How Motivational States are Embodied in a Golf Putting Task

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Gregory Holt

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Abstract

Performing with a desirable motivational state can be the difference between winning or losing a tight sporting event. Research in sports psychology has previously outlined the benefits of performing with approach motivation, along with the negative impacts of operating with avoidance motivation. Recent research has also considered relationships between motivational states and asked how athlete behaviours embody approach or avoidance motivation. However, there is a shortage of research that identifies signs that an athlete is operating in a state of approach or avoidance motivation. The aim of this thesis is to reduce the gap in the existing literature by using a behavioural perspective to identify how motivational states are embodied by experienced golfers in a golf putting task. Two studies were conducted, using a situational and instructional intervention to induce either approach or avoidance motivation in participants. In Study 1, a between subjects design was used to assess how approach and avoidance motivational states were embodied. The results of Study 1 revealed that participants in the avoidance group leaned further backwards following the situational intervention designed to induce avoidance motivation. However, no effect was found for the intervention that was designed to induce approach motivation. Participants in the avoidance group showed better performance and longer preparation time than participants in the approach condition. These findings were driven by differences in the level of expertise between the two groups. Study 2 was therefore designed to rectify this problem by increasing the difficulty of the putting task. However, as a consequence of the COVID-19 crisis it was not possible to complete the study. Body postures, such as forward and backward leaning may be influenced by motivational states, but further research is required to gain a better understanding of how motivational states are embodied. Despite a failure to find

support for forms of embodiment beyond leaning, future research should not discount the merit of other potential avenues such as preparation time and proximity.

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Chapter 1

Introduction

After three rounds of golf in the 1978 Masters, with just 18 holes to play, Gary Player finds himself 7 shots behind the leader, Hubert Green. Liverpool goes into the halftime break losing to AC Milan 3-0 in the 2005 UEFA Champions League final. The New England Patriots find themselves 28-3 down midway through the 2017 Super Bowl. Not one of these individuals or teams was expected to end the day as champion, but each did.

Sports enthusiasts know that these great comebacks are an exception to the rule, and it goes without saying that coaches across all codes would prefer winning at half time over losing. However, research over the past 50 years supports the idea that sportspeople often play better when they are slightly behind, and that a slight lead on the scoreboard can in fact negatively impact a player's performance on the field (Roskes, Elliot, Nijstad, & De Dreu, 2013). Berger and Pope (2011) analysed more than 18,000 professional basketball matches from the NBA and found that teams losing by one point at half time had a higher winning percentage than teams either tied or winning by one point. In a similar statistical analysis, Marsh (2017) compared the success of sides batting first with those batting second in 1,664 day ODI (One Day International) cricket matches between 2000 and 2015. Marsh (2017) found that teams that batted second (i.e., chasing a total number of runs) were 12% more likely to win than teams that batted first (i.e., trying to stop the opposition from reaching the total number of runs). It is improbable that batsmen are genetically predisposed to handle pressure better than bowlers, so it is likely that an observable, measurable mechanism favoured the team batting second, allowing them to win more often than would be expected by chance.

This thesis uses a behavioural 'looking glass' to examine approach and avoidance mechanisms that may be in play when these phenomena are observed. Approach motivation is characterised by the urge to move forward and strive for success, whereas avoidance motivation is characterised by the desire to move away and avoid failure (Price & Harmon-Jones, 2016; Roskes et al., 2013). The effect of these motivational states on performance has been thoroughly researched, but there is still uncertainty around how they are embodied during a sporting performance.

1.1. Approach Motivation

Approach motivation is a goal orientated movement in a forward direction, pursuing the attainment of a reward or reinforcer (Harmon-Jones, Price, & Harmon-Jones, 2014; Kelley, Hortensius, Schutter, & Harmon-Jones, 2017; Price & Harmon-Jones, 2016). Outcomes associated with approach motivation include improved processing abilities, greater positive perceptions of a task, and the promotion of reward maximising decision making (Harlé & Sanfey, 2015; Kuhl & Koole, 2008; Roskes et al., 2013). Price and Harmon-Jones (2016) argued that approach urges are "a fundamental ability of all organisms capable of movement" (p. 83).

In humans, it is suggested that approach motivation aligns closely with the evolutionary fight response mechanism (Kelley et al., 2017; Kuhl & Koole, 2008). When operating with approach motivation, the survivalist concept of fight is directed towards winning, which can be accomplished by thwarting an opponent and gaining reinforcement for engaging in certain successful behaviours (Kelley et al., 2017). Approach motivation in many sporting contexts is crucial to success, as the biological mechanisms that underlie a fight response (e.g., priming the body for action), along with psychological components of mental preparedness and positive affect, work together to help the athlete perform at a high level (Kelley et al., 2017; Mishra &

Suar, 2011; Spierer, Griffiths, & Sterland, 2009).

Despite the well documented benefits of operating in a state of approach motivation in sport, this motivational state is not something an athlete can switch on and off. A recognised antecedent considered likely to evoke approach motivation occurs when individuals or teams find themselves slightly behind a competitor (e.g., score/distance) (Berger & Pope, 2011; Roskes et al., 2013). For instance, the members of a hockey team one goal behind late in an important match are likely to experience approach motivation. From a behavioural perspective, scoring a goal becomes more reinforcing for members of this team as a result of the game context (Poling, Lotfizadeh & Edwards, 2017). This is likely to culminate in an observable improvement in performance. Thorndike's (1927) law of effect proposes that the reinforcing outcome of scoring a goal that wins the game makes it more likely that members of the team will engage in the same level of performance in future matches where their goal is to win.

Operating with an approach motivational state provides a goal-oriented direction forward, which is likely to result in more successful outcomes that are interpreted as comparatively higher levels of performance (Forgas & Harmon-Jones, 2014). Harmon-Jones, Harmon-Jones, and Price (2013) posited that both internal processes, such as traits and moods, and external stimuli, can induce approach motivation. As this thesis chooses to take a behavioural view, subsequent analysis will be tasked with having a primary focus on observable, measurable and objective behaviours (Watson, 1913).

1.2. Avoidance motivation

Avoidance motivation is a physiological or psychological energisation away from a perceived negative stimuli (Forgas & Harmon-Jones, 2014; Harmon-Jones et al., 2014; Kelley et al., 2017; Price & Harmon-Jones, 2016). Where there is a winner in sport, there is also a loser. If one team

has taken the lead, the other team has lost the lead. In most cases, athletes prefer to avoid experiencing this motivational state, which typically is associated with higher levels of cognitive processing to promote increased vigilance and a more systematic method of interpreting information (Roskes et al., 2013). While increased vigilance can be useful in tasks that require precision and attention to detail, the reality for athletes in a sporting context is that the nature of avoiding a negative consequence rather than attaining a positive reward has a detrimental impact on performance **(**Forgas & Harmon-Jones, 2014; Kuhl & Koole, 2008; Roskes et al., 2013).

In humans, it is suggested that avoidance motivation aligns closely with the flight response (Kelley et al., 2017; Kuhl & Koole, 2008). When operating with avoidance motivation, the survivalist concept of flight commonly manifests in the form of anxiety and highly controlled top-down processing that taxes cognitive resources more than a neutral or approach state (Roskes et al., 2013). A cricket player operating in a state of avoidance motivation may perform worse than when in a state of approach motivation. The behaviours that the cricket player is likely to strive for include not missing the ball, not hitting it to the fielders, and avoiding the bowler getting him out. Interpreting situations in this way has been shown to lead to poorer performance by athletes due to an increase in self-focused attention (Panayiotou & Vrana, 2004).

A connection between self-focused attention and poor performance has been a prominent topic in sport psychology for more than a decade. Masters (1992) and Masters, Polman, and Hammond (1993) began this discussion by suggesting that motor performance supported by predominantly explicit knowledge is more likely to fail in stressful situations than motor performance supported by predominantly implicit knowledge. Conscious processing of movements by an athlete, as a result of anxiety, can easily disrupt automated motor output when movements are supported by predominantly explicit knowledge compared to implicit knowledge

(see Masters & Maxwell, 2008, for a review). Conscious processing experienced by the athlete may be associated with avoidance motivation, but this does not explain its onset.

A recognised antecedent considered likely to evoke avoidance motivation is present when individuals or teams find themselves slightly ahead of a competitor (Berger & Pope, 2011; Roskes et al., 2013). If the goal of winning changes and becomes a goal of avoiding losing, performance may decline as motivation becomes avoidance oriented. From a behavioural perspective, scoring a goal in hockey that extends a team's lead will be inherently less reinforcing to players than scoring a goal to take the lead (Poling et al., 2017). This is likely to be observable in teams that take an early lead before allowing their opposition back into the game by underperforming.

Applying Thorndike's (1927) law of effect to the experience of avoidance motivation would interpret the outcome of successfully avoiding an event as being reinforcing in nature, and therefore avoidance behaviours are more likely to occur in the future. This may explain why the long term effects of avoidance motivation are more visible than the negative short term effects (Roskes et al., 2013). In the short-term, an athlete's goal of avoiding losing may prove to be effective, but operating with avoidance motivation over a longer period of time is likely to lower intrinsic motivation, have negative impacts on well-being, and deplete cognitive resources available for other tasks (De Lange, Van Yperen, Van der Heijden, & Bal, 2010; Elliot & McGregor, 1999; Elliot & Sheldon, 1997; Oertig et al., 2013; Van Dijk, Seger, & Heller, 2013).

