doubt may act as a stressor and lead one to disengage altogether. Thus, an inverted 'U' relationship between preparatory self-efficacy and effort in practice is implied (Feltz, Short, & Sullivan, 2008). The aims of the current study were twofold. First, to test for an inverted 'U' relationship between preparatory self-efficacy and effort in practice, and second, to examine whether effort acted as a positive mediator between self-efficacy and performance, only at moderate levels of self-efficacy. Fifty-three novice basketballers took part in a basketball shooting task. Results revealed no support for the hypothesized effects, and effort was not significantly related to self-efficacy or performance. We believe a major limitation of the study was the measure of effort, which considered quantity but not quality of practice. Thus, we recommend future research continues to explore for a possible inverted 'U' relationship, taking into account effort practice quality and quantity.

Keywords: *Self-efficacy, effort, performance, preparation, basketball*.

6.2 Introduction

Athletes are often told that in order to perform at their best, they need to be confident in their ability to perform at the highest level. In sport psychology, confidence in one's ability is often referred to as self-efficacy. Self-efficacy is defined as the 'belief in one's capabilities to organise and execute courses of action required to produce given attainments' (Bandura, 1997, p. 3). Self-efficacy theory (Bandura, 1997) predicts that self-efficacy has a positive and reciprocal relationship with performance, such that higher levels of self-efficacy lead to higher levels of performance, and vice versa. Several meta-analyses have demonstrated support for a positive relationship between self-efficacy and performance across a variety of domains, including sport (Moritz, Feltz, Fahrbach, & Mack, 2000; Woodman & Hardy, 2003), work (Stajkovic & Luthans, 1998), and academia (Multon, Brown, & Lent, 1991). However, there remains some doubts that increasing one's level of self-efficacy is beneficial for performance all of the time (e.g. Vancouver, Thompson, & 2001; Vancouver, Tischner, & Putka, 2002).

For example, Vancouver et al. (2001; 2002) used a computerised version of the game Mastermind in order to examine the relationship between self-efficacy and performance within-person and over a series of trials. Results demonstrated that self-efficacy had a negative effect on performance when examined intra-individually. However, Bandura and Locke (2003) fiercely refuted these findings by drawing attention to several limitations. Bandura and Locke argued that the notion that having belief in one's capabilities is self-debilitating is nonsensical, and that nine large scale meta-analyses is evidence that self-efficacy contributes positively and significantly to performance. Bandura and Locke also criticised the task used by Vancouver et al. (2001), stating that performance was the result of guess work and not the result of learning of a skill, and that 'Vancouver et al.'s (2001) proclaimed discovery of negative efficacy effects is nothing new' (p. 96).

One context where Bandura (1997) does predict that high levels of self-efficacy can have a negative effect on performance, is in the preparation context. Bandura and Locke (2003) stated that high levels of self-efficacy in preparation for an event and high levels of self-efficacy during the event itself have different effects on performance. Specifically, higher levels of performance self-efficacy (measured as close to the event as possible) result in better performance. However, high levels of preparatory self-efficacy (measured during the preparation phase of an event) can result in poorer performance, because individuals with high levels of preparatory self-efficacy have little incentive to invest effort in tedious practice for an event that they believe they already have sufficient skills to perform. Thus, performance may suffer as a consequence of ill preparation.

There is some support for Bandura's (1997) predictions, predominantly within the academic context. For example, Vancouver and Kendal (2006) examined the role of self-efficacy upon college exam preparation and performance, over the course of five consecutive exams. Self-efficacy was measured two days before the exam, by asking participants what grade they expected to achieve if were they to sit the exam immediately. Results demonstrated that self-efficacy had a negative relationship with exam preparation, such that as self-efficacy increased by a grade, planned study time decreased by 15 minutes. Richard, Diefendorff, and Martin (2006) also examined the relationship between self-efficacy and exam performance, over the course of four exams. Richard et al. (2006) measured self-efficacy one week before each exam, by asking participants to rate their confidence in performing behaviours necessary for successful performance. Results at the within-person level revealed that self-efficacy was negatively (though non-significantly) related to subsequent performance. In addition, Chiu (2014) examined the relationship between teachers self-efficacy and the motivation to receive training. Teachers' who had higher levels of self-efficacy in their ability to teach, were less motivated to join a professional training

programme. That is, more confident teachers were less motivated to invest effort in acquiring further skills that may be beneficial for performance. Therefore, evidence suggests that high levels of self-efficacy can negatively relate to effort in preparation, which may in turn contribute to poor performance.

Thus, a small amount of self-doubt (i.e., lower efficacy beliefs) in preparation may be advantageous, since it alerts the individual that they may have to increase their efforts further in order to be adequately prepared for the upcoming event. Woodman, Akehurst, Hardy, and Beattie (2010) examined whether a decrease in self-confidence is beneficial for performance through an increase of effort. Woodman et al. used a skipping rope task with two one-minute conditions, where participants had to complete as many skips as possible in one minute. To induce self-doubt in the second condition, participants were informed that they would have to repeat the task with a new rope of different length, weight, and stiffness. In reality, the ropes were identical but for the colour. Effort was measured via spare cognitive processing capacity, through participants reaction time to an auditory tone played randomly throughout the minute skips. A slower reaction time to the tone would indicate less spare processing capacity, and thus more effort was being invested in the task. Woodman et al.'s manipulation worked in that from the first to second condition, self-confidence significantly decreased, and performance significantly increased. However, no significant changes in effort were observed, perhaps because the task was too simple and the participants were skipping autonomously. Further, Woodman et al. examined confidence, as opposed to self-efficacy. Additional evidence for the negative self-confidence effect has also been reported in cognitive tasks (Stone, 1994). Stone (1994) told participants that the purpose of the study was to further the understanding of how students choose colleges. Participants read a description of a student who was interested in choosing a college to attend, which described six attributes that the student had identified as important (e.g., cost, distance from home). Participants were

then presented with eight descriptions of colleges, and had to best match the student to a college. Results demonstrated that mild negative expectations (some self-doubt) resulted in an increase in effort and performance. However, positively manipulated expectations resulted in increased confidence but not in performance.

More recently, Wood and Feltz (2013) designed two studies to test the idea that lower preparatory self-efficacy levels would benefit practice effort. In both experiments Wood and Feltz (2013) used a golf-putting task with three difficulty levels of easy, moderate, and hard, which were designed to foster high, medium, and low levels of self-efficacy respectively. The indoor green was 4ft wide and 24ft long. The first 2ft of the length was the starting point, and the final 2ft was an area that the balls could roll into if over hit. The middle 20ft was split into 1ft target zones. The difficulty levels were tailored toward each participant, by asking 'Given a reasonable number of practice putts, how many putts out of five can you land, or properly putt to roll to a stop, in Zone 'X'?' for each target zone. The easy difficulty zone was the first to the farthest zone the participant believed that they could land 5/5 putts. The moderate difficulty zone was from the end of the easy zone, up to the farthest point the participants believed that they could land 3/5 putts. The difficult zone was from the end of the moderately difficult zone, up to the final zone that the participant believed that they could land 1/5 putts. Participants had 30 practice putts to allocate to any difficulty level they chose (practice effort), before completing a performance trial of 15 putts (five attempts per difficulty/efficacy level). Performance was the number of putts out of 5 that landed in each of the target zones. Results revealed that participants allocated significantly less practice putts to the highest efficacy condition (the easy target; an average of 6.5 putts), in comparison to the medium (10.1 putts) and low (hardest target; 13.4 putts) conditions. Absolute performance was significantly different between all of the difficulty levels, and best at the high efficacy target, moderate at the moderate efficacy target, and lowest at the low efficacy target. Thus, the

more doubt prior to performance (i.e., the more difficult the task), the more effort one invested in preparation. However, Wood and Feltz stated it is possible that the high efficacy (easy difficulty) level was too easy to warrant effort. Further, the performance measure was not particularly sensitive since a putt that missed the target by 1 inch received the same score as a putt that missed by several ft.

A second study was conducted (study 2; 2013) to address these limitations. In study 2, performance was measured as the distance between where the ball stopped and the centre of the target. In addition, performance improvement was calculated as the difference between a baseline performance trial (participants hit five balls at each target), and the final performance trial. Further, the task was made more difficult by using a faster paced indoor green. Results demonstrated that effort was significantly higher when preparing for the low (hardest target; 11.7 putts) and medium (10.9 putts) efficacy targets, in comparison to the high efficacy target (low difficulty 7.4 putts). Performance improvement was largest at the moderately difficult target, smallest at the lowest difficulty target, and moderate at the highest difficulty target. The difference between the moderate and high efficacy targets provide tentative evidence for a curvilinear relationship between self-efficacy and effort in preparation.

However, too much self-doubt may act as a stressor as opposed to a motivator to practice (Bandura, 1997), and therefore may lead to task disengagement (e.g., Beattie & Davies, 2010). Beattie and Davies (2010) used a rugby throwing task which increased then decreased through five levels of difficulty within one trial. Participants could choose when to disengage then reengage at whichever difficulty level they wished. At low levels of self-efficacy, participants disengaged from the task earlier, and re-engaged at a later (easier) stage.

In light of the research reviewed thus far, an inverted 'U' relationship between preparatory self-efficacy and effort in practice is implied (Feltz, Short, & Sullivan, 2008).

Considering Wood and Feltz's (2013) findings and the dearth of preparatory efficacy literature, the first aim of this study is to test for an inverted 'U' relationship between preparatory self-efficacy and practice effort. Although Wood and Feltz (2013) found some evidence for an inverted 'U', the sample size was particularly low (24 in the first and 33 in the second study).

