Coping Strategies Of Tertiary Athletes In Singapore: The Influence Of Achievement Goals, Motivational Climate And A Brief Relaxation Intervention

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A thesis submitted to the
National Institute of Education,
Nanyang Technological University
In fulfilment of the requirement for the degree of
Doctor of Philosophy

2019
COPING STRATEGIES OF TERTIARY ATHLETES IN SINGAPORE: THE INFLUENCE OF ACHIEVEMENT GOALS, MOTIVATIONAL CLIMATE AND A BRIEF RELAXATION INTERVENTION

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Acknowledgements

I would like to take this opportunity to sincerely thank the following people.

Firstly, I would like to thank God for enabling this opportunity, and also seeing me through this journey. Next, I would like to extend gratitude to my supervisor, Professor John Wang, for all his invaluable guidance and advice throughout the course of my study.

In addition, I am immensely grateful for my friends in the Physical Education and Sport Science department, in the National Institute of Education. They provided help whenever they could and supported me in whatever ways they were able to. This journey was much more enjoyable due to the other Higher Degree students and Research Assistants in the Physical Education and Sports Science department whom I have shared various milestones with. I would also like to highlight the support I received from the National Youth Sports Institute, contributing to the completion of this thesis.

Last but not least, I appreciate all the encouragement and assistance provided by my family and friends during this period. I would like to specially appreciate the unwavering support provided by Oh Kar Wei as well as thank Danny Chua, Joey Tay, Michael Bin and Victor Leung for their indispensable help with regards to my thesis.
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<table>
<thead>
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<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>AGT</td>
<td>Achievement Goal Theory</td>
</tr>
<tr>
<td>AGQ-S</td>
<td>Achievement Goal Questionnaire for Sport</td>
</tr>
<tr>
<td>ANOVA</td>
<td>Analysis of Variance</td>
</tr>
<tr>
<td>AVE</td>
<td>Average Variance Extracted</td>
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<tr>
<td>BCI</td>
<td>Brain Computer Interface</td>
</tr>
<tr>
<td>CETASP</td>
<td>Coping Effectiveness Training for Adolescent Soccer Players</td>
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<tr>
<td>CFA</td>
<td>Confirmatory Factor Analysis</td>
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<tr>
<td>CFI</td>
<td>Comparative Fit Index</td>
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<tr>
<td>CSAI-2</td>
<td>Competitive State Anxiety Inventory-2</td>
</tr>
<tr>
<td>CSAI-2R</td>
<td>Competitive State Anxiety Inventory-2 (Revised)</td>
</tr>
<tr>
<td>CSQ</td>
<td>Coping Styles Questionnaire</td>
</tr>
<tr>
<td>EEG</td>
<td>Electroencephalogram</td>
</tr>
<tr>
<td>EFA</td>
<td>Exploratory Factor Analysis</td>
</tr>
<tr>
<td>fMRI</td>
<td>Functional Magnetic Resonance Imaging</td>
</tr>
<tr>
<td>HIV</td>
<td>Human Immunodeficiency Virus</td>
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<tr>
<td>IMI</td>
<td>Intrinsic Motivation Inventory</td>
</tr>
<tr>
<td>IZOF</td>
<td>Individual Zones of Optimal Functioning</td>
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<tr>
<td>MANOVA</td>
<td>Multivariate Analysis of Variance</td>
</tr>
<tr>
<td>MB</td>
<td>Mind Builder (NeuroSky)</td>
</tr>
<tr>
<td>MCI</td>
<td>Multidimensional Coping Inventory</td>
</tr>
<tr>
<td>MCSYS</td>
<td>Motivational Climate Scale in Youth Sports</td>
</tr>
<tr>
<td>MCYS</td>
<td>Ministry of Community, Youth and Sport</td>
</tr>
<tr>
<td>MLE</td>
<td>Maximum Likelihood Estimation</td>
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<tr>
<td>MRI</td>
<td>Magnetic Resonance Imaging</td>
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<tr>
<td>MST</td>
<td>Mental Skills’ Training</td>
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<tr>
<td>NIRS</td>
<td>Near Infra-red Spectroscopy</td>
</tr>
<tr>
<td>NSA</td>
<td>National Sports Associations</td>
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<tr>
<td>NNFI</td>
<td>Non-normed Fit Index</td>
</tr>
<tr>
<td>RMSEA</td>
<td>Root Mean Square Error of Approximation</td>
</tr>
<tr>
<td>SCAT</td>
<td>Sport Competition Anxiety Test</td>
</tr>
<tr>
<td>SEA</td>
<td>Southeast Asian</td>
</tr>
<tr>
<td>SMT</td>
<td>Stress Management Training</td>
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<tr>
<td>TOPS-2</td>
<td>Test of Performance Strategies-2</td>
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Abstract

As the sports industry thrives with local athletes gaining more international recognition, athletes face increasing pressure to perform. This pressure requires effective coping with stress or defeat. Moreover, effectiveness of coping strategies differs across unique individuals. Hence, examining disposition and situational factors could explain effective coping. Cluster analysis revealed in a mastery climate, athletes with high mastery and low performance goals used the most adaptive coping strategies whilst athletes with high mastery and performance goals used the least maladaptive coping strategies. Follow-up interviews found athletes to place high expectations on themselves and think negatively. Athletes largely responded with both positive and negative mental skills. The efficacy of a brief relaxation training session on reducing anxiety in a mastery and performance climate for golf-putting was determined through questionnaires, brainwave and qualitative data. There was no significant difference between both climates, but the intervention helped improve post-performance scores. Future studies could further explore how brief relaxation techniques can impact sport performance.

Keywords: stress, coping, achievement goals, motivational climate, relaxation
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Chapter 1: Introduction

Athletes constantly face high-pressure situations, especially during competitions where they wrestle with huge expectations to excel – both from others and from themselves. This desire to win and fear of failure could result in the athlete being highly aroused, as these expectations translate into a greater task demand placed on the athlete. For instance, during the recent 2016 Rio Olympic Games, Singapore women’s table tennis team failed to bring a medal home for the first time since the 2004 Athens Olympic Games. This left many Singaporean supporters in disbelief and disappointment. This medal drought was attributed by Singapore’s most bemedalled Olympian Feng Tianwei, to the inability to cope with the pressure of bringing home yet another medal (Loke, 2016). According to Feng, she was so “caught up in winning another medal for Singapore” that the pressure became too much for her to handle. This resulted in her conceding two critical matches, which eventually landed the Singapore women’s table tennis team a fourth placing in the 2016 Rio Olympic Games’ team event – just one position short of receiving a medal (Loke, 2016). Therefore, it is evident that sporting competitions place huge amounts of pressure on athletes. The hardest part of it all moreover, is that the athlete has to overcome such pressure all by himself/herself. The former women’s table tennis team coach Chen Zhibin noted that in the Olympic Games, “dealing with the huge amount of pressure was something that Feng had to achieve herself” (Loke, 2016). No one else is able to help the athlete handle competition stress during the competition itself.

What the women’s table tennis team experienced stands in stark contrast to that of world-renowned golfer Tiger Woods. Woods revealed that, “the challenge (in golf) is hitting good golf shots when you have to… to do it when the nerves are fluttering, the
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heart pounding, the palms sweating… that’s the thrill” (as cited in Davies, 2001, p. 26).

Therefore, in spite of the physiological symptoms that accompany anxiety such as fluttering nerves, a racing heart, and sweaty palms, a sportsman still has to do what he has to in order to win the competition. Woods is the epitome of a sportsman who uses mental skills to cope with pre-competition anxiety and achieves phenomenal results. His ability to cope with anxiety can be seen in how he acknowledges pressure associated with competing and embraces it. After winning the 2008 US Open, Woods said:

Well, it’s pressure there’s no doubt. I was nervous and that’s a good thing. That means you care. You can try and use that energy as best as you can to heighten your focus and then get into the right situation and it worked out great for me this week. (R. Jerris, personal communication, June 16, 2008)

Therefore, the competitive nature of sport inevitably brings about anxiety in the face of a competition. On that count, being able to cope effectively with this anxiety is the difference between an outstanding sportsman, and merely a good one. Coping effectively with anxiety is crucial in ensuring the athlete is able to continue performing at his or her peak level of performance. After all, when arousal levels become extremely high, and the athlete experiences unpleasant emotional reactions associated with the autonomic nervous system, a maladaptive form of stress results (Landers & Arent, 2006). The term ‘stress’ has been identified by Selye (1950) to be either positive (eustress), or negative (distress) in direction. In psychological literature, the term ‘distress’ describes the maladaptive form of stress mentioned earlier. Conversely, being able to cope with high levels of arousal is one of the markings of a successful sportsman. One example of a successful athlete who constantly copes with and
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overcomes these high levels of arousal during competitions is the most decorated

Olympian of all time, Michael Phelps. According to Phelps:

> You can look at pressure in two different ways. It’s either going to hurt you or help you. I see it as something that helps me. If there’s pressure on me or someone thinks I can’t do something, it’s going to make me work even harder.