Additional impacts of operating in a state of avoidance motivation in sport are that the individual is more likely to make negative appraisals of a situation, display a lack of goal-oriented direction, and experience increases in negative affect both inside and outside the game (Forgas & Harmon-Jones, 2014; Harmon-Jones et al., 2014; Kuhl & Koole, 2008; Price &

Harmon-Jones, 2016). The impacts that avoidance motivation can have on the athlete outside sport adds to the list of reasons that these ideas are an important topic of conversation, and a better understanding of how they are embodied could be useful for athletes and coaches across a range of codes.

1.3. Embodiment of emotion

A review of how the literature on approach and avoidance motivation has been developed begins with the early work on the embodiment of emotion. Psychology considers embodiment to be the ways in which the human body uses its senses to aid, enhance or interfere with behavioural operations (Farr, Price, & Jewitt, 2012). Buddhist monk Thích Nhât Hanh (as cited in Coles, Larsen, & Lench, 2019, p. 610) is known to have said "sometimes your joy is the source of your smile, but sometimes your smile can be the source of your joy." This is consistent with the facial feedback hypotheses, which suggests that facial expressions provide sensorimotor feedback about current emotional sensations that a person experiences and can prime responses to, or provide cues about, ongoing emotional states (Allport, 1922, 1924; Berkowitz, 1990; Bower, 1981; Ekman, 1979; Izard, 1971; Laird & Bresler, 1992; Laird & Crosby, 1974; Tomkins, 1962, 1981, as cited in Coles et al., 2019).

Early studies on the embodiment of emotions considered how facial expressions can influence a person's attitudes and perceptions. Strack, Martin, and Stepper (1988) conducted a two-part study involving 45 male and 38 female participants, in which they examined how facilitating and inhibiting the anatomy of the smile influenced perceptions of a humorous cartoon. One group of participants held a pen in their mouth using their teeth while they evaluated cartoons, whereas a second group held a pen in their mouth using their lips. The former manipulation was designed to activate facial muscles associated with smiling, whereas

the latter activated facial muscles that were not associated with smiling. Participants in a control condition simply held the pen with their non-dominant hand. The dependent variable in this task was a 10-point funniness scale, requiring participants to rate each cartoon on a scale (range 0-9). Strack et al. (1988) found the highest ratings (M=5.14) in the group instructed to hold the pen in their mouth using their teeth, and the lowest ratings (M=4.32) in the group instructed to hold the pen in their mouth using their lips. These results provided further support for the facial feedback hypothesis, with evidence pointing to the manipulation of facial expressions having the potential to both positively and negatively influence a person's affective experiences (Strack et al., 1988).

A second study of interest conducted one year later by Zajonc, Murphy, and Inglehart (1989) examined the link between facial efference and subjective experiences of emotion. When participants read a story that contained frequent pronunciation of the German vowel *ü,* Zajonc et al. (1989) observed a rise in blood pressure that was not observed in the control group who read a story that did not include the use of this vowel. The rationale behind the use of the German vowel *ü* was that it induces furrowing of the brow. This facial expression not only restricts air intake through the nasal cavity, but also results in an increase in blood pressure, which has been linked with the emotional expression of anger (Ax, 1953). At the emotional experience level, Zajonc et al. (1989) found that 78% of participants liked the no-*ü* story more and 81% of participants reported the no-*ü* story to be more pleasant. The explanation proposed by Zajonc et al. (1989) that a link exists between the restriction of air intake and an increase in blood pressure associated with the likeableness of the stories is supported by the fact that a significant correlation existed between the two variables. Zajonc et al. (1989) suggested that it is these physiological changes that account for the feelings of negative affect that participants in the study experienced after regularly pronouncing the German vowel *ü*.

While the physiological explanation of correlations between facial efference and attitudes towards stimuli fits the experiment conducted by Zajonc and colleagues (1989), a behavioural explanation of priming could be used to improve understanding of the mechanisms behind this connection. Behavioural psychology considers priming an antecedent stimulus that prompts a behavioural response, often signaling the availability of a conditioned reinforcer (Billingsley & Romer, 1983). Used to increase the likelihood of a behavioural response, priming is commonly applied in skill acquisition through verbal, visual or physical assistance (Billingsley & Romer, 1983). Due to the potential link between facial expressions and positive affect, it could be hypothesised that smiling may prime the feeling of happiness. Paul, Pope, Fennell, and Mendl (2012) explored this idea in a study involving the brief presentation of images depicting either smiling, neutral or angry faces prior to asking the participants (n=67) to rate the likeableness of Chinese characters. Paul et al. (2012) found that participants generated more positive appraisals of Chinese characters that were preceded by the smiling faces than the neutral or angry ones.

The research conducted across these three studies suggests that an athlete embodying particular emotions may make positive evaluations of a situation, consistent with a state of approach motivation. However, emotional responses can be difficult to measure without reliance on self-reporting methods. Due to questions in psychology around the validity and scientific rigour of self-reporting measures (Haeffel & Howard, 2010), the manipulation of approach and avoidance motivation shifted in favour of specific body movements.

1.4. Specific Body Movements

While specific body movements could be considered an extension of the priming mechanism discussed previously, the theory behind their potential effectiveness is through establishing approach or avoidance motivation in the form of an almost habitually learned conditioned

stimulus and conditioned response pairing. This idea was explored in the early work of Cacioppo, Priester, and Berntson (1993) who looked at the effects arm flexion and arm extension have on attitudes. Cacioppo et al. (1993) proposed that arm extension is unconditionally coupled with onset of the pain-flexor reflex, whereas flexion leads to the offset. Using the example of someone touching a hot surface, arm extension would lead to the positively punishing feeling of pain from the hot surface. Flexion of the arm to get away from a hot surface acts as a negative reinforcer through the removal of the aversive condition. It is also suggested that the act of arm flexion is more closely associated with receiving reinforcement than arm extension is, fostering a potential association between approach motivation and arm flexion that is worth further evaluation.

The research of Cacioppo et al. (1993) involved a series of six experiments, testing the relationship between arm flexion and extension with approach and avoidance motivation. Findings from this study discovered a small but significant effect in that attitudes formed about Chinese ideographs were more positively evaluated in the arm flexion condition, and more negatively evaluated in the arm extension condition (Cacioppo et al., 1993). Collecting additional information from participants about the tasks revealed no significant preference for either arm movement, but also that neither condition led to an increase in positive or negative affect. It seems that arm extension or flexion alone is insufficient as an intervention without specifically pairing this response with an already evaluable antecedent (Cacioppo et al., 1993). Cacioppo and colleagues (1993) acknowledge that arm movement alone does not serve to predispose particular attitudes, but encouraged future research into the attitudinal effects that motor processing can have on motivational operations.

The work of Cacioppo et al. (1993) was built upon by the research of Centerbar and

Clore (2005) who argued that the pairings alone of Chinese ideologies and arm movement (by flexion or extension) were insufficient in establishing attitudes towards the stimuli. Centerbar and Clore (2005) instead hypothesised that for an attitude to be influenced by the aforementioned arm flexion or extension, an evaluation of the stimuli must already have been established. Findings from 130 participants across three experimental procedures provided support for this hypothesis, with arm flexion (approach motivation) leading to previously rated Chinese ideologies being evaluated as more pleasant, and arm extension (avoidance motivation) leading to a decrease in the rating of pleasantness (Centerbar & Clore, 2005). Effectively, motor processes such as arm flexion or extension neither establish nor change a person's attitude or perception of a stimuli, but merely act to emphasise or minimise the current one. This modifies the findings of Cacioppo et al. (1993) who had previously suggested that a neutral stimulus or state could be influenced by these particular motor processes (Centerbar & Clore, 2005).

Another study in the field of specific body movements that impact approach and avoidance motivation comes from a paper by Eder and Rothermund (2008). This study further evaluated specific body movements that match approach and avoidance behaviour, using the process of pulling and pushing a lever in response to evaluation of a word (Eder & Rothermund, 2008). Playing on the ideas of Cacioppo et al. (1993) that lever pulling would be associated with approach motivation, and lever pushing would be associated with avoidance motivation, Eder and Rothermund (2008) hypothesised that lever pulling would occur more naturally in response to positively evaluated words, and lever pushing would occur more naturally in response to negatively evaluated words. Half the participants were instructed to pull the lever toward them in response to evaluating a word positively and push the lever away from them in response to evaluating a word negatively, while the other half received the reverse valence movement as

their instructions. Eder and Rothermund (2008) found a significant effect in which reaction time of the lever pulling or pushing was faster in participants that were responding congruently by matching positive word evaluations with a lever pull, and negative word evaluations with a lever push. These findings provide an important direction for later work on approach and avoidance motivation, and feature as an important rationale for future research on the embodiment of approach and avoidance motivation.

1.5. Unilateral body movements

Moving forward to the popularisation of how unilateral body movements can induce approach or avoidant motivational states, the context of these theories in a sporting application requires some additional background information. Work by Masters and Maxwell (2008) and Panayiotou and Vrana (2004) outlines the negative impacts self-evaluation can have on the performance of a task. Panayiotou and Vrana (2004) provide support for the idea that the brain's processing capacity is limited, and that self-evaluation therefore uses valuable resources that would otherwise be allocated to task-oriented performance. This is particularly evident in people prone to experiencing anxiety, suggesting that a history of anxious behaviour is likely to lead to the consumption of a larger allocation of self-evaluative resources, leaving less to be dedicated to the performance task (Panayiotou & Vrana, 2004).