The second aim of the study is to examine a conditional indirect effect of preparatory self-efficacy upon performance (Figure 1, below). That is, effort will only act as a mechanism to positively influence the relationship between self-efficacy and performance under moderate levels of self-efficacy. This model allows us to examine the relationship between preparatory self-efficacy and effort in practice (path *a* in Figure 1), the relationship between effort in practice and performance (path *b*), the total (indirect) effect of preparatory self-efficacy upon performance (which will be moderated by self-efficacy, path *c,*), and the direct effect of self-efficacy on performance (the *c'* path).
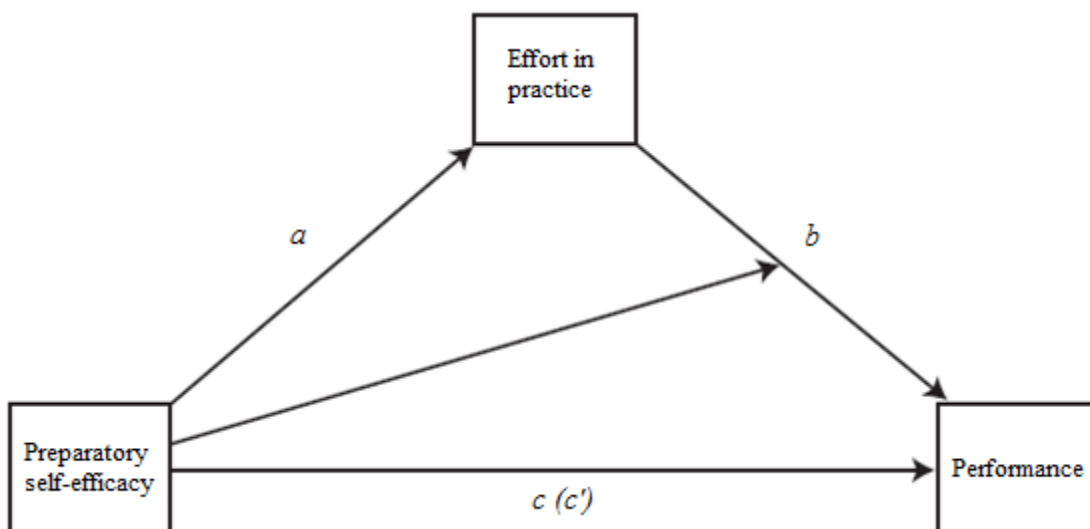
Figure 1. *The conceptual conditional indirect effect (moderated mediation model).*

<center>**6.3 Method**</center>

Participants

Fifty-three participants (M_{age} = 22.07 years, SD = 4.73; 39 males) took part in the study. Participants were basketball novices (never played basketball competitively and did not play frequently, i.e., less than once a week). All participants signed a consent form prior to taking part. An internal University ethics board granted ethics for the procedure.

Task

Participants attended one testing session where they completed a basketball free-throw shooting task. The procedure consisted of three trials and lasted approximately 45 minutes. The first trial was a forced practice trial, where participants had to keep shooting standard free throw shots until they had successfully scored ten baskets. The second trial was a free practice trial, where participants chose how many practice shots they wished to take in preparation for the final trial. The final trial was a performance trial, which replicated the first practice trial (keep shooting until ten successful shots were scored), with the added incentive of a cash prize. The cash prize was £50 for the participant who completed the task in the least attempts, £30 for the participant who finished second, and £10 for the participant who finished third. Participants were informed of the full procedure before the first practice trial began.

Measures

Self-efficacy: Self-efficacy was measured by asking each participant to answer 'yes' or 'no' to the statement 'I have the skills and resources to make 10 shots in 10 attempts', 'I have the skills and resources to make 10 shots in 11 attempts', repeating in one shot intervals up to 100 attempts. Therefore, self-efficacy ranged from 0 to 91, and lower values indicate higher self-efficacy (as participants will be stating that they can complete the task in fewer attempts). This measure is presented in Appendix I.

Effort: Effort was recorded as the number of shots attempted in the free practice trial.

Performance: Performance was recorded as the number of shots taken to successfully score ten free throws in the final trial.

Apparatus

All participants used the same court, basket, and Adidas 3 stripe streetball basketballs which were inflated to the standard weight (approximately 8 lbs). The free throw line was 15ft (4.57m) from the backboard, and the hoop was 10ft (3.05m) above the ground. These measurements conform to a standard basketball court.

Procedure

The task procedure was explained to participants upon arrival, who then signed a consent form in order to take part. Immediately after, participants began the first trial (the forced practice trial). Once participants had scored ten free throws, they received performance feedback concerning the number of shots it took them. After receiving the performance feedback, participants completed the self-efficacy questionnaire, and were reminded that they had one more opportunity to practice (free practice trial) before the chance to repeat the task for the opportunity to win a cash prize (performance trial). Once participants finished the free practice trial, they received more performance feedback regarding shots attempted and shots scored, and were also reminded of their performance in the first trial. Before the final trial, participants again completed the self-efficacy questionnaire. After participants completed the performance trial they were told that they would be contacted if they won a prize.

Descriptive statistics including means, standard deviations and correlations are

displayed in Table 1.

Table 1. *Means, standard deviations, and correlations between variables.*

		Correlations			
	Mean ± SD	**1**	**2**	**3**	**4**
1. Forced practice trial (shots made)	45.15 ± 16.70				
2. Preparatory self-efficacy magnitude	26.98 ± 11.85	.53**			
3. Shots attempted in free practice (effort)	22.89 ± 18.41	-.14	-.001		
4. Performance self-efficacy magnitude	27.98 ± 12.57	.39**	.77**	.26	
5. Performance (shots made) competition	39.19 ± 15.67	.52**	.35*	-.08	.32*

*$p < .05$; **$p < .001$

The preparatory self-efficacy magnitude score indicates that on average, participants

believed that they could complete ten successful free throws in approximately 27 attempts.

Performance self-efficacy (trial 3) remained stable and decreased by one shot from

preparatory self-efficacy (trial 2). Participants displayed considerable overconfidence in both

measures of self-efficacy. That is, in trial 1, participants took approximately 45 attempts to

score ten free throws, however, participants subsequently believed that they could achieve ten

successful shots in approximately 27 attempts. In addition, after practicing for an average of

23 shots, participants then believed they could complete ten successful shots in 28 attempts.

However, it actually took approximately 39 attempts.

Paired sample *t*-tests demonstrated that the change in self-efficacy from the first to

second measure was not significant (t (52) = .88; p =. 38). However, performance

significantly improved from the forced practice trial to the final performance trial (t (52) =

2.74, $p < .05$).

Hypothesis 1 predicted that preparatory efficacy would have a curvilinear relationship with effort in practice. In order to test for a non-linear relationship between variables, we used a two-step hierarchical multiple regression. In step 1, we entered preparatory self-efficacy, and in step 2 we entered the quadratic term of preparatory self-efficacy (multiplied the variable by itself). This method allows us to identify if the quadratic term (curvilinear relationship) demonstrates a stronger relationship between self-efficacy and effort than the linear. Results were not significant for the linear relationship between self-efficacy and effort ($r^2 = .00$, $\beta = .001$, $F_{1, 51} = .003$, $p = .99$). Results were also not significant regarding the quadratic term ($\Delta r^2 = .02$, $\beta = -1.28$, $F_{1, 50} = .88$, $p = .35$). Thus, self-efficacy was not significantly related to effort, either in a linear or curvilinear manner.

Hypothesis 2 predicted a conditional and indirect effect of self-efficacy upon performance. That is, effort (number of shots in practice) will only act as a positive mediator between self-efficacy and performance under moderate levels of self-efficacy (Figure 1, above). In order to test this model, we conducted a moderated-mediated regression analysis using model 74 in PROCESS (Hayes, 2013), with bias-corrected confidence intervals (CI's) generated from 50,000 bootstraps. This model allows the examination of a mediating effect at different values of the moderator (self-efficacy). Specifically, the different levels of the moderator (self-efficacy) examined were the 10th, 25th, 50th, 75th, and 90th percentiles. Thus, we examined whether effort (shots in practice) acted as a mediator between self-efficacy and performance, with self-efficacy as a moderator set to the value of the 10th, 25th, 50th, 75th, and 90th percentiles.

As displayed in Table 2 (below), the a-path between self-efficacy and effort was not significant ($\beta = -.01$, $p = .99$). The b-path between effort and performance was positive and non significant ($\beta = .41$, $p = .68$). The c'-path, which represents the direct effect of self-efficacy upon performance, was positive and significant ($\beta = 2.39$, $p < .05$). This

demonstrates that performance was better at higher levels of self-efficacy (it took less attempts to score 10 successful free-throws). The interaction between self-efficacy and effort upon performance (i.e., number of attempts to score 10 baskets) was not significant ($\beta = .01$, $p = .46$).

Regarding the results for the conditional indirect effect, relationships are accepted as significant if the upper and lower confidence intervals do not incorporate zero. Thus, there was no conditional indirect effect of self-efficacy on performance (via effort), since the indirect path was not significant at every percentile of the moderator. Results of the conditional indirect effect are displayed in Table 2, below.

Table 2. *Mediation and conditional indirect effect results.*

	B	SE	β	*P*
DV = Effort				
Self-efficacy	-.002	.22	-.01	.99
DV = Performance				
Effort	.11	.27	.41	.68
Self-efficacy	.59	.25	2.39	.02
Self-efficacy x Effort	-.01	.01	-.74	.46

Conditional indirect effect of self-efficacy on performance at values of the moderators

	Self-efficacy	Effect	Boot SE	Boot LLCI	Boot ULCI
10th percentile	10.00	-.0001	.05	-.10	.09
25th percentile	20.00	.00	.03	-.06	.06
50th percentile	25.00	.0001	.03	-.06	.06
75th percentile	31.00	.0001	.04	-07	.08
90th percentile	40.00	.0002	.05	-.10	.13

6.5 Discussion

The first aim of the study was to test the inverted 'U' relationship implied by Bandura (1997), regarding preparatory self-efficacy and effort. Bandura predicts that if an individual has high levels of preparatory self-efficacy, they will have little incentive to invest effort to prepare for an upcoming task. Thus, as a result of ill preparation, subsequent performance will suffer. On the other hand, too little self-efficacy (high amounts of self-doubt) may be debilitative to preparation, which may also be detrimental to performance. However at moderate levels of self-efficacy (when an individual has a little bit of self-doubt), one is provided with the driving force needed to invest effort in acquiring skills needed for performance. Thus, one would expect to see a curvilinear relationship between self-efficacy and effort in practice (Feltz et al., 2008). Hypothesis one tested this prediction, however, no support was found.

The second aim of the study was to test for a conditional indirect effect of self-efficacy upon performance. That is, effort will only act as a mediator that positively influences the relationship between self-efficacy and performance under moderate levels of self-efficacy. Based on previous findings, it is apparent that effort acts as a mediator between self-efficacy and performance, since the belief an individual has in their capabilities determines how much effort they believe they need to invest in order to perform (e.g., Richard et al., 2006; Vancouver & Kendall, 2006). However, we argue that a positive mediation effect only occurs at moderate levels of self-efficacy, since at low levels of self-efficacy individuals may disengage (e.g., Beattie & Davies, 2010), and at high levels of self-efficacy individuals may become complacent (e.g., Vancouver & Kendall, 2006). However, results did not support these predictions.