(Sunday Tribune, personal communication, May 2, 2007)

From the examples of these three athletes, each successful in his/her own sport, the difference that led to either a defeat or victory laid with their individual ability to cope effectively with the pressure each of them faced. Coping can be described to be “constantly changing behavioural and cognitive efforts to manage specific external and/or internal demands that are appraised as taxing or exceeding the resources of the person” (Lazarus & Folkman, 1984). In a sports setting, coping effectively entails an individual’s ability to adapt to quickly changing circumstances in the face of psychological stress, beyond merely taking steps to reduce stress (Aldwin & Revenson, 1987). As such, the concept of coping may also encompass an attempt to manage stress upon appraisal and could take the form of less adaptive strategies. Examples of less adaptive coping strategies are distraction- and disengagement-oriented coping, which have been found to be negatively associated to goal attainment (Nicholls, Polman, Levy, & Borkoles, 2010).

In the rest of this introduction section, I will proceed to elaborate more on the importance of being able to cope effectively with sporting stress, before delving into some factors, such as one’s goal orientation and also perceived motivational climate that may influence the coping process. After which, I will touch on various coping
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interventions as well as measurements, and their effectiveness. Finally, I will end this section off with the justification and purpose of my study.

1.1 Stress

The ability to cope in various situations has long been an area of interest to researchers because it is an essential factor for successful sporting performance (Hardy, Jones, & Gould, 1996). Causes of stress, also known as stressors, can be chronic or acute in nature. According to the American Psychological Association (n.d.), chronic stress occurs when the source of stress is persistent and entrenched, such as an athlete’s poor relationship with teammates over a prolonged period of time. On the other hand, acute stress is more situational and could take the form of being reprimanded by the coach, making a physical error, or receiving a penalty from a game official, to name a few (Anshel, Williams, & Williams, 2000). Due to its situational nature, acute stress occurs more commonly in sports, especially during high-stake competitions (Anshel et al., 2000). On top of defining stressors in these two different ways, there have also been other attempts made to understand this phenomenon. Lazarus (1966) contended that stress comprises three processes. First, in primary appraisal, the individual recognises threat to oneself. The secondary appraisal would then involve thinking of ways to respond to that threat. Lastly, coping is actually effecting that planned response. Therefore, only after the onset of stress will athletes react to these stressors using various coping responses.

1.2 Coping

The importance of coping effectively in sports and its role in influencing performance have been researched from various angles through the years. Researchers have previously examined coping in relation to stress appraisal (Dugdale, Eklund, &
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Gordon, 2002; Nicholls, Levy, Grice, & Polman, 2009), goal orientation (Kristiansen, Roberts, & Abrahamsen, 2008), and coping strategies used by elite athletes (Gould, Eklund, & Jackson, 1993a; Gould, Finch, & Jackson, 1993b). Being able to cope effectively with sport-related stress has also been found to have an impact on burnout in sports (Smith, 1986). In a similar vein, being unable to cope effectively with these stressors can lead to decreased athletic performance (Haney & Long, 1995) as well as withdrawal from sport (Kolt, Kirkby, & Lindner, 1995). These studies primarily use semi-structured interviews (Gould et al., 1993b), stress and coping diaries (Nicholls et al., 2009), or various questionnaires such as the COPE inventory (Dugdale et al., 2002; Kristiansen et al., 2008). The numerous research done over the years have led to vast amounts of coping measurements in the field today. Hence there is a need to scrutinise and determine which are most relevant and effective for the purpose of helping athletes cope well with stress.

1.3 Factors Affecting Coping

Despite the copious amounts of available information, one key piece of information is the nature of the sport involved and how this affects the coping strategies employed by the athletes. As different sports place different demands on athletes, the type of sport athletes engaged in is able to affect the use of coping strategies in athletes. For instance, table tennis players generally engaged in coping strategies that helped them avoid the stressor, as opposed to coping strategies that approached the stressor (Laborde, You, Dosseville, & Salinas, 2012). Moreover, it was found that in the sport of table tennis, players who use coping strategies that avoid the stressor have been found to perform better (Anshel & Anderson, 2002). This could be because the fast-paced nature of the game means that players do not have time to dwell on their mistakes and hence
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have to avoid thinking about them, so that they can focus on the next point. On the other hand, in the case of another form of an individual sport, American wrestlers were shown to generally use more problem-focused coping strategies, although they also indicated use of emotion-focused coping strategies (Gould et al., 1993b). Additionally, despite being a team sport with vastly different environmental demands, it was found that Brazilian soccer players also relied on a problem-focused coping approach (Verardi et al., 2012). This suggest that the type of sport, which athletes are involved in could affect their use of coping strategies.

Another crucial piece of information in deciphering the coping process is what the person wants to accomplish in the encounter (Lazarus, 1991). Hence, researchers have also started to look at motivational dispositions as well as motivationally related situational influences, to see how they affect an individual’s cognitive appraisal and eventual coping response. The mindfulness level of athletes was found to be able to predict the types of mental skills they used (Kee & Wang, 2008). Things such as the type of goal orientation and motivational climate athletes’ face have also been found to affect how these athletes cope with stress in their sport (Kristiansen et al., 2008; Ntoumanis, Biddle, & Haddock, 1999). Therefore, it appears that examining one’s goal orientation and perceived motivational climate can help to increase understanding in this complex area of coping and coping strategies in sports.

A possible theory that can be used to further understand the aforementioned relationship is the Achievement Goal Theory (AGT). Research in the area of achievement goals has helped in the understanding of an individual’s motivational process. From these studies, the AGT was formulated (Nicholls, 1984, 1989). The AGT assumes that the goal of showing one’s ability is the main motivational stimulus in
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Achievement contexts and these goals are manifested through two different states of involvement – task and ego involvement (Nicholls, 1989). The different state of involvement the performer is in then specifies his/her behaviour. Task involvement originates from a notion of perceived ability that is self-referenced, and emphasis is placed on mastery of the task, exertion of effort, and the development of knowledge and skills related to the task at hand (Harwood & Swain, 1998; Reinboth & Duda, 2004). On the other hand, ego involvement concerns perceived ability that is normatively or socially referenced, and performance is usually carried out with less effort (Harwood & Swain, 1998). Situational factors (e.g., motivational climate), and dispositional orientation (e.g., degree of task or ego orientation) can determine whether an individual is in a task-involving or ego-involving state (Reinboth & Duda, 2004). In the context of sport, a mastery-involving climate can be identified by an emphasis on mastering the task at hand, learning, using effort, and improvement. Conversely, a performance-involving climate is one that promotes social comparison, interpersonal competition and also public appraisal.