Masters and Maxwell's (2008) reinvestment theory builds on this idea, suggesting that conscious control, which can occur when a performer focuses attention internally in order to oversee their movements, generates self-evaluation and results in poorer performance of the task. This is suggested to occur following an individual's judgement that the current standard of performance is below the standard expected of themselves. The individual will respond by becoming more self-evaluative and readjusting the expectation until the level of performance

matches the goal that has been set (Carver & Scheier, 1978; Duval & Wicklund, 1972; Panayiotou & Vrana, 2004). If reinvestment theory holds true, the performer will respond by attempting to consciously control behaviour through declarative knowledge during this self-evaluative process (Masters & Maxwell, 2008). Declarative knowledge requires a greater allocation of resources than procedural knowledge, resulting in a negative impact on performance (Masters & Maxwell, 2008).

The relationship between unilateral movement and motivational states begins with the well documented fact that the left hemisphere of the brain controls the right side of the body, and the right hemisphere controls the left side (Harmon-Jones, 2006; Schiff, Guirguis, Kenwood, & Herman, 1998; Stanković & Nešić, 2018). Schiff et al. (1998) showed that participants attempting to solve very difficult puzzles exhibited greater persistence when contracting muscles in their right hand compared to their left, due to an association between the left hemisphere and approach motivation. Schiff et al. (1998) suggested that right handed muscle contractions activated the left frontal cortex of the brain, inducing an approach state. Furthermore, Schiff et al. (1998) proposed that right handed contractions that activate the left hemisphere induce positive states consistent with positive affect, while left handed contractions that activate the right hemisphere induce negative states consistent with negative affect.

Harmon-Jones' (2006) research provided neural evidence in support of hemispheric activation via contralateral hand contractions using electroencephalography (EEG). Modelled on the hand contraction method used in the Schiff et al. (1998) experiment, the EEG results showed that left handed squeezing increased activity in the right frontal cortex, and right handed squeezing increased activity in the left frontal cortex (Harmon-Jones, 2006). Self-report measures in Harmon-Jones' (2006) research also suggested that participants activating their left

frontal cortex found themselves in an approach state while participants activating their right frontal cortex did not.

Peterson, Shackman, and Harmon-Jones (2007) built upon this work by providing further evidence of the link between hemispheric activation and contralateral hand contraction. Testing the reaction of participants (n=43) who received insulting feedback, Peterson et al. (2007) found that the group activating their left frontal cortices were more likely to respond with aggression when given the opportunity, compared to participants activating their right frontal cortices. These findings point towards a connection between the left hemisphere and approach motivation, as aggressive behaviour is consistent with expression of a fight response, as opposed to a flight response, when encountering an antecedent which presents a potential conflict. The relationship between the fight response and approach motivation (Kelley et al., 2017; Kuhl & Koole, 2008) suggests that right handed squeezing, and by extension activation of the left frontal cortex, can induce an approach oriented motivational behavioural output (Peterson et al., 2007).

While touching on the link between the fight response and the embodiment of approach motivation, it is important to also acknowledge that a review of the literature by Carver and Harmon-Jones (2009) outlines a potentially negative outcome of operating under approach conditions. Definitions of anger imply that it is commonly experienced when an individual's goal or approach is disrupted or thwarted (Carver & Harmon-Jones, 2009). As alluded to in the work of Peterson et al. (2007), inducing approach motivation by activating the left hemisphere can result in a more pronounced aggressive response to negative feedback. While this may be considered a beneficial emotional state to some sportspeople, other codes which may require a more controlled heightened awareness may find this has a negative impact on performance. This idea highlights the importance for sports psychologists to take into consideration the individual

requirements of a sporting context relative to an intervention's aim.

Further support for the use of unilateral body movements was provided when Harlé and Sanfey (2015) examined the role of hand contractions in decision making. Participants (n=75) were allocated to either a left handed contractions, a right handed contractions, or a control group and participated in two games involving economic decision making, with the goal of making as much money as they could by accepting or rejecting offers. Findings showed that participants engaging in right handed contractions were more successful on these tasks, suggesting that left hemispheric activation "promotes reward-maximizing strategies, consistent with an approach motivation, and relative right frontal activation may decrease such strategic tendencies" (Harlé & Sanfey, 2015, p. 76). The idea that approach motivation can improve decision making and maximise reward acquisition strengthens the value its embodiment can have for sportspeople.

In regard to the activation of avoidance motivation using unilateral body movements, Mungee et al. (2014) provided evidence that activation of the right hemisphere induced a greater fear response than activation of the left hemisphere. Using a skin conductance response measure, Mungee et al. (2014) showed that activation of the right prefrontal cortex can increase fear consolidation. These findings point towards a connection between the right hemisphere and avoidance motivation, because fear conditioning is consistent with an expression of the flight response, as opposed to the fight response, when encountering an antecedent which is interpreted as the source of potential danger.

Despite a number of studies providing support for the connection between unilateral body movement and motivational states, a recent paper by Kelley et al. (2017) reviewing studies that manipulate approach and avoidance motivation through unilateral body movements, raises a

number of questions about the reliability of the existing research. Kelley et al. (2017) argued that functional MRI studies provide a lack of support for a relationship between unilateral movement and cortical activity, suggesting that future research would be better advised to move in the direction of full body movements and body postures as a more reliable means of inducing motivational states.

1.6. Full body movements and body postures

The idea that physical posture can affect a person's emotional experience and behaviour is not particularly new. Riskind and Gotay (1982) hypothesised that adopting a slumped physical posture can strengthen or establish negative evaluations of a situation, leading to subsequent behaviour changes that align with this viewpoint. Additionally, adopting an upright physical posture can strengthen or establish positive evaluations of a situation, leading to subsequent behaviour changes that align with this viewpoint (Riskind & Gotay, 1982). Participants (n=20) assumed a slumped or upright posture for eight minutes, before attempting a number of unsolvable, or otherwise difficult to solve, puzzles as a measure of their motivational persistence. Persistence was measured by the 'number of attempts' made to solve the puzzle. Participants in the slumped condition made comparatively fewer attempts, indicating a lack of motivation to perform the task, consistent with learned helplessness. Participants in the upright condition made more attempts, indicating a greater level of motivation. While completing the puzzles, participants were not required to remain in the slumped or upright position, indicating that the motivational states resulting from the eight minute manipulation had lingering after-effects (Riskind & Gotay, 1982).

Based on the findings reported by Riskind and Gotay (1982), along with current assumptions about approach and avoidance motivation, Harmon-Jones et al. (2014) considered

the effects of different postures (e.g., leaning forward, sitting upright, reclining) on approach motivation. Harmon-Jones et al. (2014) reasoned that in a person's everyday life, relaxation and the satisfaction of accomplishing a goal are often associated with leaning back in a reclined position. Harmon-Jones et al. (2014) provide evidence of this from the work of Harmon-Jones and Peterson (2009). In this study, participants (n=46) were asked to write an essay for which they received negative feedback. The group adopting a reclined posture experienced a greater reduction in approach motivated anger than the supine posture group following the feedback they received (Harmon-Jones & Peterson, 2009). This experiment provides a solution to the issue proposed earlier by Carver and Harmon-Jones (2009) and Peterson (2007) that an approach motivated state has the propensity to lead to a more pronounced aggressive response to negative feedback. Perhaps in sports that require moderate levels of arousal, the athlete experiencing a raised emotional response to a negative outcome may consider adopting a reclined position to return to a state of arousal better suited for future performance.

Harmon-Jones et al. (2014) also referred to a follow up study by Price and Harmon-Jones (2010), which considered the effects of leaning forward on motivational states. Reasoning that leaning forward often occurs during the acquisition of a positive reinforcer, such as receiving food, Price and Harmon-Jones (2010) hypothesised that leaning forward would induce greater left cortical activity than participants in a reclined or sitting upright position. Following EEG analysis of 87 participants who were randomly assigned to one of the three posture groups, Price and Harmon-Jones (2010) observed greater left cortical activity in the leaning forward group than the reclined position group. These EEG findings allowed Price and Harmon-Jones (2010) to accept their experimental hypothesis, suggesting that leaning forward could be used as a successful intervention to induce an approach motivational state.

The link between body postures and motivational states was examined further in research conducted by Harmon-Jones, Gable, and Price (2011), who suggested that leaning forward is associated with things humans desire. They used EEG to examine the left cortical activity of participants in either a reclined or leaning position while they observed virtual images of either rocks or desserts. Leaning forward was associated with an increase in activity in response to the appetitive pictures relative to the neutral ones, while a reclined position was not associated with significant differences. These findings are consistent with a relationship between approach motivation and forward leaning.