The correlation results provide mixed support for self-efficacy theory. We found a significant and positive correlation between the forced practice trial and self-efficacy

measured directly afterwards (preparatory self-efficacy). This demonstrates support for the predicted positive relationship between previous performance and self-efficacy (Bandura, 1997). We also found a positive and significant relationship between performance self-efficacy (measured just before the performance trial) and performance. Therefore finding support for Bandura's (1997) prediction that performance self-efficacy and performance are positively related. Self-efficacy did not significantly change after the free practice trial, and therefore preparatory and performance self-efficacy displayed almost identical positive and significant relationships with performance. However, this may be due to the fact that participants had limited mastery experiences to base their self-efficacy judgments on. Further, effort in the free practice trial was not significantly related to either self-efficacy measure, or either performance trials.

Taken together, the results do not provide support for the implied inverted 'U' relationship between preparatory self-efficacy and effort in practice. There are several reasons why self-efficacy and effort may have had no relationship. One reason may be that we neglected to differentiate between practice quality and practice quantity, which was a limitation of the Wood and Feltz (2013) study that we failed to address. The fact that some participants took more practice shots than others does not determine whether practice was worthwhile. The lack of a significant relationship between effort and performance suggests that it may not have been. For instance, an individual who takes twenty practice shots but takes careful notice of their technique in a quest to improve, may be more likely to improve their subsequent performance compared to another individual who takes fifty practice shots without giving them much thought. The present study may have been particularly susceptible to this, since the participants were inexperienced at basketball, and therefore most likely had limited knowledge of the correct technique in taking free throws. Thus, we agree with Wood and Feltz's (2013) suggestion that practice quality is an important variable to consider when

testing such relationships. In order to attend to this limitation, future research could include choices for participants regarding practice quality. For example, future research may differentiate between levels of practice quality by presenting participants with different options during the free practice trial. For instance, a 'high practice quality' option could be to receive guidance from a basketball expert who is on hand to guide them through the technique. A 'moderate practice quality' option could be to watch a video of the perfect technique, and a 'low practice quality' option could be to practice via trial and error as was the case with the present study.

A second potential reason why self-efficacy and effort were not related, may be a function of the participants approach to the free practice trial. The experimenter was present for the entire procedure, therefore, some participants may have felt compelled to practice for longer than they wanted to. Conversely, participants may have taken minimal practice shots, because it would mean that they could leave the experiment sooner. In order to address this limitation, an alternative research design which gives participants a choice of practice attempts, such is the case in Wood and Feltz (2013), could be utilised. Wood and Feltz (2013) informed participants that they had thirty practice shots, and that they could allocate them as they wish to the different levels of task difficulty. Thus, the present study may have benefitted from giving the participants a choice of practice attempts, for example in offering ten, twenty, thirty, forty, and fifty practice shots.

A further limitation considers the timing of the preparatory self-efficacy measure and thus how applicable the research is to real-life scenarios, and in particular, sport performance. Although preparatory self-efficacy was recorded before the free practice trial, it was still in close proximity to the final performance trial. One complete testing session lasted for approximately forty-five minutes, thus, preparatory efficacy was measured roughly twenty-five minutes before the performance trial. In real-life sport performance preparation, the

preparation phase could be up to a week before competition, and an individual's level of self-efficacy surrounding the upcoming competition could fluctuate throughout a clearly defined preparatory phase. Future research may wish to consider creating a testing schedule that more closely mimics the time line of sport preparation and competition.

Another consideration concerns the role of previous performance. It is worth noting that the current study did not control for past performance, nor did Wood and Feltz (2013). Since previous performance is such a strong predictor of self-efficacy, it is necessary to consider controlling for previous performance, so that the relationship between self-efficacy and subsequent performance is not inflated by previous performance (Sitzmann & Yeo, 2013). Indeed, the significant positive relationship between preparatory efficacy and subsequent performance (see Table 2) in the current study becomes non-significant when the performance in the first trial (forced practice) is controlled for. This suggests that previous performance is a stronger predictor of subsequent performance than self-efficacy, thus, more confident individuals may have performed better due to higher levels of ability, and not due to a combined efficacy/effort effect. We recommend that future research examining preparatory self-efficacy and effort considers adopting this approach in future.

Finally, the overconfidence demonstrated in self-efficacy coupled with the fact that effort in practice was unrelated to final performance, provides evidence for a phenomenon known as the Dunning-Kruger effect (Dunning & Kruger, 1999). The Dunning-Kruger effect describes the double burden that novice performers are unaware of their lack of skill level (resulting in a positive bias in self-efficacy), and unaware of the skills they need to acquire in order to improve. In the present study, the overconfident predictions demonstrate a lack of awareness regarding current skill level. In addition, the fact that effort was unrelated to performance (and of seemingly low quality) suggests that participants were unaware how to practice the task, due to being unaware of the skills they needed to acquire.

To conclude, although self-efficacy and effort were not significantly related in any of the analyses, the curvilinear relationship appeared to represent the data slightly more accurately. The significance value associated with the curvilinear relationship was much closer to significance (albeit, still rather far) in comparison to the linear relationship, which may provide tentative evidence that the relationship is preferred to the linear one in a preparation context. Thus, we recommend future research considers the abovementioned limitations before concluding that such relationships do not exist.

5

General Discussion

'Confidence is ignorance. If you're feeling cocky, it's because there's something you

don't know'

- Eoin Colfer (Artemis Fowl)

7.1 Thesis Summary.

The main aim of the thesis was to further explore potential moderating variables (namely, positive bias) of the relationship between self-efficacy and performance, when examined at a within-person level and over a series of trials. A secondary aim of the thesis was to further explore the role of effort as an underlying mechanism of the self-efficacy and performance relationship. Chapter 2 examined the role of the subconscious positive bias often observed in self-judgements, in a self-efficacy and performance framework. We examined differences in bias and discrimination components of self and peer performance evaluations, and whether positive bias contributed to a negative self-efficacy and performance relationship. Chapter 3 examined the moderating role of subclinical narcissism on the reciprocal self-efficacy and performance relationship. Narcissism is a personality characterised by overconfidence and grandiose claims about one's behaviour. The chapter also utilised a psychophysiological measure of cognitive effort. Finally, chapter 4 attempted to find evidence for the proposed curvilinear relationship between preparatory self-efficacy and effort in practice, and how these variables interacted with subsequent performance. At present, there is a dearth of research regarding preparatory efficacy. Each chapter is summarised below, before the remainder of this chapter considers the theoretical and applied implications of the main findings. Finally, future directions and a conclusion are presented.

7.2 Chapter 1: *General Introduction*

Chapter 1 provided a summary of much of the self-efficacy research that has been conducted during the past 15 years. Of particular interest is the increase in within-person

repeated measures designs, which has repeatedly presented a positive relationship between previous performance and subsequent self-efficacy (Sitzmann & Yeo, 2013), and positive (Seo & Ilies, 2009), negative (e.g., Vancouver et al., 2001; 2002), and non-significant relationships (e.g., Richard et al., 2006) between self-efficacy and subsequent performance. Research examining moderators of the self-efficacy and performance relationship followed. Finally, the chapter introduced the areas that the thesis examined, in positive bias, narcissism, and the role of effort.

7.3 Chapter 2: *Bias in self-efficacy: A comparison of self and peer predictions of future performance.*

Chapter 2 examined the role of positive bias in self-evaluations, and if positive bias (overconfidence) plays a role in the reciprocal relationship between self-efficacy and performance. Previous research has demonstrated that the relationship between one's prediction of future behaviour, and one's actual behaviour, is modest at best (Dunning, Heath, & Suls, 2004; Zell & Krizan, 2014). This finding has been replicated within the within-person self-efficacy and performance research (e.g., Beattie et al., 2011). In comparison, peer predictions of future behaviour typically display more accuracy (less positive bias) when compared to self-predictions (Helzer & Dunning, 2012). Helzer and Dunning (2012) demonstrated that this difference is a function of the information used. That is, the self values performance aspirations over previous performance, whereas the peers value previous performance information above the self's performance aspirations. Since previous performance is a stronger predictor of future performance than performance aspirations (Helzer & Dunning, 2012), peer predictions are typically more accurate.

Further, there are two ways to assess the accuracy in one's predictions of future performance (Zell & Krizan, 2014), bias (the amount of error in prediction) and

discrimination (the relationship between performance predictions and actual subsequent performance). The self-efficacy research typically adopts the discrimination approach, and neglects to report bias. Therefore this chapter examined both bias and discrimination and asked, how much of the negative relationship between self-efficacy and performance is due to a positive bias in self-evaluations?

We compared the strength of the relationship between previous performance and subsequent self-efficacy for the self and peers, and expected the peer to display a stronger relationship (based on the findings of Helzer & Dunning, 2012). However, the relationships were very similar. We further predicted that the self would display a larger positive bias in their self-efficacy judgements in comparison to the peer. Our results demonstrated that self and peer bias were both positive (in support of Helzer & Dunning, 2012). However, the amount of bias displayed by the self and peer in chapter 2 was very similar, whereas in Helzer and Dunning's (2012) study the self was significantly more overconfident than the peer. Finally, we examined the relationships between self-efficacy (or in the case of the peer, performance prediction) and subsequent performance (discrimination). We again predicted that the peer would display a more positive relationship, which to some extend they did (the relationship was positive and non-significant for the self, and positive and significant for the peer), although the coefficients were not significantly different.

We believe that the research design contributed to the difference in our results and those of previous research. Firstly, one key difference is that our research design was repeated measures and within-person, compared to the cross-sectional and between-person research (Helzer & Dunning, 2012) we largely compared our results to. Secondly, the fact that both the self and peer had full access to previous performance feedback may have led to a certain amount 'de-biasing' of performance evaluations (e.g. Arkes et al., 1987; Beattie et al., 2015). These arguments are explored more fully later in this chapter.

7.4 Chapter 3: *The moderating role of subclinical narcissism on the reciprocal relationship between effort, self-efficacy, and performance.*

Chapter 3 examined whether subclinical narcissism moderated the within-person reciprocal relationship between self-efficacy and performance. Chapter 3 focussed on the grandiose aspect of narcissism, which 'primarily reflects traits related to grandiosity, aggression, and dominance' (Miller et al., p. 1013). Grandiose narcissism is often associated with over positive self-evaluations that reflect overconfidence (e.g. Campbell et al., 2004; Robins & Beer, 2001), and a tendency to only recall self-flattering past events (Rhodewalt & Eddings, 2002). We predicted that subclinical narcissism may partly account for the negative relationship between self-efficacy and performance in a number of ways.