However, Elliot and McGregor (2001) proposed a new dimension to the dichotomous achievement goal framework. This framework was expanded into a 2 x 2 achievement goal framework. The four constructs in the 2 x 2 achievement goal framework are mastery-approach, mastery-avoidance, performance-approach, and performance-avoidance (Elliot & McGregor, 2001). The term ‘mastery’ is used to describe intrapersonal or absolute standards, and ‘performance’ is used to describe normative standards. ‘Approach’ is used to describe a successful outcome, where the individual approaches success, and ‘avoidance’ is used to describe a negative valence. These four constructs represent the adoption of different achievement goals. A pictorial example of this 2 x 2 framework can be seen in Figure 1 below.
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<tr>
<th>Definition</th>
<th>Absolute/Interpersonal (Mastery)</th>
<th>Normative (Performance)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valence</td>
<td></td>
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<tr>
<td></td>
<td>Positive (Approaching success)</td>
<td>Mastery-approach goal</td>
</tr>
<tr>
<td></td>
<td>Negative (Avoiding success)</td>
<td>Performance-avoidance goal</td>
</tr>
</tbody>
</table>

**Figure 1.** The 2 x 2 achievement goal framework (Elliot & McGregor, 2001).

A research conducted looking at goal orientation, motivational climate and subsequent use of coping strategies, found that individuals with greater task orientation and a perceived mastery climate engaged in more approach coping strategies such as putting in effort and seeking social support. On the other hand, individuals who had a greater ego orientation and perceived performance climate engaged in more avoidance coping strategies such as behavioural disengagement and venting of emotions (Ntoumanis et al., 1999). Hence it is apparent that various factors, such as one’s goal orientation and motivational climate, are able to affect how athletes cope with stress in their sport.

Nevertheless, athletes and coaches may be unaware of these factors and how they are able to affect the way athletes cope. Sometimes, athletes themselves are even unaware of their own use of coping strategies or are unable to utilise effective coping strategies. The bulk of research has been conducted on the dispositional entity of goal orientation, but lesser attention is given to the situation specific level of goal involvement (Ntoumanis, et al., 1999). Furthermore, in a meta-analysis of Elliot and McGregor’s 2 x 2 achievement goals and performance, findings were aligned with literature in that mastery and in particular, mastery approach goals resulted in desirable
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Motivational outcomes (Lochbaum & Gottardy, 2015). However, there was significant heterogeneity in performance approach and performance avoidance goals in relation to performance (Lochbaum & Gottardy, 2015). Moreover, how these achievement goals affect performance in different motivational climates remains to be seen. Therefore, there is a need to profile athletes in light of how their achievement goals and perceived motivational climates affect their coping responses. It is hoped that this can help them identify their coping strategies, and also be more intentional in their use of effective ones.

1.4 Coping Interventions

Due to the importance of being able to cope effectively with stress, there have been attempts to equip various groups of people to do so. Interventions in the area of coping have usually been conducted in a health setting (Kroese, Adriaanse, Vinkers, van de Schoot, & de Ridder, 2014; Phelps, Bennett, Hood, Brain, & Murray, 2013). These interventions were conducted with chronically ill patients suffering from various diseases, such as cancer (Antoni et al., 2001) and Human Immunodeficiency Virus (HIV; Chesney, Chambers, Taylor, Johnson, & Folkman, 2003), and were focused on improving quality of life for these patients or helping them to accept their chronic illness. That being said, coping interventions have been conducted in sports settings as well. In particular, two coping skills intervention programmes have gained prominence in literature, namely the Cognitive-Affective Stress Management Training (SMT; Smith, 1980) and the COPE intervention (Anshel, Gregory, & Kaczmarek, 1990). Both intervention programmes have been found to lead to improved performance, but they are also limited in their own ways (Reeves, Nicholls, & McKenna, 2011). This is because participants in these studies were not specifically taught to assess their level of
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stress controllability and direct coping strategies accordingly. Nor did these interventions teach athletes how to prompt social support (Reeves et al., 2011). In the light of intervention programmes, the most successful studies that have been found to help athletes cope with stress usually involve mental skills adoption (Sharp, Woodcock, Holland, Cumming & Duda, 2013; Taylor, Pham, Rivkin & Armor, 1998). The term ‘mental skills training’ (MST) was coined to describe cognitive-somatic techniques used to improve athlete performance competency (Blakeslee & Goff, 2007). MST is the use of tools and techniques aimed at enhancing naturally occurring daily activities and behaviours in a specific setting such as sport and exercise (Ashbrook, Gillham, & Barba, 2018; Weinberg & Gould, 2007). MST programmes have been observed to improve both the mental skills and sporting performance in athletes (Ashbrook et al., 2018; Davidson & Edwards, 2014). Specifically, imagery, relaxation and self-talk can be used to cope with competition stress, facilitate attentional control and also boost self-confidence (Vealey, 1988). Additionally, goal setting is also a mental skill that has been shown to influence the performance of athletes and also aid in their psychological states of motivation, anxiety and confidence (Gould, 2006). Moreover, these four strategies – imagery, relaxation, self-talk and goal setting, were found to be considered the most important psychological skills training strategies in a study conducted on Malaysian university soccer players (Sadeghi, Omar-Fauzee, Jamalis, Ab-Latif, & Cheric, 2010).

Therefore, the success of mental skills training on sports performance is evident over the years.

However, there is still a dearth of research looking at the positive effects of relaxation alone (Kudlackova, Eccles, & Dieffenbach, 2013). Despite being widely advocated in applied sports psychology, little is known about the relevance of relaxation to performance, the types of skill used, or how the athletes’ skill level affects its
COPING STRATEGIES OF TERTIARY ATHLETES IN SINGAPORE: THE INFLUENCE OF ACHIEVEMENT GOALS, MOTIVATIONAL CLIMATE AND A BRIEF RELAXATION INTERVENTION effectiveness (Kudlackova et al., 2013). Accordingly, how relaxation is able to affect performance under different achievement goals or perceived motivational climate is also relatively unknown. Through this study, how athletes use coping strategies and mental skills to cope will firstly be examined. By means of an intervention design, how the adoption of a brief relaxation technique as a mental skill (specifically relaxation techniques), coupled with achievement goals in different motivational climates can help one to cope more effectively will also be observed.

The skill of relaxation was specifically chosen for the intervention design to counter the negative effects of cognitive and somatic anxiety, both of which are common in competitions (Kais & Raudsepp, 2005). Cognitive anxiety refers to thought-related anxiety of worry, apprehension or negative expectations whilst somatic anxiety refers to physiological activation such as cold and clammy hands or butterflies in the stomach (Weinberg & Gould, 2015). Relaxation techniques such as progressive muscular relaxation (PMR) have previously been found to be effective in reducing both cognitive and somatic anxiety (Gill, Kolt, & Keating, 2004). Accordingly, researchers have suggested for somatic stress to be addressed through somatic-based relaxation and cognitive stress through cognitive-based relaxation (Pelka et al., 2017).

1.5 Coping Measurements

To determine the use of coping strategies and also the efficacy of a brief coping intervention, measuring tools are required. In the area of sports psychology, many different methods have been used to measure performance. One such method is the use of self-report questionnaires. The COPE questionnaire was used for this study as it has been widely used and revised (COPE; Carver, Scheier, & Weintraub, 1989). However, research has shown that subjective measurement tools have their own limitations, as
individuals are unable to accurately report their own levels of cognition (Nisbett & Wilson, 1977). Hence, objective research methodologies are needed to counteract such limitations. One such objective method is the use of neurophysiological measures, even though this is still a relatively new approach, it is becoming more important in recent years (Reinecke et al., 2011). Some of the technology used to measure neurophysiological measures are the electroencephalogram (EEG), near infra-red spectroscopy (NIRS), functional magnetic resonance imaging (fMRI), and bold magnetic resonance imaging (BOLD MRI). Neurophysiological measures are gaining popularity because such measures can help to give a more accurate gauge of the body’s responses. Nonetheless, advances in this area are slow as it is not possible to measure cortical activity out of the laboratory due to equipment limitations or movement artefacts (Reinecke et al., 2011). Specifically, traditional EEG measurements have to be conducted in a clinical setting, using invasive probes under the skull, or wet-gel electrodes arrayed over the scalp (Chang, Nguyen, Wang, & Johnson, 2013). This restricts the applicability of findings from a clinical setting to the field setting as the environment in the latter is not as controlled (Reinecke et al., 2011; Riley et al., 2008).

In recent years, NeuroSky, a manufacturer utilising brain-computer interface (BCI) technologies for consumer product applications, created the BrainWave starter kit utilising NeuroSky MindWave EEG headsets (NeuroSky, 2011) to simplify neurological measurements. These devices make use of BCI technology, which operates on the basis of creating a direct communication pathway between the brain and the various non-invasive, wearable devices. Results are then translated into easily interpretable values. The portability of these devices also means that they can be used in various ways and in different settings. BCI systems have primarily focused on helping disabled people through neural prostheses to restore damaged hearing, sight, and
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movement so that they can interact with their environment (Robbins & Stonehill, 2014).