More recently, Hackford, Mackey, and Broadbent (2019) examined the effect of walking postures on affect and physiological states (blood pressure, galvanic skin response and skin temperature) of 73 participants who were divided into either an upright or slumped body posture group. Participants adopting an upright walking posture were expected to experience fewer undesirable physiological responses in response to psychological stressors they were exposed to. Consistent with evidence of the impact of body postures on approach and avoidance motivation, participants in the upright walking posture reported less negative affect, and displayed more stable physiological measures compared to participants in a slumped walking posture (Hackford et al., 2019). These results provide an interesting opportunity for future research into motivational states that is yet to be fully explored – if an upright walking posture is found to also induce increased left cortical activity, this simple embodiment intervention could be used to facilitate an approach state and reduce the likelihood of an avoidance one.

1.7. Preparation time

Research into penalty taking in football yields an additional avenue of exploration in the study of approach and avoidance motivation. Jordet and Hartman (2008) provided evidence for a

relationship between preparation time in penalty taking and anticipatory dread. In their experiment, preparation time was measured from the instant the referee blew the whistle until the player's run up to kick the ball was commenced. When the penalty taker's situation was negatively framed (if you miss your team will lose), preparation time was shorter than when the situation was positively framed (if you score your team will win). Consistent with the claims of Centerbar and Clore (2005), negatively valenced instructions may influence a penalty taker's attitude towards the penalty kick, leading to behaviours such as hastened preparation time.

A more recent study by Furley, Dicks, Stendtke, and Memmert (2012) takes the work of Jordet and Hartman (2008) one step further, highlighting additional negative impacts of hastening preparation time. Furley et al. (2012) provided evidence that less preparation time can not only lead to poorer penalty taking performance, but that it can also improve performance by the goalkeeper. Football goalkeepers reported that observation of hastened preparation time indicated weakness in the penalty kicked, which caused them to rate their chance of saving the upcoming kick higher (Furley et al., 2012). While further research is required to gain a better understanding of this phenomenon, preparation time appears to be a nonverbal behaviour that may embody change in a sportsperson's motivational state.

1.8. Research Objective

Psychology, the scientific study of the mind and human behaviour, has been divided for a number of years into a number of branches that specialise in the study of particular behaviours, or vary in their methodological approaches to research (Hebb & Donderi, 2013). Two of the branches that are considered in the following research are behavioural and sports (also referred to as performance) psychology. While behavioural psychology uses terminology and methodological approaches rarely seen in the study of sports psychology, and behavioural

psychology rarely adopts sports psychology principles or a sporting context in its quest to study and predict human behaviour, there is room for greater unison between these two branches moving forward. The following study attempts to use a golf putting task as an example of how behavioural and sport psychology can be unified to compliment the experimental and research processes.

Golf putting is one performance related motor skill that has been used in recent studies with success (Cooke et al., 2015; Gallicchio, Cooke, & Ring, 2017; Masters & Maxwell, 2008). When testing an intervention, studies that use golf putting are able to report results with a strong external reliability as the possible variables such as distance from the hole, type of equipment used, and the break of the green would all be relatively easy to control for and replicate in subsequent testing. As the intervention being tested in this study is aimed at improving the performance of experienced golfers, a decision was made to include only golfers with two or more years playing experience, and allow them to use their own club in an attempt to best replicate a golf tournament or serious practice session.

The following experiment aimed to fill a number of gaps in the existing literature on motivational states in sport, while remaining consistent with the direction of future research. A situational (Phase 2) and instructional (Phase 3) intervention was used to evoke approach motivation in one experimental group, and avoidance motivation in the other. The effect of these interventions on performance was measured by putting success and video analysis of embodiment related changes. The intervention adopted in this experiment was aimed at applying a full body (Kelley et al., 2017), directionally focused (Harmon-Jones & Gable, 2017) method that incorporated the recent work of Harmon-Jones et al. (2011) and Hackford et al. (2019) regarding the positive and negative impacts of body postures. Dependent measures used in this

experiment attempted to capture how motivational states are embodied naturally (i.e., preparation time, posture, proximity) following the situational and instructional interventions, rather than only observing their effect on performance.

Being able to identify the natural embodiment of approach motivation may provide direction for future research aiming to create interventions that facilitate the embodiment of such desirable behaviours. Being able to identify the embodiment of avoidance motivation may provide direction for future research aiming to create interventions that are incompatible with the unwanted avoidance behaviours. The intervention of an incompatible behaviour from behavioural psychology could be used when an athlete is identified to be embodying avoidance motivation (e.g., looking at the ground). By providing an incompatible behaviour intervention (e.g., having raised shoulders and lifting of the chin) the athlete is no longer able to engage in the avoidance behaviour of looking at the ground. Establishing a replacement behaviour is proven to be equally as effective as an intervention that attempts to create a new one (Van Haaren, 2017).

1.9. Hypotheses

Approach motivated participants will perform comparatively better at a golf putting task than avoidance motivated participants. Approach motivated participants will display embodied behaviours that will include standing closer to the golf ball, leaning further forward during putts, and taking less time to prepare for the execution of putts compared to avoidance motivated participants. The null hypothesis in this experiment is that there will be no significant differences in performance or embodied behaviours between approach and avoidance motivated participants in this experiment.

Chapter 2

Study 1

2.1. Methods

2.1.1. Participants

Twenty participants (*M* age = 22.45 years, *SD* = 9.86 years; 17 males, 3 females) with at least two years of golf experience (*M* experience = 10.35 years, *SD* = 7.56 years) took part in the experiment. Participants were recruited by word of mouth and an online call for participants posted by the school's head golf coach.

Ethical approval was attained prior to the participant recruitment process, from the Human Research Ethics Committee of the Faculty of Arts and Social Sciences (HREC2019#20).

2.1.2. Materials and setting

Participants used their own golf putter (generally 90cm in length), and a marker was used to indicate the distance of 1.5m from the hole. This distance was selected with an expectation that 65%-80% of putts would be successful based on the anticipated skill set of the golfers in this study (Putting Probabilities, n.d.). The hole measured a standard 10.8cm in diameter, and a bucket of standard golf balls (4.7cm in diameter) was provided. Participants were encouraged to complete their usual routine before beginning each putt. A video camera (Canon XA 10 HD, Canon Inc., Tokyo, Japan; 60Hz) was set up on a tripod at a distance of 3.0m from the marker, in line with the golf ball and the hole. A protective mat was also provided for the participants to stand on, designed to protect the putting green from general wear and tear that could result from

a high volume of participants standing on the same spot. A regularly maintained practice putting green, with a slight right to left break, was used. The putting green was deemed an appropriate testing location as it represented a typical green encountered in golf tournaments.

2.1.3. Design

A between subjects design was employed, with an equal number of participants assigned to either an approach group or an avoidance group. A random number generator was used to determine the experimental condition of each participant, but any participant who scored 100% in Phase 1 (Baseline) was assigned to the avoidance group due to the Phase 2 intervention. The independent variable was motivational state, which was induced through (1) a situational intervention (Phase 2), and (2) an instructional intervention (Phase 3). The dependent variable was defined as how participant performance was influenced by the change in motivational state.

2.1.4. Dependent measures

Performance. Putting performance was operationally defined by the number of times the golfer putted the ball into the hole, recorded as a percentage of the number of attempts. Potential outcomes of each putt attempted by the golfer were either successful (1 point) or unsuccessful (0 points), with a maximum score of 15 (Phase 1), 15 (Phase 2), or 20 (Phase 3).

Preparation time. Preparation time was operationally defined as the amount of time between the golfer placing the putter behind the ball and the moment at which the putter contacted the golf ball to initiate the roll.

Embodiment of leaning. Two different measures of leaning were used to capture how an induced approach or avoidance state influenced the participant's body posture. The embodiment of leaning measures were recorded at the video's final frame before the golf club made contact

with the golf ball. As illustrated on Figure 1, the first leaning measure used (left) calculated the acute angle formed from the furthest point of the participant's backside to the peak of their dome. The second leaning measure used (right) calculated the acute angle formed by the tip of the participant's nose to the centre of the golf ball.

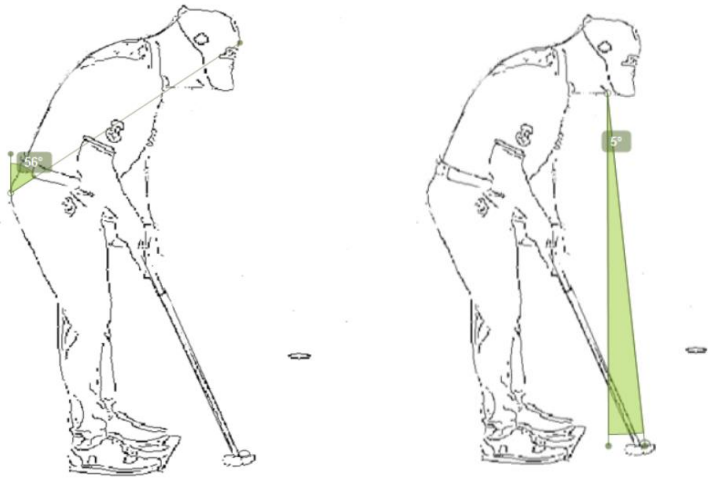

Figure 1. Leaning measurement 1 (left) measures the angle created by the golfer's backside to the peak of their dome. Leaning measurement 2 (right) measures the angle created by the golfer's nose to the centre of the golf ball.

Embodiment of proximity. This measure of distance provided an indication of how close the golfer stood to the golf ball during the putt. The distance (cm) was taken from the centre of the golf ball to the front toe of the participant's right shoe as the golfer made impact with the ball.