We first predicted that subclinical narcissism would have a negative moderating effect on the relationship between previous performance and subsequent self-efficacy, due to the fact they have a preference to recall positive past events (Farwell & Wohlwend-Lloyd, 1998; Rhodewalt & Eddings, 2002). Results supported our prediction. We also predicted that subclinical narcissism would negatively moderate the relationship between self-efficacy and subsequent performance relationship, due to their overly positive self-perceptions (Campbell et al., 2004; Robins & Beer, 2001). However, this was not the case.

A secondary purpose of the study was to explore the role of effort. Control theory (Powers, 1991) predicts that a negative self-efficacy and performance relationship emerges when resources allocated toward a task (i.e., effort) are reduced when self-efficacy is high, and there is evidence to support this prediction (e.g., Richard et al., 2006; Vancouver & Kendall, 2006). Thus, we explored whether subclinical narcissism plays a role in the relationship between effort, self-efficacy, and performance. In addition, we supplemented our self-report measure of effort (Zijlstra, 1993) with a psychophysiological measure of effort, heart rate variability (HRV; Wright, 1996).

Results revealed a significant moderating effect of subclinical narcissism upon the relationship between self-efficacy and self-report effort. Such that individuals higher in subclinical narcissism had a negative relationship between self-efficacy and self-report effort, and individuals lower in subclinical narcissism had a positive relationship. However, there was no moderating effect of subclinical narcissism upon the relationship between self-efficacy and HRV. This provides tentative evidence that individuals higher in subclinical narcissism were underreporting the amount of effort invested in the task. Further, subclinical narcissism moderated the relationship between self-report effort and performance, such that individuals higher in subclinical narcissism displayed a 'flat' relationship between self-report effort and performance, and individuals lower in subclinical narcissism displayed a positive relationship. The moderating effect disappeared when self-report effort was substituted for HRV. Taken together, these results may provide evidence of an ego-protecting strategy employed by those higher in subclinical narcissism. Individuals higher in subclinical narcissism have been known to engage in ego-protecting strategies in order to discount failure (Rhodewalt et al., 2006), thus, individuals higher in subclinical narcissism in chapter 3 may have been under-reporting their effort level post-trial if their performance level did not confirm their positive self-views, despite investing the same amount of effort as low narcissists. However, further research comparing self-report and psychophysiological measures of effort is needed, since although decreases in HRV have been associated with an increase in cognitive effort, there are potentially better measures available (e.g., pupil dilation, Alnaes et al., 2014; pre-ejection period, Wright, 1996).

7.5 Chapter 4: *Self-efficacy and performance: Exploring the mediating role of effort.*

Chapter 4 investigated the relationship between preparatory self-efficacy, effort in practice, and performance. First, we tested for the proposed curvilinear relationship between

preparatory self-efficacy and effort (Feltz et al., 2008; Wood & Felt, 2013). Second, we tested for a conditional indirect effect of preparatory self-efficacy upon performance, through effort in practice. That is, effort would only positively mediate the relationship between self-efficacy and performance at moderate levels of self-efficacy. However, results failed to support for either of these models.

One major issue regarding this study concerns the effort measure. Effort in chapter 4 was measured via the number of practice shots taken by the participants in a free practice trial. However, we failed to the consider effort quality as well as effort quantity. Thus, it was impossible to judge whether the effort invested was high or low quality. Further, it may have been difficult for participants to ensure high quality practice, since they may not have been aware of the best technique to focus their efforts on due to the fact that they were novice performers. A second key point concerns the low generalisability. The preparatory period of an upcoming sport performance would likely span the week prior to the event, thus preparatory efficacy should arguably be measured at least 24 hours before the performance event or task. In chapter 4, both the preparatory and performance trials took place within the same hour. Therefore, future research may wish to more closely mimic the practice and competition time frame. Due to these limitations, we concluded that due to the lack of research on preparatory self-efficacy, we recommend the limitations are addressed and future research conducted before disregarding the curvilinear relationship theorised by Feltz et al.'s (2008) predictions.

7.6 Theoretical implications.

Equal self and peer bias.

The results presented in chapter 2 do not provide support for previous findings (Helzer & Dunning, 2012). Two measures of accuracy were examined, 'discrimination' (relationship between predictions of future performance and actual subsequent performance)

and bias (error in performance predictions). Previous research has demonstrated that self and peer discrimination is typically similar (e.g., Helzer & Dunning, 2012; Vazire & Mehl, 2008), yet bias in self and peer predictions 'most reliably diverge' (Helzer & Dunning, 2012, p. 2), such that the peer demonstrates less bias (more accuracy). Helzer and Dunning (2012) reported that these findings are the result of the weighting given to performance information (past performance and performance aspirations) in the predictions of the self and peer. That is, the peer placed the most value in past performance information, compared to the self who placed the most value in their performance aspirations.

In light of these findings, we expected to find similar results within a self-efficacy framework, since self-efficacy research has also demonstrated positive bias in one's judgments of ability (e.g., Beattie et al., 2011). However, we failed to find support for Helzer and Dunning's (2012) results. Helzer and Dunning (2012) reported a large difference in the self and peer results, such that the self displayed a considerably weaker relationship between previous performance and self-efficacy compared to the peer (self: $\beta = .21$; peer: $\beta = .62$; both positive and significant). In comparison, our results revealed very similar relationships for the self and peer (self: $\gamma = -.31$; peer: $\gamma = -.28$). This suggests that the self and peer have equally valued previous performance information, when formulating their performance predictions.

We also failed to support Helzer and Dunning (2012) regarding both the bias and discrimination results. Regarding bias, Helzer and Dunning (2012) demonstrated that both the self and peers were overconfident in their predictions of future performance, but the self was significantly more so. Our results did not support this finding. We found that the self and peer had very similar levels of positive bias, which reflected equal levels of overconfidence (on average, the self was overconfident by 9.05 points, and the peer by 8.44). Thus, although we

partly supported Helzer and Dunning (2012) in that both the self and peer were overconfident, we did not support them fully since the overconfidence levels were similar.

Finally, Helzer and Dunning (2012) reported very similar relationships between self-efficacy and performance (discrimination) ($r = .40$), and peer predictions of future performance and performance ($r = .41$). In comparison, our results demonstrated fairly different discrimination for the self and peer (self: $\gamma = .12$; peer: $\gamma = .31$). Despite the somewhat large difference, the coefficients were not significantly different from each other. As mentioned in the discussion of chapter 2 and discussed below, the repeated measures design and presence of feedback seem to have contributed significantly to the difference in results.

Research design: Repeated measures and feedback.

The repeated measures design adopted in chapter 2 allowed a within-person and repeated measures analysis of the relationships between self-efficacy and performance. Thus, we were able to identify what happens to a person's performance as their self-efficacy changes, and what happens to self-efficacy as performance changes (Vancouver et al., 2001). This is an important consideration, since self-efficacy beliefs are personal to each individual (Gilson, Chow, & Feltz, 2012), and research has shown that accuracy (or inaccuracy) in self-perception is a stable individual difference (Nilsen & Campbell, 2003). This is in contrast to previous research designs (e.g., Buehler et al., 1997; Buehler et al., 1994; Helzer & Dunning, 2012), which have been cross-sectional and therefore included performance predictions for only one upcoming performance. Further, in chapter 2, participants received performance feedback after every trial, which included all performance scores up to and including the last trial. Again this is in contrast to Helzer and Dunning (2012) who provided 'a small amount of relevant information' (p. 12) to the peer, but argued that the self 'had a seemingly limitless

supply of first-hand knowledge relevant to future performance' (p. 12). Therefore, the difference in the results may be attributed to the fact that both the self and peer had full access to all previous performance information. Indeed, the self and peer in chapter 2 displayed similar relationships between previous performance and self-efficacy, which suggests that they may have been basing their performance predictions upon the same information, and subsequently reported similar discrimination and bias. In addition, the peers in chapter 2 had visible feedback of the self's putting ability through observation. This information was not available in Helzer and Dunning's (2012) study, where the task was an upcoming exam. As mentioned in chapter 2, in order to confirm this reasoning a second study without feedback would be needed.

Narcissism and self-efficacy.

Chapter 3 examined the influence of subclinical narcissism upon the reciprocal relationship between self-efficacy and performance at the within-person level. Subclinical narcissism moderated the relationship between previous performance and subsequent self-efficacy, but not the relationship between self-efficacy and subsequent performance. Regarding the former, as far as the authors are aware, the moderating effect present on the relationship between previous performance and subsequent self-efficacy is the first time a non-positive relationship has been reported here. That said, within the context of the narcissism literature, the finding may not be considered particularly new. Indeed, as Kernis and Sun (1994) demonstrated, narcissists are selective regarding which information they take on to inform their self-evaluations. Kernis and Sun (1994) revealed that narcissistic individuals viewed feedback as diagnostic and accurate, and the evaluator as competent, if it was positive. However, if feedback was negative, narcissists viewed it as less diagnostic and the reviewer as less competent and likeable. In addition, narcissists have displayed a selective

memory for self-flattering past events (Rhodewalt & Eddings, 2002) and hold overly optimistic views of current performance and performance achievements (Farwell & Wohlwend-Lloyd, 1998; Robins & Beer, 2001). Thus, regarding the results of chapter 3, it seems that individuals low in subclinical narcissism saw the value in the performance feedback and based their self-efficacy judgments more closely upon it, whereas individuals high in subclinical narcissism were selective in which feedback they valued (presumably, the feedback which confirmed their positive self-views). We encourage future research to attempt to replicate this finding, and echo Sitzmann and Yeo's (2013) call to further explore potential moderators of the relationship between previous performance and subsequent self-efficacy.

Despite the support for the first hypothesis results did not support the second, that subclinical narcissism would moderate the relationship between self-efficacy and subsequent performance. One reason that subclinical narcissism may not have moderated the self-efficacy/performance relationship was eluded to in chapter 3, and concerns the level of self-enhancement available to participants. Chapter 3 offered a moderate level of self-enhancement opportunity present, via the opportunity to be placed on the leader board in the lab and receive a cash prize if one were amongst the top ten fastest drivers. In addition, the experimenter was present throughout the entire procedure, thus, it may have been perceived that performance was being judged. However, driving performance was not going to be publicised and task difficulty was not increased. Past research has demonstrated that narcissists invest more effort (and subsequently perform better) when there is an opportunity for glory, such as public identifiability and increasing the challenge level of the task (Wallace & Baumeister, 2002). Thus, chapter 3 may have benefitted from a two condition design (high and low opportunity for glory), which would have allowed the possibility of exploring a three-way interaction between opportunity for glory, self-efficacy, and effort upon

performance. One might expect that for high narcissists, the opportunity for glory is a stronger predictor of effort than is self-efficacy.