However, more recent use of BCI involves application in video games or mind-controlled cars.

Given the current lack of understanding regarding the usability of the NeuroSky MindWave EEG headset, it is timely to observe the feasibility of the NeuroSky MindWave in place of more traditional methods to obtain neurophysiological measurements especially in the context of sport, due to its mobility and non-invasive nature. Furthermore, coping research has traditionally utilised self-report measures when collecting results from athletes. As such, using a more objective form of measurement could provide more information on the coping phenomenon, and possibly help with the design of future coping intervention programs.

1.6 Justification and Purpose

Corresponding to the increasing emphasis on improving performance in sports, there is a growing need to explore how the coping strategies of athletes can help improve their sporting prowess. Literature has shown that the ability to cope effectively with stress leads to favourable athletic performance (Reeves et al., 2011). Specifically, athletes who perceive feeling multiple stressors perform significantly worse than those who do not (Anshel, 1990). This highlights the need for effective coping interventions, which have been shown to improve the use of coping strategies and consequently, positively influence performance (Anshel & Anderson, 2002).

This thesis therefore seeks to bridge the gap between literature on coping strategies and the efficacy of a coping intervention. Coping strategies adopted by Singapore tertiary athletes will be examined, and more specifically, the effectiveness of
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relaxation techniques when paired to athletes’ achievement goals and perceived motivational climates will be explored using both subjective and objective measures.

1.7 Statement of the Study

Three studies were conducted to a) explore the use of coping strategies by athletes and, b) to determine the efficacy of brief coping interventions catered to their achievement goals and perceived motivational climates. The first study looked at investigating the factor structures of the COPE inventory to further understand the coping phenomenon in an Asian context. This is a novel study because the area of coping in sport is relatively new in Singapore. The closest studies done in the sport context looked at reactive stress tolerance in elite athletes (Ong, 2017) as well as the effect of mental skills training on competition anxiety in schoolboy rugby players (Ong & Griva, 2017). Hence it is not surprising that the COPE inventory is rarely used in Singapore, especially in sport. A previous study investigated the coping strategies of police officers in Singapore using the COPE inventory (Bishop et al., 2001). Therefore, few studies have been conducted using the COPE inventory in an Asian population and even fewer if any were conducted in sport. Yet, the questionnaire may not be fully relevant in Singapore, as it was developed in a Western context. Moreover, Eastern and Western cultures contain different characteristics that would in turn influence the use of coping strategies. Therefore, CFA was run to determine construct validity as well as model fit of the questionnaire to local athletes and determine if it has a suitable factor structure for our population. The sample for this study comprised athletes from tertiary institutions who engaged in various sports. Targeting these athletes spanning across various sports (and not restricting the sample to one single sport) helped to paint a clearer picture of this relatively fresh area of research in Singapore. This also ensured
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There was a reasonable amount of representation from real sports settings. Additionally, by having a variety of sports, trends in coping strategies across sports were also observed.

The second study further explored the stress process of athletes in Singapore. How achievement goals and motivational climate affected the adoption of mental skills and use of coping strategies in athletes were investigated using both qualitative and quantitative measures. Athletes were first given self-report questionnaires based on the constructs being examined. Other antecedents influencing athletes’ use of coping strategies were later examined using a qualitative study design. Participants were selected based on their questionnaire responses to ensure an even representation across their goal orientations, perceived motivational climates, use of mental skills and also coping strategies. Semi-structured interviews were conducted individually with them. How these athletes coped in stressful situations and the consequent efficacy of coping strategies were assessed in greater detail. It is hoped that the results obtained from this study can contribute to a more holistic understanding of the stress process – from the appraisal of stress to the delivery of a coping response translated into performance, ultimately benefitting athletes in Singapore.

For the third study, a laboratory-based experiment was conducted to determine how mental skills training in the form of relaxation techniques, when paired with achievement goals in different motivational climates could help individuals cope more effectively with stress. Previous studies elucidating anxiety and coping have not been conducted using objective measurements. On the other hand, self-report measures and interviews are inherently limited as subjective measures. As such, a healthy balance was achieved through this study to obtain more accurate results via an objective-subjective
COPING STRATEGIES OF TERTIARY ATHLETES IN SINGAPORE: THE INFLUENCE OF ACHIEVEMENT GOALS, MOTIVATIONAL CLIMATE AND A BRIEF RELAXATION INTERVENTION approach. Before the experiment, participants were assessed on their 2 x 2 achievement goals through the use of a self-report questionnaire. They were then invited to participate in a golf-putting task. Participants were randomly allocated into three conditions; namely performance, mastery and control. Those in both the performance and mastery conditions were given a short training session on the mental skill of relaxation. Participants were all given one practise trial and one actual trial, with 10 chances to put within each trial. Their anxiety levels were measured at the start and end of the experiment. Upon completion of the experiment, participants were questioned about their actual goal intention during the experiment. Next, as mentioned above, the objective element lies in comparing these results with the participants’ attention and concentration levels obtained from the NeuroSky MindWave EEG Headset (NeuroSky, 2011). The aim of this experiment was a) to observe the relationship between achievement goals and perceived task competence with relaxation techniques, and b) to investigate which motivational climate resulted in the most effective use of coping, when matched with one’s achievement goal adoption.

1.8 Significance

Results from this study can contribute to research on coping in sports and give deeper insights with regard to helping athletes cope better. Investigating the factors and efficacy behind the use of coping strategies has the potential of helping to advance research in, and the development of, coping interventions. Moreover, mental skills have always been taught together at a general level, but not so much at an individual one (Kudlackova et al., 2013). By looking at how relaxation techniques can affect coping from a dispositional and situational level, can help tailor more effective coping strategies for athletes in future. Finally, as previous studies have been conducted using
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only subjective data, the proposed objective-subjective method of measuring data promises a more accurate and precise means of measuring data in sports psychology.

1.9 Overview

The ensuing six chapters in this thesis will proceed to describe the research background, the research study, the methods used and the findings of the study in greater detail. In Chapter 2, a literature review will be provided in the areas of the stress process, coping, measurements of coping strategies, the Achievement Goal Framework, as well as brief intervention strategies. Chapter 3 will then proceed to thoroughly explain results from the psychometric testing of the COPE inventory. Chapter 4 illustrates the relationship among dispositional and situational factors, with the use of mental skills and one’s coping strategies. Further insight to the coping process, obtained from the in-depth qualitative interview sessions, is elaborated in Chapter 5. Following which, Chapter 6 investigates the feasibility of a coping intervention, through the novel use of objective measures paired with subjective ones. The final chapter of this thesis then summarises the main findings of all three studies, discusses their contributions as well as implications and proposes future research directions.
Chapter 2: Literature Review

This chapter will cover an overview of stress and coping strategies, as well as the current ways of measuring coping. The concept of stress and the need for coping strategies will first be presented, with an emphasis on the various frameworks of coping. Factors behind the use of coping strategies will also be explored and explained. As the importance of coping is highlighted in sports performance, brief coping interventions as well as the different ways of measuring coping strategies and their effectiveness will also be discussed and evaluated. Hence, the literature review will be presented with six main sections, namely: a) Overview of Stress and Coping; b) Factors behind the Use of Coping; c) Achievement Goal Framework; d) Coping Interventions; e) Neurophysiological Measures and f) Summary.