2.1.5. Procedure

When participants arrived at the venue, they were provided with an information sheet about the study, were asked to sign a consent form, and filled out a pre-test questionnaire. They were informed that they were welcome to ask questions and that verbal instruction would also be provided prior to the putting task.

The experiment was conducted in three parts. Prior to the putting task, each participant was informed that there were three phases, and that they would receive new instructions at the beginning of each phase. Participants were asked to make their best attempt on each putt as if it were a tournament, and informed that they were allowed to undertake their regular pre-shot routine prior to every putt, or as they saw fit. The only requirement was that they were not allowed to take more than one step back from the ball, as this could interfere with a later intervention. Participants were instructed to place the ball left of the marker, and to putt while standing on the protective mat provided. The positioning of the protective mat was adjusted by participants at the beginning of the experiment to a comfortable distance from the ball, but not closer to the hole, and at any point during the experiment if they needed to reposition themselves. Participants were informed that they were allowed to take a break at any point in the experiment.

Phase 1. Participants were instructed to putt 15 golf balls from the same spot on the green, from which percentage accuracy was computed. The putts were recorded by a video camera located on a tripod, capturing footage of the direct line from the golf ball to the hole. Phase 1 was used to establish a baseline, which would be used to assess behavioural changes in Phases 2 and 3 following the approach or avoidance interventions.

Phase 2. At the conclusion of Phase 1, participants were informed that their score out of 15 had been compared to the score of a random golfer from the experiment and that they were either two shots ahead (avoidance group) or two shots behind (approach group) their opponent. Participants were instructed that they would be putting 15 balls from the same spot on the green with this new knowledge, from which percentage accuracy was computed. Those in the avoidance group were instructed "do your best to avoid the other golfer catching your score and passing it," while those in the approach group were instructed "do your best to catch up to the other golfer's score and

attempt to pass it." Participants were informed that they would receive an update about how far ahead or behind they were with five putts remaining. After 10 putts, participants in the avoidance group were told that they were now only one shot ahead, and the instruction to avoid the other golfer catching their score was repeated. At the equivalent point, participants in the approach group were told that they were now only one shot behind, and the instruction to catch the other golfer's score was repeated. These updates after 10 putts were designed to emphasise the motivational state the intervention was attempting to induce, as golfers are often aware of how well they are performing compared to other opponents in the field. It should also be mentioned that five participants in the avoidance condition who scored 10/10 in Phase 2 were informed that they were still two shots ahead of their opponent in an attempt to maintain the illusion that their score was truly being compared to another golfer in the experiment. Regardless of performance on the final five putts, participants in all groups were informed that they had scored higher than their opponent and received verbal praise from the experimenter for beating their opponent.

Phase 3. In the final phase of this experiment, participants were provided with an instructed pre-shot routine which they would engage in prior to every second putt. The participants in the avoidance group were instructed to begin at the hole and look down at it. While still looking down at the hole, they would take three steps backwards before setting up to putt as normal. The participants in the approach group were instructed to begin three steps back from their putting marker. These participants were instructed to look at the hole, look at the ball, and then take three steps towards the ball. These interventions were verbally instructed and demonstrated by the experimenter. An equal number of participants was randomly assigned to undertake this pre-shot routine on either odd numbered or even numbered putts, to ensure the conditions were counterbalanced. Participants were informed that they could ask whether or not to perform the

pre-shot routine on a particular putt if they were unsure. In this final phase, the success of 20 putts was recorded, instead of 15, to ensure that a large enough sample of putts performed under this condition was recorded.

Following participation in the putting task, participants were asked to complete a final post-test questionnaire and were thanked for their involvement. A $10 voucher was provided independent of the participant's performance or score on the putting task. Following the conclusion of this study, it was disclosed to participants from the avoidance group that the intervention provided for them was not designed to improve their putting performance. This follow up was important as it provided an explanation for why some of the participants performed below personal expectations in the task, and so that participants did not adopt the intervention method in the future in an attempt to improve their golfing performance. The experimental session generally took between 15 and 25 minutes per participant, depending largely on the amount of time the individual spent undertaking their own pre-shot routine and reading the green.

2.1.6. Statistical analysis

Two-way Group (Approach; Avoidance) x Phase (Phase 1; Phase 2; Phase 3) repeated measures analyses of variance were conducted to examine differences in performance, posture, proximity and preparation time in each phase of the experiment as a function of intervention. Bonferroni corrected pairwise comparisons were used to follow up significant main and interaction effects. Statistical significance was set at $p \leq .05$.

2.2. Results

2.2.1. Performance

A main effect of Group was found ($F(1,18) = 23.00$, $p < .001$, $\eta p^2 = 0.56$), suggesting that overall participants in the avoidance group performed better than participants in the approach group (see Figure 2). A main effect of Phase was also observed ($F(2,36) = 6.52$, $p = .004$, $\eta p^2 = 0.27$), with putting performance worse in Phase 1 than in Phase 2 ($p = .007$) and Phase 3 ($p = .047$). No performance differences were found between Phase 2 and Phase 3 ($p = 1.00$). An interaction between Phase and Group was not present, ($F(2,36) = 3.03$, $p = .061$, $\eta p^2 = 0.14$).

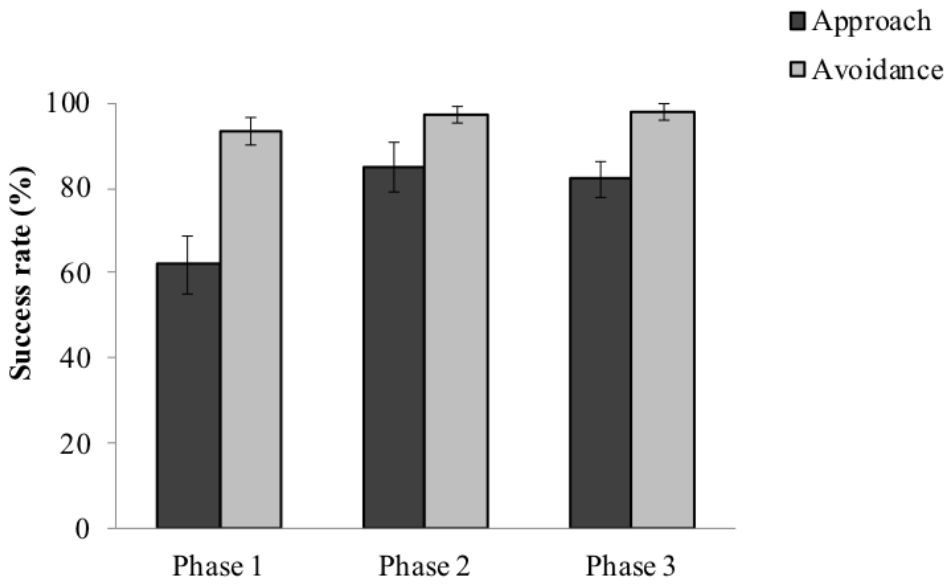

Figure 2. Mean percentage of successful golf putts by participants in either the approach or avoidance group across three phases

2.2.2. Preparation time

A main effect of Group was found ($F(1,18) = 5.90$, $p = .026$, $\eta p^2 = 0.25$), suggesting that overall participants in the avoidance group displayed longer preparation times than participants in the approach condition (see Figure 3). Neither a main effect of Phase ($F(1.52, 27.29) = 0.65$, $p =$

.488, ηp^2 = 0.04) nor an interaction between Phase and Group (F(1.52, 27.29) = 0.43, p = .598, ηp^2 = 0.02) were observed, providing insufficient evidence of a relationship between preparation time and motivational state.

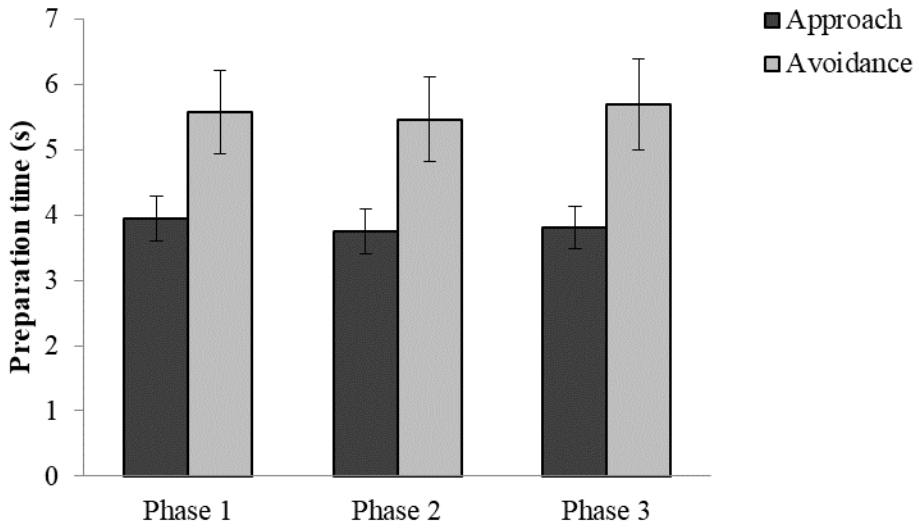

Figure 3. Preparation time as measured by the average length of time (s) between the golfer placing their club beside the ball and the moment the putter made contact with the golf ball

2.2.3. Leaning

There was no main effect of Group found (F(1,18) = 0.58 p = .457, ηp^2 = 0.03), suggesting there was no overall difference in leaning by participants in the approach or avoidance group (see Figure 4). There was also no main effect of Phase observed (F(2,36) = 0.38, p = .869, ηp^2 = 0.02). An interaction between Phase and Group was found (F(2,36) = 4.16, p = .024, ηp^2 = 0.19). Bonferroni corrected follow-up tests revealed that the posture of participants in the Approach group did not change, whereas the posture of participants in the Avoidance group was significantly more upright during Phase 2 compared to Phase 1 (p = .016). No significant

differences were found between Phase 2 and Phase 3 (p = 1.00) and Phase 1 and Phase 3 (p = .298).