Alternatively, subclinical narcissism may moderate the self-efficacy and performance relationship when performing well learned tasks as opposed to at the novice level of performance. It is well documented that novices over predict their performance level (e.g., Kruger & Dunning, 1999) and since we adopted a novel task (driving simulator), any moderating subclinical narcissism effect may have been lost in a novice over-rating effect that occurred across all participants. However, at the other end of the learning continuum, experienced individuals tend to be more accurate in self-perceptions and have been known to be slightly modest (i.e., underrate one's own performance level; Dunning, Johnson, Ehrlinger, & Kruger, 2003). Therefore, subclinical narcissism may moderate the relationship between self-efficacy and performance at more advanced stages of the learning continuum, where over rating may be more a function of personality than a failure to recognise one's own incompetence. This may be a worthwhile consideration for future research.

Finally, it is also worth considering the general low levels of subclinical narcissism in chapter 3. Chapter 3 reported a mean narcissism score of 3.68 on the NPI-16, which translates into a proportionate score of .23 on a scale of 0 to 1. In addition, when examining the moderating effects of subclinical narcissism, we examined scores that were +1 and -1 standard deviations from the mean. In comparison, Campbell et al. (2004) (who reported that higher levels of narcissism were related to higher levels of overconfidence) reported a mean narcissism score of 16.51 on the NPI-40. This translates into a proportionate score of .40 on a scale of 0 to 1, which is considerably higher than the .23 score reported in chapter 3. Further, Campbell et al. (2004) compared narcissists in the top and bottom quartile of their sample, which allowed a comparison between the highest and lowest scoring narcissists. Therefore, it may be that chapter 3 did not find support for subclinical narcissism as a moderator on the

relationship between self-efficacy and performance because the participant pool did not display a particularly high amount of subclinical narcissism, or a large enough range. In order to deal with this issue, more participants would be needed.

Effort.

The thesis also examined the role of effort. First in chapter 3, we adopted a psychophysiological approach to measuring effort, and revealed some potentially interesting findings regarding the differences in self-report and the heart rate variability measure of effort. Second, we examined the relationship between preparatory efficacy and effort in practice in chapter 4.

Psychophysiological approach to measuring effort.

The HRV measure adopted in chapter 3 was SDNN. SDNN is a time domain index of the spectral power in the 0.04 Hz to 0.15 Hz frequency band (Carrasco, Gaitan, Gonzalez, & Yanez, 2001). Previous research has used SDNN as a psychophysiological marker of cognitive effort, with increased cognitive effort associated with a decrease in heart rate variability (e.g., Cooke et al., 2010; Mulder, 1992).

The moderating role of subclinical narcissism was different depending on which effort variable was used in the analyses. Subclinical narcissism moderated the relationships between self-efficacy and self-report effort, and between self-report effort and subsequent performance. However, the moderating effect disappeared when self-report effort was substituted for HRV. One may interpret the results as tentative evidence that subclinical narcissists were under reporting their level of effort as an ego-protecting technique. Indeed, Morf and Rhodewalt (2001) stated that narcissists engage in cognitive reorganisation of information following an ego threat, in order to restore self-esteem (e.g., attributing failure to

the fault of the task). Thus, narcissists engagement in ego-protecting strategies is not a new theoretical implication, however as far as the authors of the study are aware, we have demonstrated a novel approach in demonstrating this phenomenon by adopting a psychophysiological measure. That said, we concede that HRV is perhaps not the clearest indicator of cognitive effort, and therefore we encourage future research to adopt better physiological measures of cognitive effort such as pre-ejection period, systolic blood pressure (Wright, 1996), or pupil dilation (Kahnemann, 1973; Alnaes, et al., 2014).

Effort in practice: Considering effort quality.

Chapter 4's primary purpose was to test for an inverted 'U' relationship between preparatory self-efficacy and effort in practice, based on Bandura's (1997) predictions and Feltz et al.'s (2008) theorising. A secondary purpose was to examine whether the positive mediating effect of effort was only present at moderate levels of self-efficacy.

As recognised by Wood and Feltz (2013) and discussed in the discussion of chapter 4, it is important to consider effort quality as well as effort quantity. For instance, consider two individuals repeatedly practicing a skill, such as the basketball free throw shot described in chapter 4. Both individuals might practice the task twenty times, however one individual may just go through the motions, and the other may consciously invest in purposeful practice. If only effort quantity is examined, then both of these individuals would record the same amount of effort, despite the latter individual demonstrating a higher level of effort quality. From the data collected in chapter 4, it is impossible to differentiate between effort quantity and effort quality. Further, it is fair to argue that the effort quality was likely fairly low, since participants were basketball novices and may not have been aware of the correct technique to practice. Thus, even though results did not support our hypotheses, we believe this is more

likely due to limitations of the study (e.g., the measure of effort) as opposed to a weak rationale.

The elusive inverted 'U': Are we looking in the wrong place?

Chapter 4 failed to find support for the proposed inverted 'U' relationship between preparatory self-efficacy and effort in practice. Although several important limitations were highlighted and need to be addressed, one further point to consider is testing for the relationship at the within-person level. As mentioned, self-efficacy beliefs are personal to each individual (Gilson et al., 2012). If one is predicting that low and high levels of self-efficacy may lead to disengagement or a reduction in the amount of resources allocated in practice (e.g., Beattie & Davies, 2010; Vancouver & Kendall, 2006), one must consider the possibility that a low self-efficacy score between individuals could be very different. The same is true for moderate and high levels of self-efficacy. Therefore, future research may wish to consider testing the proposed inverted 'U' relationship between preparatory self-efficacy and effort in practice at the within-person level.

7.7 Applied implications.

Objective performance feedback vs. peer feedback.

A considerable amount of previous research suggests that peers can provide a more accurate prediction of one's future behaviour than can the self (Dunning et al., 2004; Helzer & Dunning, 2012). The applied implications of these findings would be to promote seeking a peer's opinion of one's performance level, in order to gain a more accurate view of oneself. However, chapter 2 found no difference in self and peer prediction accuracy (the positive bias present in predictions was similar), and therefore suggests that the self can be just as accurate as the peer. If indeed the self is able to be just as accurate in the right conditions, the findings

of chapter 2 may challenge Helzer and Dunning's (2012) statement that 'People can achieve greater self-insight about their futures, though the trick is that they *must be able to see themselves as others see them*' (italics added, p. 13). Of course, there were methodological differences between Helzer and Dunning (2012) and chapter 2 (chapter 2 provided considerable objective performance feedback during the course of repeated task performance, and examined bias within-person), and so further research would be warranted.

Personality (narcissism) and feedback.

One applied implication from chapter 3, which examined subclinical narcissism and self-efficacy, considers subclinical narcissism and performance feedback. Bandura's (1997) self-efficacy theory states that previous mastery experiences are the most influential antecedent to self-efficacy beliefs, and that learning must take place in order for the reciprocal relationship to remain positive (Bandura & Locke, 2003). We also know that individuals (Brett & Atwater, 2001), in particular narcissists (Kernis & Sun, 1994), can react aggressively to negative feedback and view such feedback as less diagnostic and less useful, if the feedback does not support positive self-views (Bushman & Baumeister, 1998). Our results compliment these findings, and suggest that subclinical narcissists do not consider all previous performance information when forming self-efficacy judgments. Thus, it is important to consider how performance feedback is framed (particularly if it may be perceived as negative) in order to ensure that narcissists take it on board. Barry, Chaplin, and Grafeman (2006) compared three ways of delivering feedback, which consisted of comparing an individual's performance to their own previous standards (ipsative standard), comparing an individual's performance to another person's standards (normative standard), and comparing an individual's performance to an idealized performance (idealized standard). Barry et al. (2006) demonstrated that participants who received feedback based on a

normative standard tended to be more aggressive compared to individuals who received feedback based on an ipsative standard. Perhaps if performance feedback for narcissists is purely based on their own previous performance they may be more likely to consider it.

7.8 Future directions.

Despite the recent surge of research examining the self-efficacy and performance relationship, there are still several research questions more than worthy of consideration.

Further exploring personality: Optimism and defensive pessimism.

Chapter 3 demonstrated that personality may be an important consideration for future research on the self-efficacy and performance relationship. For example, another personality trait, optimism, may also play a role. By definition, 'Optimists are people who expect good things to happen to them' (Carver, Scheier & Segerstrom, 2010, p. 879). Therefore, are optimists more likely to reduce resource allocation to a task, or in preparation for a task, and experience negative self-efficacy and performance relationships?

Further, it has been suggested that optimists are particularly good at using more effective coping strategies, and better at matching the coping strategy to the task at hand (Carver et al., 2010). Thus, the interaction between optimism, self-efficacy and performance may be complex when examined with novice performers. Optimists may display higher average levels of self-efficacy and a more positive within-person relationship across trials between self-efficacy and performance, due to their ability to adopt coping strategies. Alternatively, it may be that optimists disregard any performance 'red flags' and continue with their current performance strategy even in the face of failure.

At the other end of the spectrum is pessimism, but perhaps of more interest to the self-efficacy and performance research, defensive pessimism. Defensive pessimism is a cognitive

strategy used by highly anxious individuals, who lower their expectations in order to help manage their anxiety so that it does not become self-debilitating (Norem & Cantor, 1986). Thus, individuals who adopt this strategy may report lower levels of self-efficacy in anticipation of not performing at their best, but subsequently experience positive self-efficacy/performance relationships.

'Thinking fast and Slow': Time between repeated measures.

The time between repeated measures may contribute toward whether the self-efficacy and performance relationship is positive or negative. Allowing an individual an appropriate amount of time to reflect on the performance feedback available to them, and how it relates to the task demands, may produce a positive self-efficacy and performance relationship. This idea stems from a best-selling book produced by Daniel Kahneman, 'Thinking Fast and Slow' (2011). The book describes two modes of thought. The first mode of thought is subconscious, fast, and emotional, whereas the second is conscious, effortful, and calculated. To the candidate's best knowledge, the time between repeated measures has not yet been considered as a moderator of the within-person self-efficacy and performance relationship.