The first section will look deeper into the presence of stress and its debilitating effect on sports performance. Thereafter, the need to be able to cope with such stress in sports will be emphasised, and the different coping frameworks will be presented. The subsequent section will introduce various factors and how they are able to affect the way athletes’ cope with stress. Particular emphasis will be placed on Elliot and McGregor’s (2001) achievement goal framework and also the impact of one’s motivational climate. Specifically, how achievement goals and motivational climate affect the use of coping strategies and the adoption of mental skills will be examined. The role of brief coping interventions and their efficacy will then be assessed. The penultimate section looks at the different forms of neurophysiological measurements and advancements in the field of sport science. Finally, this chapter will conclude by pointing out existing research gaps and discussing the purpose of this research and the research questions to be examined.
Northern Irish professional golfer Rory McIlroy, the first-round leader at the 2011 Masters said, “You’re always going to be nervous teeing it up in a Major Championship. It’s very natural and it’s a good thing. It means that you want it.” Therefore, it is indeed normal that athletes get stressed during competitions, as this is the moment they have been training months, and even years for. Unlike trainings, where mistakes are encouraged because one can then learn from them, competitions do not allow for errors to be made. It is because of this pressure to not make mistakes, coupled with the knowledge that everyone is watching, which place athletes under demanding and highly pressurising situations, requiring them to be able to cope with these stressors in order to become professional sportsman (Holt & Dunn, 2004). Consequently, the inability to cope effectively with stress leads to athletes being unable to perform according to their peak potential (Lazarus, 2000).

In 1966, Lazarus identified three processes in stress, namely the primary appraisal, secondary appraisal, and the coping response. During the primary appraisal, the individual considers the personal significance of a situation with regards to his or her own values, personal beliefs, situational intentions, and goal commitments. Interpretation of the situation can happen in three ways: (a) irrelevant, no implications for well-being; (b) benign/positive, where demands of the task are perceived as not threatening and it is possible to preserve or enhance well-being; and (c) stressful, where the demands of the task are perceived to threaten well-being. The secondary appraisal is a cognitive-evaluative process, which aims to minimise harm, or maximise gains through coping responses. It involves purposeful evaluations of cognitive, affective, and behavioural efforts to manage a stressor (Lazarus, 1999). Upon appraisal of stress,
Coping options and resources may then include social, physical, psychological, and material assets (Lazarus & Folkman, 1984). Specifically, people who are healthy would be able to cope better, as would people who view themselves positively, have problem-solving skills, social skills, social support, and material resources such as money (Lazarus & Folkman, 1984). There are three important factors to consider in the conceptualisation of coping (Schwarzer & Schwarzer 1996). Firstly, coping need not be a completed act, but an effort has to be made. Secondly, this effort need not be expressed in actual behaviour, but can be directed to cognition as well. Thirdly, a cognitive appraisal of the taxing situation is a prerequisite of initiating coping attempts. However coping responses will only be required for situations perceived as stressful, and situations perceived as positive or benign do not require coping responses (Anshel & Delany, 2001).

The process through which individuals interpret and assess stressful situations is known as cognitive appraisal (Devonport & Lane, 2006). Cognitive appraisal has been defined as the process whereby a person evaluates whether a specific interaction with the environment is relevant to his or her wellbeing, and if so, in what ways (Folkman, Lazarus, Dunkel-Schetter, DeLongis, & Gruen, 1986). Cognitive appraisal is influenced by personal factors, environmental demands, constraints, and opportunities (Lazarus & Folkman, 1984). Therefore, this interaction between a person and the environment causes the appraisal of stress and the resultant coping strategies to be seen as a process; a transaction between person and event, that plays out over time and changing circumstances (Lazarus, 1993). In order to explain how individuals cope with stress, Lazarus and Folkman (1984) presented the Transactional Model of Stress and Coping, which contends that stress is neither in the environment, nor in the person, but a product of their interplay. This means that stress is a result of a person’s interaction and...
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evaluation of his or her environment. Due to the complexity of the relationship between stress and coping, Frederikson and Dewe (1996) came up with an expanded view of this transactional process. They contended that the relationship between perceived stress and resultant coping behaviour involves elements of individual differences, stressor characteristics, cultural factors and the availability of certain resources (Frederikson & Dewe). Tension or emotional discomfort is included as it is generally assumed to accompany the stress process, although its role is yet to be adequately determined (Frederikson & Dewe). Moreover, how individuals give meaning to an event – meaning how important they view the situation and the feelings it arouses, was more important in contributing to the eventual response as compared to the stressor itself (Frederikson & Dewe). As the different phases of the transaction result in different coping reactions, repeated measures are required so that changing, as well as relatively stable variables can be identified in this process of determining stress appraisal and resultant coping strategies (Lazarus, 1999).

The notion of stress is especially prevalent in the field of sports. As competitions themselves are a constant source of stress, acute stress is more commonly found in sports, as opposed to chronic stress. Acute sport-related stress occurs when an athlete is abruptly faced with an unpleasant input (Anshel et al., 1990). Some forms of acute stress can be physical, as evidenced in contact sports, however most forms of acute sport-related stress are psychological in nature (Anshel et al., 1990). Hence, more research is required in developing cognitive strategies to help an athlete cope with such forms of stress. This can then lead to the maintenance of emotional, psychological and physical well-being, so as to ensure continued performance in competition.
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How stress affects sporting performance, and hence the relationship between anxiety and performance, has long been an area of interest in research. Several theoretical explanations have been proposed over the years to explain this important relationship, such as the drive theory (Hull, 1943; Spence & Spence, 1966), the multidimensional anxiety theory (Burton, 1988; Davidson & Schwartz, 1976; Martens, Burton, Vealey, Bump, & Smith, 1990), as well as individual zones of optimal functioning (IZOF; Hanin, 2000). From the vast array of studies conducted in this area, it can be seen that there is a strong link between anxiety and performance, and anxiety has often proven to be debilitating when an athlete is unable to cope with it.

The process of coping commences upon the appraisal of a stressful event or stimulus. After the initial appraisal of stress, athletes’ use of coping strategies follow, finally ending off with athletes’ thoughts and actions following the use of coping strategies, known as post-coping activity (Figure 2). As can be seen in the model below, coping is categorized into approach and avoidance dimensions, as well as behavioural and cognitive sub-dimensions, a structure that is increasingly popular in the general psychology literature.

![Coping Process Model](image)

**Figure 2.** A model of the coping process in sport. Adapted from Anshel, Kim, Kim, Chang, & Eom (2001).
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This model of the coping process in sport was tested using a qualitative design on 28 Australian Rugby League players from New South Wales, Australia (Anshel, 2001). Structured personal interviews confirmed athletes’ utilisation of both approach and avoidance coping dimensions, together with the use of three categories of post-coping activities – remaining on task, assessing coping effectiveness, and cognitive reappraisal.

2.1.1 Coping Strategies.

Due to the importance of understanding how athletes cope, research over the years has looked into coping strategies, and how to categorise them. Researchers have taken two directions in the area of coping, namely, coping styles and coping strategies (Anshel & Anderson, 2002). Coping style is dispositional, meaning it involves an individual’s preference or tendency to use a certain type, or category, of coping in response to acute stress (Anshel, 1996; Roth & Cohen, 1986). The second direction involves the identification of coping strategies, which is a state measure that reflects a person’s use of coping responses, following acute stress. When measuring coping styles, Anshel (1996), as well as Anshel, Williams and Hodge (1997), asked athletes how they usually responded to selected stressors in sport, similar to figuring out their trait anxiety. On the other hand, to measure coping strategy, Gould et al. (1993a) asked referees and athletes to identify their actual use of coping strategies at specific times before and during the game, similar to identifying state anxiety. Coping style research has also suggested paying attention to and obtaining athletes’ actual use of coping strategies in response to stressful events (Monat and Lazarus, 1991). Therefore, although one’s coping style could give an indication of the eventual coping strategy
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used, the athlete’s actual use of coping strategies at specific time points should still be ultimately identified.

In 1980, Lazarus and Folkman developed a measure that identifies two general types of coping, where one is the ability to manage or change the problem causing the stress (problem-focused coping), and the other involves regulating one’s emotional response to the stressor (emotion-focused coping). An example of problem-focused coping would be when an athlete starts losing consecutive points in a match and decides to try another tactic. Conversely, emotion-focused coping focuses on altering the emotional response of the stressor by reinterpreting the event, such as re-interpreting a stressful competition as an exciting opportunity to be challenged. Subsequently, Tobin, Holroyd, Reynolds and Wigal (1989) distinguished coping into two factors called engagement and disengagement coping. Engagement coping involves active efforts to manage the situation, and also deal with emotional responses to the stressor. On the other hand, disengagement coping involves behaviours that avoid the stressful situation, and strategies to avoid thinking about the stressor. Various other categories of coping have evolved in literature over the years. However, of all these categories, the approach and avoidance framework has been increasingly used in recent years, to further understand the coping phenomena.