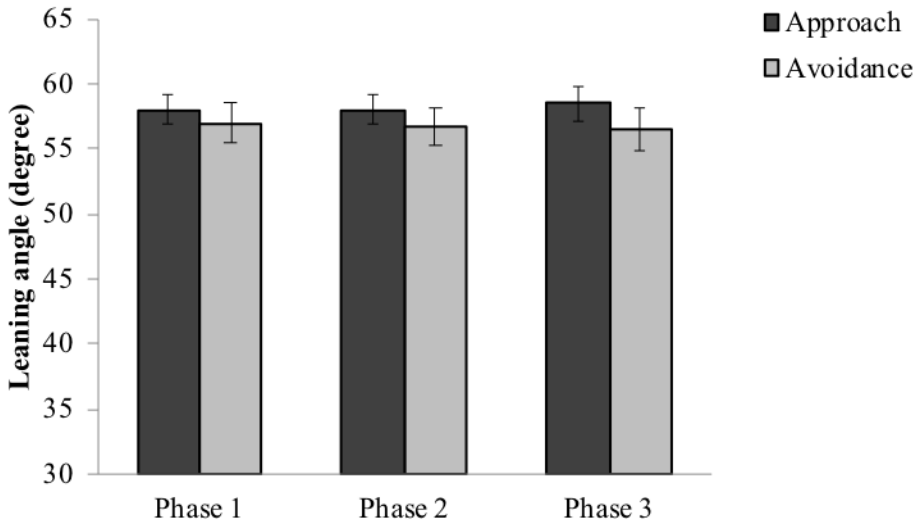

Figure 4. Embodiment of leaning as measured by the average acute angle (from backside to dome) of participants in either the approach or avoidance group across three phases

For the second leaning measure, there was no main effect of Group (F(1,18) = 0.69 p = .417, ηp^2 = 0.03), indicating no difference in the posture of participants in the approach or avoidance group (see Figure 5). There was also no main effect of Phase (F(1.46, 26.32) = 1.37, p = .266, ηp^2 = 0.07), suggesting an absence of fatigue effects that could have impacted body posture as the experiment went on. As with the first leaning measure, an interaction between Phase and Group was found (F(1.46, 26.32) = 3.65, p = .05, ηp^2 = 0.17). Bonferroni corrected follow-up tests, however, showed no significant differences between Phases as a consequence of Group (p's > .170).

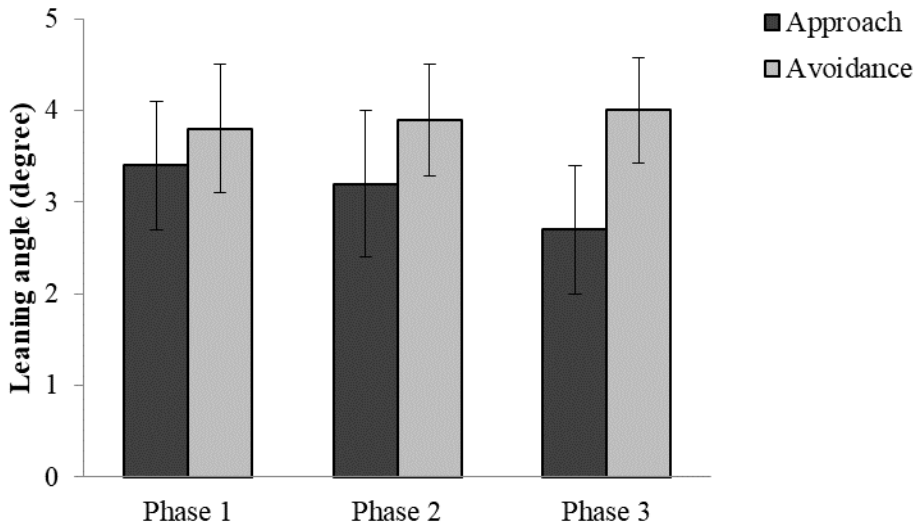

Figure 5. Embodiment of leaning as measured by the average acute angle (from nose to ball) of participants in either the approach or avoidance group across three phases

2.2.4. Proximity

The results revealed no main effect of Phase ($F(1.52, 27.37) = 3.49$, $p = .056$, $\eta p^2 = 0.16$) or Group ($F(1,18) = 0.31$, $p = .584$, $\eta p^2 = 0.02$), and no interaction between Phase and Group, ($F(1.52, 27.37) = 0.97$, $p = .371$, $\eta p^2 = 0.05$) (see Figure 6).

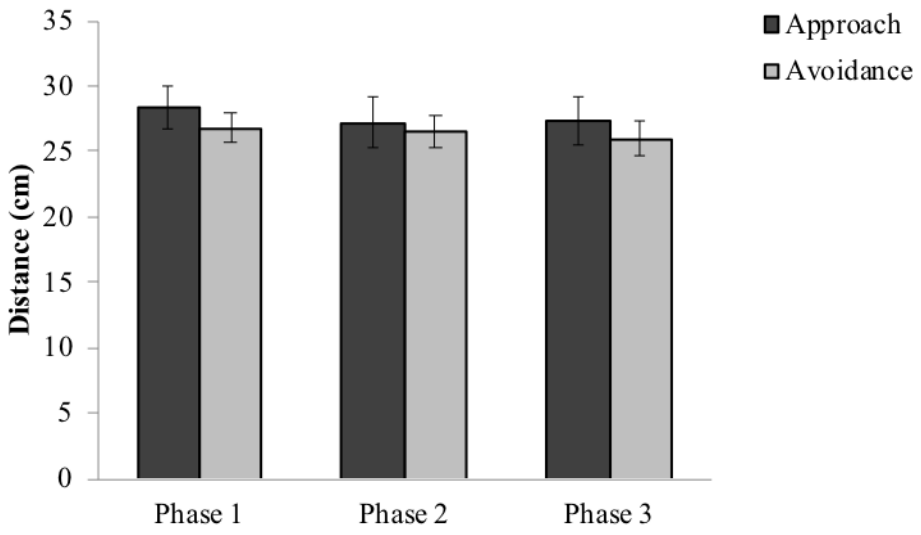

Figure 6. Embodiment of proximity as measured by the average distance (cm) from the participant's foot to the centre of the golf ball in either the approach or avoidance conditions across three phases

2.3. Discussion

The results of Study 1 revealed that participants in the avoidance group leaned further backwards following the situational intervention designed to induce avoidance motivation. However, no significant effect was found in the leaning measurements taken from the approach group. Participants in the avoidance group showed better performance and longer preparation time than participants performing with approach motivation. These findings were driven by differences in the level of expertise between the two groups which was a result of putting distance related ceiling effects. It is for this reason that a second study was conducted, requiring participants to putt from a greater distance.

Chapter 3

Study 2

Participants in the Avoidance group in Study 1 performed significantly better than participants in the Approach group. This important limitation can be explained by the influence of ceiling effects in the putting task. Five of the 20 participants scored 100% in Phase 1, which meant they could not be allocated to the Approach group in Phase 2 (it was not possible to inform them that they were two shots behind another golfer in this study, given that they had scored perfectly). Consequently, these participants were allocated to the avoidance group, causing average performance to be significantly higher.

It was concluded that the original putting distance of 1.5m in Study 1, was responsible for the ceiling effect (i.e., it was too easy), so a longer distance was used in Study 2.

3.1. Methods

The data collection process and analysis for the second study was disrupted by the COVID-19 crisis. This resulted in a shortened study involving ten participants (*M* age = 34.80 years, SD = 19.55 years; 10 males, 0 females) with at least two years golfing experience (M experience = 20.40 years, SD = 20.19 years). Only performance measures were recorded. The design of the study was identical to Study 1, but the distance from which participants putted was increased to 2.25m, consistent with distances used in other golf putting experiments (e.g., Cooke et al., 2015; Gallicchio, Cooke, & Ring, 2017).

3.2. Results

No main effect of Group was found ($F(1,8) = 0.33$, $p = .581$, $\eta p^2 = 0.04$), suggesting that participants in the approach and avoidance groups did not significantly differ in putting ability (see Figure 7). A main effect of Phase was observed ($F(2,16) = 4.86$, $p = .022$, $\eta p^2 = 0.38$). Performance in Phase 2 was significantly better than in Phase 1 ($p = .030$), while no performance differences were found between Phase 2 and Phase 3 ($p = 1.00$) or Phase 1 and Phase 3 ($p = .076$). No interaction between Phase and Group was present ($F(2,16) = 1.11$, $p = .353$, $\eta p^2 = 0.12$).