Recall that Vancouver et al. (2001) and Yeo and Neal (2006) argued that when an individual has high levels of self-efficacy, they do not consider performance feedback fully, and consequently their performance suffers as a result of missing information relevant to performance. Subsequently, participants were ill-informed when making judgments and acting. Perhaps this argument is related to the first mode of thinking outlined by Kahneman, above. The repeated measures research design adopted by the within-person studies may contribute to this effect, as participants often repeat the trials in quick succession. However, if participants were given an increased amount of time between trials, and were encouraged to carefully consider the feedback available to them and base their performance strategy

concerning the next trial on said feedback (reflecting the second mode of thinking), we may see a positive self-efficacy and performance relationship.

Justification of self-efficacy level to others.

Another method which may affect the direction of the self-efficacy and performance slopes, is to ask people to justify their level of self-efficacy, or, at least lead them to believe that they will have to. This method has been known to reduce overconfidence (Arkes et al., 1987), and therefore may negate the negative relationships between self-efficacy and performance.

Arkes et al. (1987) used general knowledge questions, where participants had to state their degree of confidence in their answers, and justify why they had chosen the response they did. Results demonstrated that when participants anticipated that they would have to justify their answers, their confidence levels dropped significantly. Granted, one argument for this effect is that the reduction in confidence is the result of participants actively managing how they are perceived to others (Goffman, 1959), since appearing modest is often more admirable than appearing overconfident. However, Koriat, Lichtenstein, and Fischoff (1980), and Slovic and Fischhoff (1977) have both demonstrated that when participants had to select one of two possible options, there is a genuine reduction in confidence that the chosen option is the correct one. Arkes et al. (1987) argued that the reduction in confidence for participants who believed they would have to justify their answers, was due to an increase in the time spent filling in the questionnaires, and thus they applied a more complete review of potential answers available. Thus, asking an individual to justify their level of self-efficacy prior to performing a task may result in a more considered view of their ability to utilise their skills. A final point is that this idea may relate to the idea above concerning time between repeated

measures, that taking time to consider all information available may contribute to positive self-efficacy effects.

The Learning Continuum: Novices vs Experts.

The learning continuum (Fitts & Posner, 1967) describes the process of progression of skill acquisition. The learning continuum states that an individual will progress from the novice (beginner) phase, to the associative (intermediate) phase, to the expert phase. The vast majority of research regarding self-efficacy and performance relationship has used novel tasks or novice performers, in order to adhere to Bandura's recommendation that learning must take place between trials in order for self-efficacy to display a positive relationship with performance (Bandura & Locke, 2003). However, this leaves us with very little research that attempts to understand the self-efficacy and performance relationships for those who may be considered as 'intermediate' or 'expert' performers.

The Dunning-Kruger effect (Kruger & Dunning, 1999) offers a potential framework to examine the self-efficacy and performance relationship at different levels of ability. The Dunning-Kruger effect explains that inexperienced performers are unskilled and unaware. That is, novices have to deal with the double burden of inaccuracy in self-perceptions (reflecting overconfidence), and the inability to recognise their incompetence. Conversely, individuals who are considered experts are likely to slightly underestimate their ability level. Kruger and Dunning (1999) state that a novice's positive view of themselves is the result of an internal error in judging the self, however, the experts underestimation of themselves is the result of an error in gauging others performance. Indeed, the positive bias displayed by novice performers is echoed in the self-efficacy literature, since a lack of mastery experience makes it difficult to accurately judge one's efficacy level and contributes to negative

relationships. What remains unclear, is how the experienced performers tendency to underestimate themselves contributes to the self-efficacy and performance relationship.

Vicarious Experience

Vicarious experience is appraising one's own capabilities by comparing them against the attainments of others (Bandura, 1997), and is the second most influential antecedent to self-efficacy. An individual who has no (or limited) previous mastery experience available for a specific task, may turn towards vicarious experience in order to inform their efficacy judgements. Thus, self-efficacy appraisals are more sensitive to vicarious experience when an individual lacks previous experience (Takata & Takata, 1976).

As mentioned, research into moderators of the relationship between self-efficacy and performance has focussed on novice performers or novel tasks. Considering novice performers are more susceptible to being influenced by vicarious experience, vicarious experience could play an important role in self-efficacy/performance relationships. A positive relationship between self-efficacy and performance could be expected should one witness an individual succeeding at a task that they are due to perform, since the individual observing will then be more inclined to believe that they too will perform well, and invest effort into their performance. However, a negative relationship may be observed when observing failure, since self-perceptions and motivation to perform a task can be undermined (Brown & Inouye, 1978).

In addition, there may be the possibility that an increase in self-efficacy from a vicarious experience source, inflates self-efficacy beyond actual capabilities and contributes to a negative relationship. Alternatively, does observing performance give an individual more information regarding the task demands, and therefore an individual can make more accurate judgments in self-efficacy and a positive relationship emerges? The role of vicarious

experience on the self-efficacy/performance relationship is certainly a potentially exciting line of research.

Generalisability: Need for longitudinal, field-based studies.

One outstanding issue surrounding much of the within-person self-efficacy and performance research, is that of generalisability. Most (if not all) of the studies cited throughout this thesis are repeated-measures, lab-based, novel tasks. Thus, a valuable addition to the research would be to conduct a within-person, longitudinal, and field based research study. Of particular interest is the applicability to a sporting context, such as the changing relationship between self-efficacy and performance for athletes who spend their week training in preparation for competition at the weekend over many weeks of the year.

Of course, the difficulty in controlling for other variables presents a particularly arduous challenge. For instance, coach behaviours, the competition environment (home vs away), and the dynamics of the team (in the case of a team sport) could all have an impact on the self-efficacy/performance relationship in such contexts. However, despite the considerable difficulty, it is paramount that this research is applied to real-life situations due to the importance of self-efficacy in the real world. Longitudinal, field based studies, perhaps of a case study nature to begin with, would provide a valuable addition to the research.

8. Concluding Thoughts

In spending almost four years researching and learning about self-efficacy, I found that at one point I was certain that reducing overconfidence and encouraging an accurate gauge of one's performance level should be of utmost importance when working as an applied practitioner. Regarding well practiced skills, I believe this remains the case, since one can only make appropriate plans to improve when one has an accurate view of one's own performance level. However, when approaching new skills, difficult tasks, or working with novice performers, I believe that we should allow the individuals room to dream. Thus, I believe a bigger picture question remains somewhat unanswered: precisely, when should we allow individuals to be overconfidence? Are there instances where we should encourage individuals to be overconfident? And when exactly should we aim to decrease it? Answers to these questions will surely enlighten many regarding managing the confidence levels or their employees, athletes, or students. Perhaps sometimes, we should be allowed to try and prove 'reality' wrong.

Because the scientist said the bumble bee couldn't fly,

She lacked the wing beats per minute or the necessary size,

But the bumble bee in her ignorance proved him wrong,

She knew that she could fly 'cos she'd flown all along.

Now imagine if she listened to the man she might have stopped

Given up on the spot, tucker her wings in and dropped,

So don't ever let someone tell you what you can't do,

Because just because it's proven, doesn't mean it's true.

<div style="text-align:right">Harry Baker (The Scientist and the Bumblebee)</div>

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A

Chapter 2: Self-efficacy measure for the self.

How confident are you that you can improve on your last score of _____ points.

	Yes/No	1-100%
I have the skills and resources to beat my last score by 1 point	_____	_____
I have the skills and resources to beat my last score by 2 points	_____	_____
I have the skills and resources to beat my last score by 3 points	_____	_____
I have the skills and resources to beat my last score by 4 points	_____	_____
I have the skills and resources to beat my last score by 5 points	_____	_____
I have the skills and resources to beat my last score by 6 points	_____	_____
I have the skills and resources to beat my last score by 7 points	_____	_____
I have the skills and resources to beat my last score by 8 points	_____	_____
I have the skills and resources to beat my last score by 9 points	_____	_____
I have the skills and resources to beat my last score by 10 points	_____	_____
I have the skills and resources to beat my last score by 11 points	_____	_____
I have the skills and resources to beat my last score by 12 points	_____	_____
I have the skills and resources to beat my last score by 13 points	_____	_____
I have the skills and resources to beat my last score by 14 points	_____	_____
I have the skills and resources to beat my last score by 15 points	_____	_____
I have the skills and resources to beat my last score by 16 points	_____	_____
I have the skills and resources to beat my last score by 17 points	_____	_____
I have the skills and resources to beat my last score by 18 points	_____	_____
I have the skills and resources to beat my last score by 19 points	_____	_____
I have the skills and resources to beat my last score by 20 points	_____	_____

I have the skills and resources to beat my last score by 21 points   _____   _____

I have the skills and resources to beat my last score by 22 points   _____   _____

I have the skills and resources to beat my last score by 23 points   _____   _____

I have the skills and resources to beat my last score by 24 points   _____   _____

I have the skills and resources to beat my last score by 25 points   _____   _____

I have the skills and resources to beat my last score by 26 points   _____   _____

I have the skills and resources to beat my last score by 27 points   _____   _____

I have the skills and resources to beat my last score by 28 points   _____   _____

I have the skills and resources to beat my last score by 29 points   _____   _____

I have the skills and resources to beat my last score by 30 points   _____   _____

B

Chapter 2: Self-efficacy measure for the peer.

How confident are you that the person you are observing can improve on their last score of

_____ points.

	Yes/No	1-100%
S/he has the skills and resources to beat their last score by 1 point	_____	_____
S/he has the skills and resources to beat their last score by 2 points	_____	_____
S/he has the skills and resources to beat their last score by 3 points	_____	_____
S/he has the skills and resources to beat their last score by 4 points	_____	_____
S/he has the skills and resources to beat their last score by 5 points	_____	_____
S/he has the skills and resources to beat their last score by 6 points	_____	_____
S/he has the skills and resources to beat their last score by 7 points	_____	_____
S/he has the skills and resources to beat their last score by 8 points	_____	_____
S/he has the skills and resources to beat their last score by 9 points	_____	_____
S/he has the skills and resources to beat their last score by 10 points	_____	_____
S/he has the skills and resources to beat their last score by 11 points	_____	_____
S/he has the skills and resources to beat their last score by 12 points	_____	_____
S/he has the skills and resources to beat their last score by 13 points	_____	_____
S/he has the skills and resources to beat their last score by 14 points	_____	_____
S/he has the skills and resources to beat their last score by 15 points	_____	_____
S/he has the skills and resources to beat their last score by 16 points	_____	_____
S/he has the skills and resources to beat their last score by 17 points	_____	_____
S/he has the skills and resources to beat their last score by 18 points	_____	_____
S/he has the skills and resources to beat their last score by 19 points	_____	_____
S/he has the skills and resources to beat their last score by 20 points	_____	_____

S/he has the skills and resources to beat their last score by 21 points   _____   _____

S/he has the skills and resources to beat their last score by 22 points   _____   _____

S/he has the skills and resources to beat their last score by 23 points   _____   _____

S/he has the skills and resources to beat their last score by 24 points   _____   _____

S/he has the skills and resources to beat their last score by 25 points   _____   _____

S/he has the skills and resources to beat their last score by 26 points   _____   _____

S/he has the skills and resources to beat their last score by 27 points   _____   _____

S/he has the skills and resources to beat their last score by 28 points   _____   _____

S/he has the skills and resources to beat their last score by 29 points   _____   _____

S/he has the skills and resources to beat their last score by 30 points   _____   _____

C

Chapter 2: Means, standard deviations, and bivariate correlations for each individual trial for the putter.