Approach coping strategies reflect the intensified intake and processing of unpleasant or threatening information (Anshel, 2001). Approach coping strategies are used to improve one’s control in a stressful situation or improve one’s resourcefulness when dealing with it (Roth & Cohen, 1986). This can take the form of thoughts (approach-cognitive coping), such as planning or analysing, or can be seen through actions (approach-behavioural coping), such as asking for information or confrontation.
COPING STRATEGIES OF TERTIARY ATHLETES IN SINGAPORE: THE INFLUENCE OF ACHIEVEMENT GOALS, MOTIVATIONAL CLIMATE AND A BRIEF RELAXATION INTERVENTION (Holahan, Moos, Holahan, & Penny, 1996). Approach coping is usually preferred when the athlete views the situation as controllable, is aware of the source of stress, is receptive to discussing the situation, has good communication skills, has sufficient time to resolve or attend to the issue, will be disadvantaged at failing to resolve the issue, or has confidence in his or her ability to solve the problem (Roth & Cohen, 1986).

On the other hand, avoidance coping strategies reflect a conscious attempt at physically or mentally keeping away from the source of stress (Krohne, 1996), which allows the athlete to remain focused on the task at hand. However, there are different objectives of using avoidance coping, depending on the situation (Anshel, 2001). Avoidance coping involves avoiding behaviours (avoidance-behavioural coping), or strategies to avoid thinking (avoidance-cognitive coping) about the perceived threat and includes repression, rejection, selective inattention, disengagement, blunting, and reducers (Anshel, 2001). Roth and Cohen (1986) have suggested that avoidance coping is preferred when the situation is uncontrollable, emotional resources are limited, the person must deal with a great amount of information very quickly, the source of stress is unclear, the outcome measures are immediate or short-term, more time is needed but unavailable to assimilate stressful information, or there is little chance of resolving the stressful issue.

An athlete’s use of coping strategies has psychological impact on him/her (Nicholls & Polman, 2007). Specifically, athletes who reported greater use of emotion-focused and avoidance coping also experienced greater cognitive anxiety (Ntoumanis & Biddle, 2000). In a similar vein, emotion-focused coping predicted more negative affect whilst problem-focused coping predicted more positive affect (Nicholls & Polman, 2007).
2.1.2 Coping Measurements.

As coping is essential to help an athlete control anxiety levels, it is necessary to be able to objectively observe and measure coping strategies used by athletes. More importantly, these strategies used have to be effective for athletes to maintain performance levels. Hence, this section will examine different ways of measuring the use of coping strategies as well as the effectiveness of these strategies. In recent years, several researchers have devoted empirical attention to the strategies used by athletes to manage the stressful demands, present in their respective sports (Gaudreau & Blondin, 2002). As a result, different ways of measuring coping have evolved over the years.

Firstly, one way of measuring coping is by measuring one’s level of anxiety. As coping is only brought about after the onset of anxiety, effective coping would result in a decrease in anxiety level between the onset of stress appraisal and after utilising coping strategies. Researchers have looked at a range of physical and physiological measures, as well as self-report scales in terms of anxiety identification. With regards to physiological measures, Baron and colleagues (1992) have used catecholamine excretion from urine, and heart rate, as measurements for psychophysical stress in sport. On the other hand, various self-report measures have also been developed such as the Sport Competition Anxiety Test (SCAT), and also the Competitive State Anxiety Inventory-2 (CSAI-2) (Martens, 1977; Martens et al., 1990). Later, the CSAI-2 was revised to develop a scale with stronger psychometric properties (Cox, Martens & Russell, 2003). The Competitive State Anxiety Inventory-2 Revised (CSAI-2R) was found to have a good data fit to the model based on confirmatory factor analysis (CFA) results (CFI= .95, RMSEA= .054), and was suggested to be used to measure competitive state anxiety in athletes instead of the CSAI-2 (Cox et al., 2003). All these
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measures are able to give a rough estimate of the type of anxiety an athlete has and are also able to predict state anxiety levels. Coping effectiveness can then be determined by looking at how effective a particular strategy is in lowering anxiety levels.

A second way of measuring coping is by looking at the use of coping strategies. Due to the importance of qualitative analysis in examining the process of coping in sport (Crocker, Kowalski, & Graham, 1998), a number of studies in sport psychology have made use of a qualitative research design (Anshel, 2001; Gould et al., 1993a; Gould et al., 1993b). This is because interview questions are able to clarify the personal and situational factors, which may influence the choice of coping methods (Crocker et al., 1998). Furthermore, using qualitative methods allows the researcher to understand the coping process from the athlete’s perspective, which is essential, particularly in sport where so little is known about the coping process (Crocker et al., 1998).

Nonetheless, researchers have also developed a whole range of coping scales, all designed to investigate the different coping strategies utilised by athletes, in an attempt to understand the coping phenomenon.

COPE inventory. The COPE inventory (Carver et al., 1989) is one example of a coping scale, and it was developed to measure a vast spectrum of coping responses. The inventory includes both dysfunctional as well as functional responses. The items have been used in three formats – a trait-like version in which respondents indicate how likely they are to respond in a particular way when they are stressed, a time-limited version where respondents indicate how they responded to stress during a particular time in the past, and a time-limited version where respondents indicate how they have been responding from a particular time up to the present. The full COPE inventory consists of 60 items, and 15 different scales. These 15 different scales are positive.
reinterpretation and growth (e.g., “I try to grow as a person as a result of the experience”), mental disengagement (e.g., “I sleep more than usual”), focus on venting of emotions (e.g., “I get upset and let my emotions out”), use of instrumental social support (e.g., “I try to get advice from someone about what to do”), active coping (e.g., “I take direct action to get around the problem”), denial (e.g., “I pretend that it hasn’t really happened”), religious coping (e.g., “I put my trust in God”), humour (e.g., “I laugh about the situation”), behavioural disengagement (e.g., “I give up the attempt to get what I want”), restraint (e.g., “I restrain myself from doing anything too quickly”), use of emotional social support (e.g., “I discuss my feelings with someone”), substance use (e.g., “I use alcohol or drugs to make myself feel better”), acceptance (e.g., “I get used to the idea that it happened”), suppression of competing activities (e.g., “I keep myself from getting distracted by other thoughts and activities”), and planning (e.g., “I make a plan of action”). The items are scored on a four-point Likert scale, where participants respond to how often they used different strategies to cope with stress (1= I usually don’t do this at all, to 4= I usually do this a lot). All these responses fall into three categories as proposed by Zuckerman and Gagne (2003) – problem-focused coping (e.g. active coping, planning), seeking social support (e.g. instrumental, emotional), and emotion-focused coping (e.g. venting of emotions). The 15 different scales of the COPE inventory and all their respective items are also presented in Table 1 below. Previously the COPE inventory has also been used extensively in clinical and health settings (Pang, Strodl & Oei, 2013), on alcoholic populations (Aarstad, Aarstad & Olofsson, 2007), and also on cancer patients (Scrignaro, Barni, & Magrin, 2011).

 Despite the popularity of the COPE inventory, and it being recommended by several authors as the measure of coping strategies (Gould et al., 1993a; Hardy et al., 1996), coping research has found it hard to utilise this questionnaire due to its length.
COPING STRATEGIES OF TERTIARY ATHLETES IN SINGAPORE: THE INFLUENCE OF ACHIEVEMENT GOALS, MOTIVATIONAL CLIMATE AND A BRIEF RELAXATION INTERVENTION (Carver, 1997). Accordingly, critics of the COPE inventory have suggested that its original subscale analysis is highly unstable (Lyne & Roger, 2000). Some of the reasons for this instability include extracting too many factors with poor reliability, the number of items in each scale, the low scale reliabilities, and ignoring several factor analytic conventions in the original factor analysis (Lyne & Roger, 2000). Hence, over the years there have been further modifications made by several other researchers, to better utilise the questionnaire.