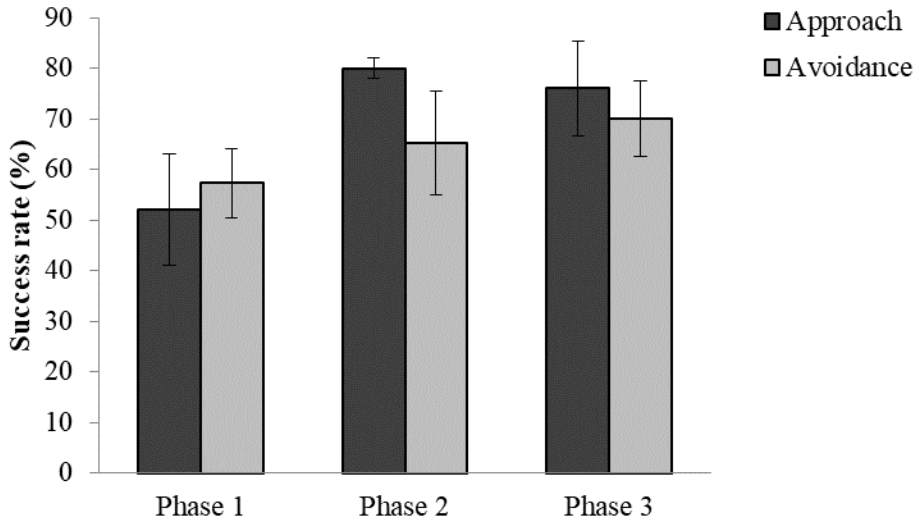

Figure 7. Mean percentage of successful golf putts by participants in either the approach or avoidance group across three phases

3.3. Discussion

Study 2 was designed to rectify the ceiling effects present in Study 1 by increasing the difficulty of the putting task. However, as a consequence of the COVID-19 crisis it was not possible to complete the study. This led to the limitation of a small sample size, which is likely to be

responsible for no significant relationship being found between participants in the approach or avoidance condition. Despite this, the approach group did perform a higher percentage of successful putts in Phase 2 and 3 of the putting task, suggesting that the interventions used may provide promising avenues for future research.

Chapter 4

General Discussion

4.1. Putting performance measures

The aim of this research was to study how applied interventions that affected the motivational state of experienced golfers altered performance in a golf putting task. It was hypothesised that golfers operating in a state of approach motivation would perform better than golfers operating in a state of avoidance motivation. In Study 1, golfers in the avoidance group performed better than golfers in the approach group, but these findings can be largely attributed to ceiling effects observed in the avoidance condition.[1] This ceiling effect, due to the greater than anticipated ability of some of the golfers, meant that the avoidance group had less opportunity to improve than the approach group. Based on previous research in this area (Forgas & Harmon-Jones, 2014; Harlé & Sanfey, 2015; Kelley et al., 2017), an improvement in the putting performance of participants operating with approach motivation was the expected outcome. The results do suggest that there was a non-significant improvement in the approach group's performance (Figure 2). The other significant finding from these results was that overall performance in Phase 2 was better than performance in Phase 1, and overall performance in Phase 3 was better than performance in Phase 1. The repetitive nature of this study means that practice effects are likely to account for these improvements in putting performance. Without the means of comparing the findings from the experimental groups to a control group putting under similar conditions, the extent of the practice effects in this task are unknown. Due to the questions that remain about the

[1] In Phase 1, participants in the avoidance group successfully holed significantly more putts than participants in the approach group, $t(18) = -4.10$, $p = .001$.

influence of motivational states on putting performance following the conclusion of Study 1, it was acknowledged that a second study using a greater putting distance would be beneficial.

Increasing the putting distance in Study 2 removed issues surrounding the presence of a ceiling effect in Study 1, allowing participants to be randomly assigned to either the approach or avoidance condition. Unsurprisingly, a main effect of Phase was found in the results of Study 2, suggesting that overall performance was better in Phase 2 than in Phase 1. This provides support for the presence of practice effects, most likely due to the highly repetitive nature of using the same golf club to putt the same sized golf ball from the same spot on 50 occasions. Figure 7 illustrates this main effect of phase, and also provides evidence that the mean putting success in Phase 2 and Phase 3 was higher in the approach group than the avoidance group. While the trends of these descriptive statistics suggest that the approach interventions in Phase 2 and Phase 3 had a greater impact on performance than the avoidance interventions, statistical analysis did not yield a significant interaction between motivational state and putting performance. This is likely to be a consequence of the COVID-19 crisis disrupting data collection, restricting the sample size to 10 participants (five participants per group). Nevertheless, non-significant trends illustrated in Figure 7 support the findings of previous research (Forgas & Harmon-Jones, 2014; Harlé & Sanfey, 2015; Kelley et al., 2017), suggesting that the approach group may have been more successful at the putting task than the avoidance group following the Phase 2 and Phase 3 interventions.

4.2. Preparation time

The preparation time measure was designed to investigate whether there was an association between the induced motivational states in Phase 2 and Phase 3 and the amount of time the golfer spent preparing for the putt. Based on the work of Jordet and Hartman (2008) and Furley

et al. (2012), it was anticipated that the negative valence of the instruction presented to the avoidance group would cause a reduction in their preparation time relative to baseline (Phase 1). An interaction was not evident between motivational state and preparation time, but a main effect of Group was observed. This strengthened the rationale for conducting a second study because the avoidance group was weighted in favour of golfers with higher putting abilities. Lam, Masters, and Maxwell (2010) showed that longer preparation time was linked with greater cognitive effort and greater expertise, so participants in the avoidance group in Study 1 may have tried harder.

4.3. Embodiment measures

The aim of analysing potential embodiment measures was to identify how a change in motivational state is embodied by participants in a golf putting task. Price and Harmon-Jones (2010) cite a relationship between approach motivation and leaning forward, suggesting that it stems from the learned association that when reinforcement is available, a person often has to lean forward to attain it. Under this assumption, it was anticipated that golfers in the approach condition would lean further forward than golfers in the avoidance group following the Phase 2 and 3 interventions. Additionally, Harmon-Jones et al. (2014) suggested that a relationship exists between avoidance motivation and leaning backwards, resulting from the learned association between accomplishing a goal and relaxing. The hypothesis that golfers in the avoidance group would adopt a more reclined posture by leaning backwards was based on these ideas.

Findings from the first leaning measure (see Figure 4) support the relationship outlined by Harmon-Jones et al. (2014). In Phase 2, participants in the avoidance group were informed that they had a lead of two shots over their opposition. As illustrated in Figure 4, the avoidance group leaned backwards significantly more in Phase 2 compared to Phase 1. The avoidance

group also adopted a more backward leaning body posture on average in Phase 3 compared to Phase 1; however this finding was not statistically significant. The significant difference between Phase 1 and Phase 2 provides support for the idea that receiving reinforcement has a paired association with leaning backwards (Harmon-Jones et al., 2014). The relationship between accomplishing a goal and leaning backwards was likely caused by the situational intervention (Phase 2) of informing participants in the avoidance group that they had a two shot lead over their opponent. This direct association was not made in Phase 3, suggesting the instructional intervention employed was less effective at inducing these motivational states than the situational intervention was.

The results from the second leaning measure (see Figure 5) illustrate a trend towards greater forward leaning in Phase 2 and Phase 3 compared to the baseline (Phase 1). Despite a significant interaction between Phase and Group, follow-up tests showed no significant differences between Phases as a consequence of the approach intervention. The Bonferroni corrected follow-up tests suggest this may be related to power, indicating a need for more participants. Nevertheless, leaning appears to be a worthwhile area for future research into the embodiment of motivational states.

Definitions of motivational states by Harmon-Jones et al. (2014), Kelley et al. (2017), and Price and Harmon-Jones (2016) suggest that approach motivation may lead to a decrease in preferred physical proximity, while avoidance motivation may lead to an increase in distancing. In this measure, it was hypothesised that Phase 2 and Phase 3 interventions would lead to a decrease in physical distance of participants from the ball in the approach group, and an increase in the physical distance of participants from the ball in the avoidance group relative to baseline. However, the results of the proximity measure (see Figure 6) failed to provide evidence of a

statistically significant interaction between motivational state and proximity to the ball. This means that the results of this measure do not provide support for this study's proximity hypothesis and are inconsistent with the outcomes implied by the definitions of approach and avoidance motivation. One reason for this may be that the golf ball on its own does not act as a source of reinforcement or punishment. Directional movement as a result of approach and avoidance motivation is described by Price and Harmon-Jones (2016) and Kuhl and Koole (2008) as being goal driven, implying the outcome of the action and not the action itself is what would be moved toward or away from. Perhaps giving golfers the choice of picking up the same ball from the hole (approach motivation) or choosing a new one from the bucket of balls (avoidance motivation) following each putt would have been more likely to elicit a significant proximity related outcome.