	Individual trial number							
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Previous performance (PP)	42.86 (15.52)	42.37 (15.64)	43.24 (15.93)	45.96 (14.82)	43.12 (15.97)	47.06 (14.63)	45.29 (14.44)	45.73 (17.53)
Subsequent Performance Improvement (SPI)	-.49 (13.49)	.88 (17.92)	2.71 (15.31)	-2.84 (18.36)	3.96 (14.57)	-1.79 (13.76)	.45 (18.58)	1.45 (20.01)
Subsequent Performance (SP)	42.37 (15.64)	43.24 (15.93)	45.96 (14.82)	43.12 (15.97)	47.08 (14.62)	45.29 (14.44)	45.73 (17.53)	47.18 (14.37)
Self-efficacy magnitude (SEM)	9.83 (7.46)	10.00 (7.29)	11.17 (9.00)	8.40 (7.18)	10.00 (9.88)	9.15 (9.00)	10.50 (9.70)	8.81 (7.90)
Self-efficacy strength (SES)	740.44 (646.95)	743.77 (603.80)	869.55 (802.39)	603.60 (628.04)	720.54 (823.48)	662.09 (744.56)	809.11 (873.01)	672.62 (700.88)
Bias	10.35 (14.00)	9.47 (18.38)	8.96 (14.36)	10.23 (18.21)	6.48 (14.72)	10.30 (15.28)	8.50 (18.11)	8.09 (19.62)
SEM and SPI r	$r = .22$ (.13)	$r = .17$ (.24)	$r = .37^*$	$r = .30$ (.39)	$r = .31^*$	$r = .10$ (.51)	$r = .26$ (.08)	$r = .10$ (51)
SES and SPI r	$r = .26$ (.07)	$r = .18$ (.22)	$r = .40^{**}$	$r = .24$ (.10)	$r = .36^*$	$r = .12$ (.43)	$r = .26$ (.08)	$r = .12$ (.43)
SEM and SP r	$r = .21$ (.15)	$r = .13$ (.37)	$r = .24$ (.11)	$r = .16$ (.28)	$r = .15$ (.32)	$r = -.01$ (.93)	$r = .13$ (.41)	$r = .06$ (.69)
SES and SP r	$r = .24$ (.10)	$r = .12$ (.41)	$r = .24$ (.11)	$r = .18$ (.23)	$r = .12$ (.44)	$r = -.03$ (.84)	$r = .13$ (.39)	$r = .01$ (.96)
PP and SEM r	$r = .02$ (.90)	$r = -.07$ (.66)	$r = -.12$ (.41)	$r = .02$ (.91)	$r = -.15$ (.33)	$r = -.10$ (.49)	$r = -.18$ (.23)	$r = -.23$ (.12)
PP and SES r	$r = .02$ (.92)	$r = -.09$ (.57)	$r = -.16$ (.29)	$r = -.10$ (.51)	$r = -.22$ (.14)	$r = -.14$ (.36)	$r = -.18$ (.23)	$r = -.24$ (.10)
Bias and SEM r	$r = .31^*$	$r = .22$ (.14)	$r = .25$ (.10)	$r = .27$ (.07)	$r = .37^*$	$r = .50^{**}$	$r = .28$ (.06)	$r = .50^{**}$
Bias and SES r	$r = .25$ (.08)	$r = .20$ (.17)	$r = .19$ (.21)	$r = .14$ (.35)	$r = .30^*$	$r = .47^{**}$	$r = .26$ (.08)	$r = .47^{**}$

D

Chapter 2: Means, standard deviations, and bivariate correlations for each individual trial for the observer.

	Individual trial number							
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Previous performance (PP)	43.27 (15.59)	42.31 (15.50)	42.88 (15.58)	46.15 (14.91)	44.73 (16.19)	47.71 (14.78)	46.19 (13.84)	46.33 (17.86)
Subsequent performance improvement (SPI)	-.96 (13.13)	.56 (17.31)	3.27 (14.72)	-1.42 (19.41)	2.98 (14.40)	-1.52 (13.77)	.15 (18.66)	1.29 (20.09)
Subsequent performance (SP)	42.31 (15.50)	42.88 (15.58)	46.15 (14.91)	44.73 (16.19)	47.71 (14.78)	46.19 (13.84)	46.33 (17.86)	47.63 (14.22)
Peer evaluation magnitude (PEM)	10.54 (7.97)	10.15 (7.25)	9.10 (7.84)	7.04 (5.90)	9.21 (8.28)	8.29 (6.71)	9.08 (8.20)	8.71 (6.83)
Peer evaluation strength (PES)	766.13 (546.31)	706.13 (520.02)	662.40 (666.14)	466.00 (412.21)	649.02 (654.72)	575.58 (568.85)	612.98 (633.14)	564.60 (530.59)
Bias	11.5 (14.04)	9.73 (17.97)	6.27 (15.21)	7.92 (18.01)	5.94 (13.17)	10.23 (14.52)	8.94 (16.69)	7.00 (19.70)
PEM and SPI *r*	*r* = .19 (.21)	*r* = .09 (.54)	*r* = .33*	*r* = .37*	*r* = .47**	*r* = .20 (.18)	*r* = .45**	*r* = .31*
PES and SPI *r*	*r* = .22 (.13)	*r* = .12 (.41)	*r* = .39*	*r* = .30*	*r* = .51**	*r* = .22 (.13)	*r* = .41**	*r* =.39**
PEM and SP *r*	*r* = .02 (.92)	*r* = .004 (.98)	*r* = .07 (.65)	*r* = .16 (.28)	*r* = .22 (.14)	*r* = -.04 (.78)	*r* = .31*	*r* = .04 (.78)
PES and SP *r*	*r* = .03 (.86)	*r* = -.02 (.87)	*r* = .07 (.65)	*r* = .06 (.68)	*r* = .14 (.35)	*r* = -.08 (.61)	*r* = .24 (.10)	*r* = .03 (.83)
PP and PPM *r*	*r* = -.14 (.34)	*r* = -.10 (.52)	*r* = -.25 (.09)	*r* = -.30*	*r* = -.22 (.13)	*r* = -.22 (.13)	*r* = -.20 (.17)	*r* = -.32*
PP and PPS *r*	*r* = -.16 (.27)	*r* = -.16 (.28)	*r* = -.30*	*r* = -.32*	*r* = -.33*	*r* = -.23 (.06)	*r* = -.24 (.11)	*r* = -.41*
Bias and PPM *r*	*r* = .39**	*r* = .31*	*r* = .17 (.24)	*r* = -.08 (.58)	*r* = .09 (.53)	*r* = .31*	*r* = -.10 (.95)	*r* = .03 (.87)
Bias and PPS *r*	*r* = .33*	*r* = .26 (.08)	*r* = .10 (.51)	*r* = -.03 (.82)	*r* = .02 (.92)	*r* = .94**	*r* = .00 (.99)	*r* = -.09 (.54)

E

Chapter 3: Car circuit used for driving simulator task.

F

Chapter 3: Self-efficacy measure.

We would like to know how confident you are you can improve from your

baseline score of _____

1) Yes / No: Please state if you believe you can achieve this level.
2) Confidence %: Please rate your degree of confidence in being able to attain this level.

	Yes/No	1-100%
I have the skills and resources to beat my baseline performance by 1s	_____	_____
I have the skills and resources to beat my baseline performance by 2s	_____	_____
I have the skills and resources to beat my baseline performance by 3s	_____	_____
I have the skills and resources to beat my baseline performance by 4s	_____	_____
I have the skills and resources to beat my baseline performance by 5s	_____	_____
I have the skills and resources to beat my baseline performance by 6s	_____	_____
I have the skills and resources to beat my baseline performance by 7s	_____	_____
I have the skills and resources to beat my baseline performance by 8s	_____	_____
I have the skills and resources to beat my baseline performance by 9s	_____	_____
I have the skills and resources to beat my baseline performance by 10s	_____	_____
I have the skills and resources to beat my baseline performance by 11s	_____	_____
I have the skills and resources to beat my baseline performance by 12s	_____	_____
I have the skills and resources to beat my baseline performance by 13s	_____	_____
I have the skills and resources to beat my baseline performance by 14s	_____	_____
I have the skills and resources to beat my baseline performance by 15s	_____	_____
I have the skills and resources to beat my baseline performance by 16s	_____	_____
I have the skills and resources to beat my baseline performance by 17s	_____	_____
I have the skills and resources to beat my baseline performance by 18s	_____	_____
I have the skills and resources to beat my baseline performance by 19s	_____	_____

I have the skills and resources to beat my baseline performance by 20s   _____   _____

G

Chapter 3: Rating Scale of Mental Effort (Zijlstra, 1993).