Table 1
List of Scales and Items in COPE Inventory

<table>
<thead>
<tr>
<th>Subscale</th>
<th>Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive Reinterpretation and Growth</td>
<td>I try to grow as a person as a result of the experience</td>
</tr>
<tr>
<td></td>
<td>I try to see if in a different light, to make it seem more positive</td>
</tr>
<tr>
<td></td>
<td>I look for something good in what is happening</td>
</tr>
<tr>
<td></td>
<td>I learn something from the experience</td>
</tr>
<tr>
<td>Mental Disengagement</td>
<td>I turn to work or other substitute activities to take my mind off things</td>
</tr>
<tr>
<td></td>
<td>I daydream about things other than this</td>
</tr>
<tr>
<td></td>
<td>I sleep more than usual</td>
</tr>
<tr>
<td></td>
<td>I go to movies or watch TV, to think about it less</td>
</tr>
<tr>
<td>Focus on Venting of Emotions</td>
<td>I get upset and let my emotions out</td>
</tr>
<tr>
<td></td>
<td>I get upset, and am really aware of it</td>
</tr>
<tr>
<td></td>
<td>I let my feelings out</td>
</tr>
<tr>
<td></td>
<td>I feel a lot of emotional distress and I find myself expressing those feelings a lot</td>
</tr>
<tr>
<td>Use of Instrumental Social Support</td>
<td>I try to get advice from someone about what to do</td>
</tr>
<tr>
<td></td>
<td>I talk to someone to find out more about the situation</td>
</tr>
<tr>
<td></td>
<td>I talk to someone who could do something more concrete about the problem</td>
</tr>
<tr>
<td></td>
<td>I ask people who have had similar experiences what they did</td>
</tr>
<tr>
<td>Active Coping</td>
<td>I concentrate my efforts on doing something about it</td>
</tr>
<tr>
<td></td>
<td>I take additional action to try to get rid of the problem</td>
</tr>
<tr>
<td></td>
<td>I take direct action to get around the problem</td>
</tr>
<tr>
<td></td>
<td>I do what has to be done, one step at a time</td>
</tr>
<tr>
<td>Denial</td>
<td>I say to myself “this isn’t real”</td>
</tr>
<tr>
<td></td>
<td>I refuse to believe that it has happened</td>
</tr>
<tr>
<td></td>
<td>I pretend that it hasn’t really happened</td>
</tr>
<tr>
<td></td>
<td>I act as though it hasn’t even happened</td>
</tr>
<tr>
<td>Religious Coping</td>
<td>I put my trust in God</td>
</tr>
<tr>
<td></td>
<td>I seek God’s help</td>
</tr>
<tr>
<td></td>
<td>I try to find comfort in my religion</td>
</tr>
<tr>
<td></td>
<td>I pray more than usual</td>
</tr>
<tr>
<td>Humour</td>
<td>I laugh about the situation</td>
</tr>
<tr>
<td></td>
<td>I make jokes about it</td>
</tr>
<tr>
<td></td>
<td>I kid around about it</td>
</tr>
<tr>
<td></td>
<td>I make fun of the situation</td>
</tr>
<tr>
<td>Behavioural Disengagement</td>
<td>I give up the attempt to get what I want</td>
</tr>
<tr>
<td></td>
<td>I just give up trying to reach my goal</td>
</tr>
<tr>
<td></td>
<td>I admit to myself that I can’t deal with it, and quit trying</td>
</tr>
<tr>
<td></td>
<td>I reduce the amount of effort I’m putting into solving the problem</td>
</tr>
<tr>
<td>Restraint</td>
<td>I restrain myself from doing anything too quickly</td>
</tr>
<tr>
<td></td>
<td>I hold off doing anything about it until the situation permits</td>
</tr>
</tbody>
</table>
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<table>
<thead>
<tr>
<th>Use of Emotional Support</th>
</tr>
</thead>
<tbody>
<tr>
<td>I make sure not to make matters worse by acting too soon</td>
</tr>
<tr>
<td>I force myself to wait for the right time to do something</td>
</tr>
<tr>
<td>I discuss my feelings with someone</td>
</tr>
<tr>
<td>I try to get emotional support from friends or relatives</td>
</tr>
<tr>
<td>I get sympathy and understanding from someone</td>
</tr>
<tr>
<td>I talk to someone about how I feel</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Substance Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>I use alcohol or drugs to make myself feel better</td>
</tr>
<tr>
<td>I try to lose myself for a while by drinking alcohol or taking drugs</td>
</tr>
<tr>
<td>I drink alcohol or take drugs, to think about it less</td>
</tr>
<tr>
<td>I use alcohol or drugs to help me get through it</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Acceptance</th>
</tr>
</thead>
<tbody>
<tr>
<td>I get used to the idea that it happened</td>
</tr>
<tr>
<td>I accept that this has happened and that it can’t be changed</td>
</tr>
<tr>
<td>I accept the reality of the fact that it happened</td>
</tr>
<tr>
<td>I learn to live with it</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Suppression of Competing Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>I keep myself from getting distracted by other thoughts and activities</td>
</tr>
<tr>
<td>I focus on dealing with this problem, and if necessary, let other things slide a little</td>
</tr>
<tr>
<td>I try hard to prevent other things from interfering with my efforts at dealing with this</td>
</tr>
<tr>
<td>I put aside other activities in order to concentrate on this</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Planning</th>
</tr>
</thead>
<tbody>
<tr>
<td>I make a plan of action</td>
</tr>
<tr>
<td>I try to come up with a strategy about what to do</td>
</tr>
<tr>
<td>I think about how I might best handle the problem</td>
</tr>
<tr>
<td>I think hard about what steps to take</td>
</tr>
</tbody>
</table>

Looking at CFA conducted on the COPE questionnaire in a sample of community drinkers and alcohol dependent individuals, it appears that there are acceptable fit indices for a 14-factor model (without the religion subscale), and also a three-higher-order-factors model with task-coping, emotion-coping, and avoidance-coping as the three factors (Table 2). A shorter version of the COPE inventory, the Brief COPE, has previously been utilized to look at coping strategies in various settings, such as in sports (Kristiansen et al., 2008). Carver (1997) developed the brief version of the full COPE inventory to enable the COPE inventory to be better used for research. This brief version consists of 14 scales, with two items per scale, for a total of 28 items. In the brief COPE, the following scales, positive interpretation and growth, behavioural disengagement, suppression of coping activities, and planning, are replaced by self-distraction, self-blame and positive reframing. In developing the brief COPE, an exploratory factor analysis (EFA) was conducted with an oblique rotation to permit correlations among factors. This analysis yielded nine factors with eigenvalues greater
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than 1.0, which together accounted for 72.4% of the variance in responding (Carver, 1997). Furthermore, in a reliability analysis conducted on the brief COPE, it was also found that despite the scales having only two items each, all their reliabilities met or exceeded the marginally satisfactory value of 0.50 (Nunnally, 1978). In fact, all exceeded 0.60 with the exceptions of the three subscales Venting, Denial and Acceptant (Carver, 1997). However, in a CFA conducted on the Brief COPE in a population of people with HIV, analyses showed poor goodness of fit to the data (Su et al., 2015). Therefore, caution is needed when using questionnaires in various populations and cultures as factor structure may differ (Su et al., 2015).

Despite being extensively used to explore coping in various populations, both the COPE inventory and Brief COPE, have also undergone statistical scrutiny. However, the questionnaire constructs of especially the COPE inventory when applied to athletes in Asia have not been subjected to thorough factor validation. A breakdown of CFA test statistics from past studies for both questionnaires are shown in Table 2 below.