4.4. Application

This research was designed to investigate how approach and avoidance motivation are embodied by sportspeople, with the aim of providing a suggestion as to how the embodiment of a certain motivational state can be used to improve performance. Due to the lack of significance in many of the statistical analyses used here, further research is required to isolate the embodiment of motivational states and their precise impact on performance. However, a number of these findings appear promising and worthy of further examination. For an athlete looking to improve performance by embodying approach motivation, the most promising avenues appear to be leaning forward (Harmon-Jones & Peterson, 2009; Harmon-Jones et al., 2014; Price & Harmon-Jones, 2010; Riskind & Gotay, 1982), adequate preparation time (Furley et al., 2012; Jordet & Hartman, 2008), and interpreting situations with positive valence (Centerbar & Clore, 2005). If a football player is preparing to take a penalty kick, before starting their run up they could lean

forward slightly – attempting to replicate the same physical response that may be associated with embodying approach motivation. If a baseball player is preparing to throw an important pitch, hesitating for an additional three seconds to focus on the performance outcome may prevent the hastened performance associated with embodying avoidance motivation. If a rugby kicker is faced with a conversion that will either win or lose his team the game, self-talk consistent with "If I kick this we win" may induce a more preferable motivational state than "If I kick this we lose."

4.5. Limitations

As alluded to previously, the primary limitation of this study was the ceiling effects observe in Study 1 that led to a higher percentage of expert golf putters being allocated to the avoidance group. This impacted not only the performance measure, but also the preparation time measure. The ceiling effect present in Study 1 was corrected for in Study 2. However, due to the COVID-19 crisis, the small sample size was limited to 10 participants. An additional limitation was the absence of a control group. A control group would have been beneficial in highlighting the extent to which practice effects play a role in the putting task. This would have aided in the determination of whether trends towards an improvement in putting performance by the approach group were due to the applied intervention, or simply due to the presence of practice effects. Lastly, findings from this study's second leaning measure suggest that the small sample size of Study 1 was a limitation. Future studies would benefit by seeking a larger sample size in research on how motivational states are embodied. Due to changes in performance often being represented by only a small distance, degree or time difference, a larger sample size reporting similar small changes in performance will provide more reliable support for the effects of approach and avoidance interventions.

4.6. Future research

Follow up studies could consider adopting the parameters of Study 2, using a larger sample size to measure putting performance, embodiment of leaning, and preparation time relative to motivational states. Future research adopting these processes would benefit from a control group to control for practice effects that often cannot be avoided. Based on the findings of this research, the most promising avenues for future studies appear to be body posture (leaning), preparation time and performance. These measures are beneficial, not only because the results appear most promising, but also because they meet the testing guidelines of behavioural psychology research. Each of these are measurable and observable, acting as either an antecedent to the performance behaviour (body posture and preparation time), or providing an indication of a reinforcing (success) or punishing (failure) outcome (performance). Golf putting appears to be a performance behaviour where extraneous variables can be controlled for. Alternatives may include football penalty kicks (Jordet & Hartman, 2008) or basketball free throws (Shoenfelt, Snyder, Maue, McDowell, & Woolard, 2002), where a strong argument can also be made for highly controlled experimental settings. If sports psychology is able to reliably isolate an embodiment measure of approach and avoidance motivation, future studies may attempt to test an embodiment related intervention used by a group of athletes over a series of games. Several varieties of the intervention may need to be tested, and it should be acknowledged that a single intervention is unlikely to meet the needs of every athlete across every sporting code.

4.7. Conclusion

The goal of this thesis was to take a behavioural view on how the motivational states of approach and avoidance are embodied by sportspeople. A between subjects design was used to test the dependent variables of performance, preparation time, posture and proximity between golfers in

a state of approach motivation and avoidance motivation. Trends in the findings provide evidence of successful approach and avoidance states being induced, with body posture (leaning) appearing to be a frontrunner for future direction in the study of how motivational states are embodied. However, the two studies conducted do not provide a stand-alone answer to the question of how motivational states are embodied, nor do they advocate the dismissal of other forms of embodiment. The study of how motivational states are embodied is a worthwhile challenge that future research will continue to attempt to answer. Perhaps in the near future sports fans will observe their favourite players leaning forward or taking a longer pause before executing their chosen skill. But for now, future research will continue to be tasked with further examination of these ideas and their application in the sporting arena.

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Appendix A

Participant information sheet

Project Title
Embodiment of approach motivation to improve performance in sport

Purpose
You are invited to participate in a research study conducted by Greg Holt, Dr Liis Uiga and Prof Rich Masters, researchers from the Te Huataki Waiora School of Health, and the Faculty of Art and Social Sciences at Waikato University. The aim of this research study is to investigate the embodiment of approach motivation compared to the embodiment of avoidance motivation when measuring golfer performance.

What is this research project about?
This research aims to investigate the roles of approach and avoidance motivation in the context of a golf putting scenario, with a focus on how embodiment effects putting performance. We seek participants, both men and women, aged 16 and over who have at least two years experience playing golf.

Funding
The University of Waikato Research Masters Scholarship is financially supporting this project.

What will you have to do and how long will it take?
You will be asked to attend two experimental sessions on two different days that we estimate will take around 15 minutes per session. At the beginning of the first session, you will be required to answer a few questions about yourself. After that, you will perform 20 golf putts with the intention of attempting to hit the ball from a distance of 1.25m into the hole. Your score from the first task out of 20 will then be compared to the score of another golfer in the experiment, and you will be instructed to either not let the other person catch up (if you are ahead), or attempt to surpass the other golfer (if you are behind). You will be informed at the beginning, and after shots 5 and 10, how far ahead or behind the other participant you are. You will then be asked how being either ahead or behind made you feel, and how you think this impacted your performance. At the beginning of the second session you will be provided with an intervention designed to have an impact on your golfing performance. You will then putt the ball 20 times from varying distances from the green. You will be instructed when to apply the intervention, and when to putt normally.

Potential risks/discomforts and their minimization
There are no known risks associated with participation.

Potential benefits
Although there are unlikely to be any immediate direct benefits to you as a consequence of participating, the data you help us collect will improve our understanding of approach and avoidance motivation in golf. Upon your request, we will send you the final write-up of results from the study. If successful, findings from this study may be used in practice to provide interventions for golfers and other athletes that may lead to improved performance in their chosen sport.

What will happen to the information collected?
Your personal information, including the data we will obtain from you, is strictly confidential. Only the named researchers will have access to all of the data. The information collected may be used by the researchers for scholarly publication and/or conference presentation. Primarily, the data collected will contribute to the student Greg Holt's masters studies, being presented in the form of a thesis. No participants will be named in the publications and every effort will be made to disguise their identity. Some of the data will be collected using video recorder. This data will be identified using subject ID, which means that your name cannot be associated with the recorded data. All data will be retained in a secured password protected computer and cabinet for five years. Afterwards, all documents will be destroyed.

Participation and withdrawal
Your participation is voluntary. This means that you can choose to stop at any time without negative consequences. You may also decline to answer any verbal or written questions posed to you at any point in this experiment. You have the opportunity to withdraw your results from our study up to 3 weeks following your participation.

Declaration to participants
If you take part in the study, you have the right to:

- Refuse to answer any particular question, and to withdraw from the study at any time during or in the three weeks after the involvement in the experiment.
- Ask any further questions about the study that occurs to you during your participation, at any time.
- Be given access to a summary of findings from the study when it is concluded.

Statement of approval
This research project has been approved by the Human Research Ethics Committee of the Faculty of Arts and Social Sciences. Any questions about the ethical conduct of this research may be sent to the Secretary of the Committee, email fass-ethics@waikato.ac.nz, postal address, Faculty of Arts and Social Sciences, Te Kura Kete Aronui, University of Waikato, Te Whare Wananga o Waikato, Private Bag 3105, Hamilton 3240.

Appendix B

Consent form

Name of participant: _____

I have received a copy of the Information Sheet describing the research project. Any questions that I have, relating to the research, have been answered to my satisfaction. I understand that I can ask further questions about the research at any time during my participation, and that I can withdraw my participation at any time *[up to three weeks]* after the experiment.

During the golfing task, I understand that I can withdraw at any time, and I can ask to have the recording device turned off at any time.

When I sign this consent form, I will retain ownership of the information I provide, but I give consent for the researcher to use the data recorded for the purposes of the research outlined in the Information Sheet.
[I understand that my identity will remain confidential in the presentation of the research findings]

Please complete the following checklist. Tick [✓] the appropriate box for each point.	YES	NO
I wish to receive a copy of my golf scores from this task		
I wish to receive a copy of the findings.		
I wish to receive written feedback outlining an individual intervention that may improve my future performance		

Participant name: _____

Participant signiture: _____

Date signed: _____

Email (Optional): _____

Appendix C

Data recording sheet

Participant number: _____

Key:
- ✓ Hit
- × Miss
- (I) Intervention has been instructed

Phase 1

1	2	3	4	5	6	7	8	9	10

11	12	13	14	15	16	17	18	19	20

Phase 2

1	2	3	4	5	6	7	8	9	10

11	12	13	14	15

Phase 3

Intervention: _____

1 (I)	2	3 (I)	4	5 (I)	6	7 (I)	8	9 (I)	10

11 (I)	12	13 (I)	14	15 (I)	16	17 (I)	18	19 (I)	20

Appendix D

Questionnaire

Participant number: _____

This questionnaire is to be completed prior to the golfing task

Gender

_____

Age

_____

How many years have you been playing golf?

_____

How many hours a week do you usually spend playing golf?

_____

What is your golfing handicap?

_____

Do you have an existing pre-performance routine prior to putting?

_____

If yes, describe what pre-performance routine you regularly engage in

_____