Rating Scale Mental Effort

Please indicate, by marking the vertical axis below, how
much effort it took for you to complete the task you've just finished

```
150 ┬
    │
140 ┼ ─
    │
130 ┼ ─
    │
120 ┼ ─
    │                    EXTREME EFFORT
110 ┼ ─────────
    │                    VERY GREAT EFFORT
100 ┼ ─────────
    │
 90 ┼ ─
    │                    GREAT EFFORT
    ┼ ─────────
 80 ┼ ─
    │                    CONSIDERABLE EFFORT
 70 ┼ ─────────
    │
 60 ┼ ─
    │                    RATHER MUCH EFFORT
    ┼ ─────────
 50 ┼ ─
    │
 40 ┼ ─
    │                    SOME EFFORT
    ┼ ─────────
 30 ┼ ─
    │                    A LITTLE EFFORT
    ┼ ─────────
 20 ┼ ─
    │                    ALMOST NO EFFORT
 10 ┼ ─────────
    │
    ┼ ─
  0 ┼ ─────────          ABSOLUTELY NO EFFORT
```

157
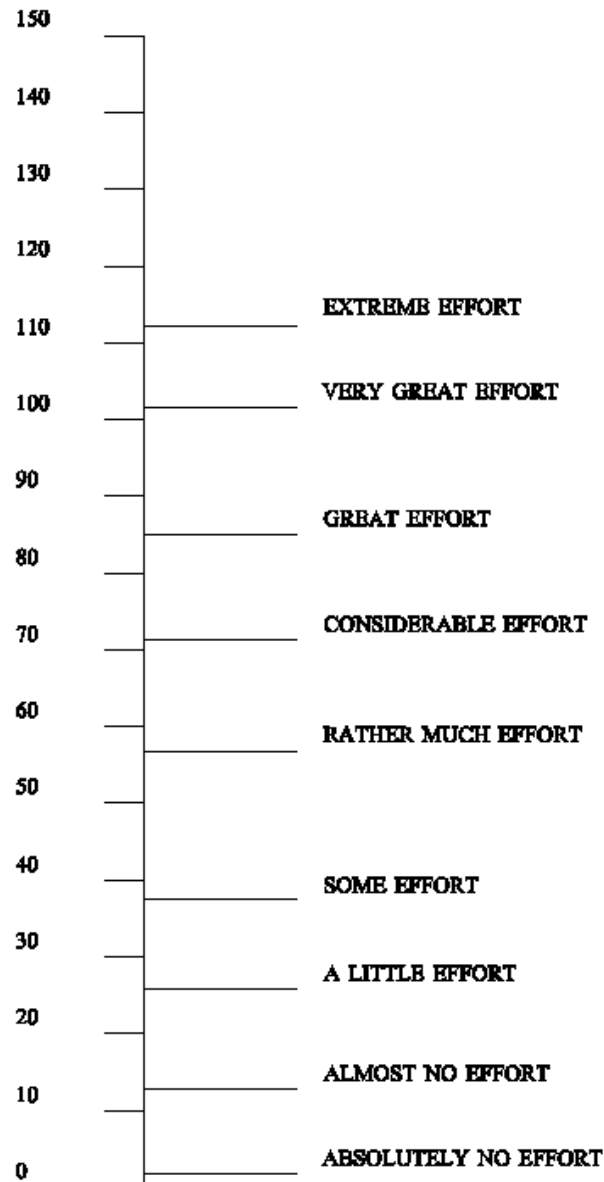
H

Chapter 3: NPI-16 (Ames et al., 2006).

Read each pair of statements below and place an "X" by the one that comes closest to describing your feelings and beliefs about yourself. You may feel that neither statement describes you well, but pick the one that comes closest. **Please complete all pairs**.

1. ___ I really like to be the center of attention

   ___ It makes me uncomfortable to be the center of attention

2. ___ I am no better or no worse than most people

   ___ I think I am a special person

3. ___ Everybody likes to hear my stories

   ___ Sometimes I tell good stories

4. ___ I usually get the respect that I deserve

   ___ I insist upon getting the respect that is due me

5. ___ I don't mind following orders

   ___ I like having authority over people

6. ___ I am going to be a great person

   ___ I hope I am going to be successful

7. ___ People sometimes believe what I tell them

   ___ I can make anybody believe anything I want them to

8. ___ I expect a great deal from other people

   ___ I like to do things for other people

9. ___ I like to be the center of attention

___ I prefer to blend in with the crowd

10. ___ I am much like everybody else

___ I am an extraordinary person

11. ___ I always know what I am doing

___ Sometimes I am not sure of what I am doing

12. ___ I don't like it when I find myself manipulating people

___ I find it easy to manipulate people

13. ___ Being an authority doesn't mean that much to me

___ People always seem to recognize my authority

14. ___ I know that I am good because everybody keeps telling me so

___ When people compliment me I sometimes get embarrassed

15. ___ I try not to be a show off

___ I am apt to show off if I get the chance

16. ___ I am more capable than other people

___ There is a lot that I can learn from other people

I

Chapter 4: Self-efficacy measure.

Basketball Free Throws

We would like to know how confident you are, that you can complete 10 successful free throw shots.

Please rate your degree of confidence for each level of performance:

	Yes/No	0-100%
I have the skills and resources to make 10 shots in 10 attempts	_____	_____
I have the skills and resources to make 10 shots in 11 attempts	_____	_____
I have the skills and resources to make 10 shots in 12 attempts	_____	_____
I have the skills and resources to make 10 shots in 13 attempts	_____	_____
I have the skills and resources to make 10 shots in 14 attempts	_____	_____
I have the skills and resources to make 10 shots in 15 attempts	_____	_____
I have the skills and resources to make 10 shots in 16 attempts	_____	_____
I have the skills and resources to make 10 shots in 17 attempts	_____	_____
I have the skills and resources to make 10 shots in 18 attempts	_____	_____
I have the skills and resources to make 10 shots in 19 attempts	_____	_____
I have the skills and resources to make 10 shots in 20 attempts	_____	_____
I have the skills and resources to make 10 shots in 21 attempts	_____	_____
I have the skills and resources to make 10 shots in 22 attempts	_____	_____
I have the skills and resources to make 10 shots in 23 attempts	_____	_____
I have the skills and resources to make 10 shots in 24 attempts	_____	_____
I have the skills and resources to make 10 shots in 25 attempts	_____	_____
I have the skills and resources to make 10 shots in 26 attempts	_____	_____
I have the skills and resources to make 10 shots in 27 attempts	_____	_____
I have the skills and resources to make 10 shots in 28 attempts	_____	_____
I have the skills and resources to make 10 shots in 29 attempts	_____	_____
I have the skills and resources to make 10 shots in 30 attempts	_____	_____
I have the skills and resources to make 10 shots in 31 attempts	_____	_____

I have the skills and resources to make 10 shots in 32 attempts _____   _____

I have the skills and resources to make 10 shots in 33 attempts _____   _____

I have the skills and resources to make 10 shots in 34 attempts _____   _____

I have the skills and resources to make 10 shots in 35 attempts _____   _____

I have the skills and resources to make 10 shots in 36 attempts _____   _____

I have the skills and resources to make 10 shots in 37 attempts _____   _____

I have the skills and resources to make 10 shots in 38 attempts _____   _____

I have the skills and resources to make 10 shots in 39 attempts _____   _____

I have the skills and resources to make 10 shots in 40 attempts _____   _____

I have the skills and resources to make 10 shots in 41 attempts _____   _____

I have the skills and resources to make 10 shots in 42 attempts _____   _____

I have the skills and resources to make 10 shots in 43 attempts _____   _____

I have the skills and resources to make 10 shots in 44 attempts _____   _____

I have the skills and resources to make 10 shots in 45 attempts _____   _____

I have the skills and resources to make 10 shots in 46 attempts _____   _____

I have the skills and resources to make 10 shots in 47 attempts _____   _____

I have the skills and resources to make 10 shots in 48 attempts _____   _____

I have the skills and resources to make 10 shots in 49 attempts _____   _____

I have the skills and resources to make 10 shots in 50 attempts _____   _____

I have the skills and resources to make 10 shots in 51 attempts _____   _____

I have the skills and resources to make 10 shots in 52 attempts _____   _____

I have the skills and resources to make 10 shots in 53 attempts _____   _____

I have the skills and resources to make 10 shots in 54 attempts _____   _____

I have the skills and resources to make 10 shots in 55 attempts _____   _____

I have the skills and resources to make 10 shots in 56 attempts _____   _____

I have the skills and resources to make 10 shots in 57 attempts _____   _____

I have the skills and resources to make 10 shots in 58 attempts _____   _____

I have the skills and resources to make 10 shots in 59 attempts   _____   _____

I have the skills and resources to make 10 shots in 60 attempts   _____   _____

I have the skills and resources to make 10 shots in 61 attempts   _____   _____

I have the skills and resources to make 10 shots in 62 attempts   _____   _____

I have the skills and resources to make 10 shots in 63 attempts   _____   _____

I have the skills and resources to make 10 shots in 64 attempts   _____   _____

I have the skills and resources to make 10 shots in 65 attempts   _____   _____

I have the skills and resources to make 10 shots in 66 attempts   _____   _____

I have the skills and resources to make 10 shots in 67 attempts   _____   _____

I have the skills and resources to make 10 shots in 68 attempts   _____   _____

I have the skills and resources to make 10 shots in 69 attempts   _____   _____

I have the skills and resources to make 10 shots in 70 attempts   _____   _____

I have the skills and resources to make 10 shots in 71 attempts   _____   _____

I have the skills and resources to make 10 shots in 72 attempts   _____   _____

I have the skills and resources to make 10 shots in 73 attempts   _____   _____

I have the skills and resources to make 10 shots in 74 attempts   _____   _____

I have the skills and resources to make 10 shots in 75 attempts   _____   _____

I have the skills and resources to make 10 shots in 76 attempts   _____   _____

I have the skills and resources to make 10 shots in 77 attempts   _____   _____

I have the skills and resources to make 10 shots in 78 attempts   _____   _____

I have the skills and resources to make 10 shots in 79 attempts   _____   _____

I have the skills and resources to make 10 shots in 80 attempts   _____   _____

I have the skills and resources to make 10 shots in 81 attempts   _____   _____

I have the skills and resources to make 10 shots in 82 attempts   _____   _____

I have the skills and resources to make 10 shots in 83 attempts   _____   _____

I have the skills and resources to make 10 shots in 84 attempts   _____   _____

I have the skills and resources to make 10 shots in 85 attempts   _____   _____

I have the skills and resources to make 10 shots in 86 attempts _____   _____

I have the skills and resources to make 10 shots in 87 attempts _____   _____

I have the skills and resources to make 10 shots in 88 attempts _____   _____

I have the skills and resources to make 10 shots in 89 attempts _____   _____

I have the skills and resources to make 10 shots in 90 attempts _____   _____

I have the skills and resources to make 10 shots in 91 attempts _____   _____

I have the skills and resources to make 10 shots in 92 attempts _____   _____

I have the skills and resources to make 10 shots in 93 attempts _____   _____

I have the skills and resources to make 10 shots in 94 attempts _____   _____

I have the skills and resources to make 10 shots in 95 attempts _____   _____

I have the skills and resources to make 10 shots in 96 attempts _____   _____

I have the skills and resources to make 10 shots in 97 attempts _____   _____

I have the skills and resources to make 10 shots in 98 attempts _____   _____

I have the skills and resources to make 10 shots in 99 attempts _____   _____

I have the skills and resources to make 10 shots in 100 attempts _____   _____