Table 2
Test Statistics for Confirmatory Factor Analyses on COPE and Brief COPE

<table>
<thead>
<tr>
<th>Questionnaire</th>
<th>Study</th>
<th>Sample</th>
<th>Model</th>
<th>(\chi^2)</th>
<th>CFI</th>
<th>RMSEA</th>
</tr>
</thead>
<tbody>
<tr>
<td>COPE</td>
<td>Hasking &amp; Oei, 2002</td>
<td>Community drinkers</td>
<td>14 primary factors with 49 items</td>
<td>1,601.85</td>
<td>0.931</td>
<td>0.43</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Three higher order factors</td>
<td>1,838.59</td>
<td>0.910</td>
<td>0.48</td>
</tr>
<tr>
<td>Brief COPE</td>
<td>Monzani et al., 2015</td>
<td>General male population</td>
<td>14-factor structure</td>
<td>460.662</td>
<td>0.965</td>
<td>0.036</td>
</tr>
<tr>
<td>Brief COPE</td>
<td>Su et al., 2015</td>
<td>Three-factor structure</td>
<td></td>
<td>2382.16</td>
<td>0.74</td>
<td>0.15</td>
</tr>
</tbody>
</table>
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People living with HIV

<table>
<thead>
<tr>
<th>Two-factor</th>
<th>2315.62</th>
<th>0.74</th>
<th>0.15</th>
</tr>
</thead>
</table>

*All $\chi^2$ statistics were significant at $p < .001$. \(^b\)Comparative Fit Index. \(^c\)Root Mean Squared Error of Approximation.

Further modifications have also been made to the original COPE inventory. In 2000, Stanton, Kirk, Cameron and Danoff-Burg modified the COPE scale, and added two sub-scales to it – emotional processing and emotional expression. The total 94 coping items were subjected to a maximum likelihood factor analysis with promax rotation to allow factors to be correlated. This resulted in a nine-factor solution, indicated by eigenvalues greater than 3.0. Five of the scales were deleted, namely mental disengagement, instrumental social support, emotional social support, substance abuse, and the suppression of competitive activities. Additionally, Zuckerman and Gagne (2003) have also proposed a revised version of the COPE inventory (R-COPE), consisting of ten subscales from the original COPE, seven new subscales, and one modified subscale. Reliability tests were conducted on the new R-COPE, and sub-scales were found to be adequate, ranging from 0.81 to 0.92 (Zuckerman & Gagne, 2003). The analyses resulted in five factors with eigenvalues greater than 1.0, accounting for 61.1% of the variance. This resultant version of the inventory consists of 40 items, with five different subscales. These five subscales are self-help, approach, accommodation, avoidance, and self-punishment. The religion scale in the original COPE inventory was also rejected in other factor analyses of the inventory due to low reliability (Lyne & Roger, 2000). Endler and Parker (1990) also proposed a three-factor model in their Multidimensional Coping Inventory (MCI) based on the original COPE, where the factors are task, emotional and avoidance coping. On the other hand, Roger, Jarvis and Najarian (1993) extracted four factors – problem solving, emotion, avoidance and
detachment, in their Coping Styles Questionnaire (CSQ). All these different results found in validating all the different coping measures could be due to the fact that coping is a non-exhaustive and diverse process (Carver et al., 1989). Table 3 presents a breakdown of the sub-scales of some of the different versions of the COPE questionnaire, and their corresponding reliability values.

Table 3
Cronbach’s Alpha Reliability Values for Various Coping Scales

<table>
<thead>
<tr>
<th>Scale</th>
<th>Sub-scales</th>
<th>α</th>
</tr>
</thead>
<tbody>
<tr>
<td>COPE Scale</td>
<td>Active Coping</td>
<td>.62</td>
</tr>
<tr>
<td></td>
<td>Planning</td>
<td>.80</td>
</tr>
<tr>
<td></td>
<td>Suppression of competing activities</td>
<td>.68</td>
</tr>
<tr>
<td></td>
<td>Restraint coping</td>
<td>.72</td>
</tr>
<tr>
<td></td>
<td>Seeking social support – instrumental</td>
<td>.75</td>
</tr>
<tr>
<td></td>
<td>Seeking social support – emotional</td>
<td>.85</td>
</tr>
<tr>
<td></td>
<td>Positive interpretation &amp; growth</td>
<td>.68</td>
</tr>
<tr>
<td></td>
<td>Acceptance</td>
<td>.65</td>
</tr>
<tr>
<td></td>
<td>Turning to religion</td>
<td>.92</td>
</tr>
<tr>
<td></td>
<td>Focus on venting of emotions</td>
<td>.77</td>
</tr>
<tr>
<td></td>
<td>Denial</td>
<td>.71</td>
</tr>
<tr>
<td></td>
<td>Behavioural disengagement</td>
<td>.63</td>
</tr>
<tr>
<td></td>
<td>Mental disengagement</td>
<td>.45</td>
</tr>
<tr>
<td></td>
<td>Alcohol-drug disengagement</td>
<td>.31</td>
</tr>
<tr>
<td>Brief COPE</td>
<td>Active coping</td>
<td>.68</td>
</tr>
<tr>
<td></td>
<td>Planning</td>
<td>.73</td>
</tr>
<tr>
<td></td>
<td>Positive reframing</td>
<td>.64</td>
</tr>
<tr>
<td></td>
<td>Acceptance</td>
<td>.57</td>
</tr>
<tr>
<td></td>
<td>Humour</td>
<td>.73</td>
</tr>
<tr>
<td></td>
<td>Religion</td>
<td>.82</td>
</tr>
<tr>
<td></td>
<td>Using emotional support</td>
<td>.71</td>
</tr>
<tr>
<td></td>
<td>Using instrumental support</td>
<td>.64</td>
</tr>
</tbody>
</table>
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| Self-distraction | .71 |
| Denial          | .54 |
| Venting         | .50 |
| Substance use   | .90 |
| Behavioural disengagement | .65 |
| Self-blame      | .69 |

More importantly, most of these instruments have not considered differences relating to gender, ethnicity, or differences in age during the conceptualisation of these coping inventories (Nicholls & Polman, 2007). Therefore, it is unclear whether the factor structure or reliability of these instruments can hold across different and varied samples (Nicholls & Polman). Hence in this study, the factor structures of the COPE inventory will be analysed to determine if it is adequate for measuring the coping strategies used by athletes in Singapore.

2.2 Factors Affecting Coping

Research in the field of coping has given insight to various facets of coping. Interestingly, a variety of factors have been found to influence the use of coping strategies by athletes. These factors, which will be elaborated in this section, are culture (Anshel & Si, 2008; Laborde et al., 2012), sport (Laborde et al., 2012), level of anxiety (Wang, Marchant, & Morris, 2004) and disposition (Kristiansen et al., 2008).
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Coping strategies appear to be influenced by culture, where oriental countries generally show a greater use of avoidance coping strategies, but western countries generally adopt an approach coping strategy as opposed to avoidance (Anshel & Si, 2008). Moreover, in a study conducted on Chinese and French table-tennis players, it was discovered that an Asian culture, when compared against a European culture, resulted in more frequent use of task-oriented and disengagement coping strategies (Laborde et al., 2012). However, the sport itself has been found to be able to affect the use of coping strategies as well, and in the sport of table tennis, avoidant coping strategies were generally used more predominantly across different cultures (Laborde et al., 2012). The type of coping style an individual prefers also seems to be able to influence the level of anxiety they feel towards the task at hand. This can be seen in a study conducted by Wang, Marchant and Morris (2004), which discovered that basketball players tasked to complete free throws under conditions of induced stress, were under greater anxiety when they sought to reduce their level of stress using an approach coping style. Accordingly, an approach coping style was found to increase the perceived threat in pressure situations, and an avoidance coping style was found to reduce perception of threat. Personality, too, has been considered a contextual factor that can influence each aspect of the stress-coping process. However, these relationships between personality and the stress-coping process are assumed to be relatively weak (Kaiseler, Polman, & Nicholls, 2009). Nonetheless, perceived control of the situation seems to affect one’s coping strategy with avoidance coping being used with less perceived control, and approach coping being used with greater perceived control. Hence, the extent to which coping is shaped by culture, situation, as well as individual differences is unclear (Laborde et al., 2012). However, individual differences do appear to have an influence on the adoption of coping strategies (Carver et al., 1989). In spite
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of this influence of individual differences on adoption of coping strategies, the said individual differences have seldom been considered when conducting coping research.

In light of how individual differences are able to affect coping, an athlete’s disposition has been found to play a role in the use of coping strategies. An athlete with a greater task orientation has been found to use more problem-focused and adaptive coping strategies such as positive reframing as well as active coping, whereas an athlete with a greater ego orientation was found to use more emotion focused coping strategies such as denial and religion (Kristiansen et al., 2008). Similarly, goal commitment was closely linked to the use of approach coping strategies. This is because when people are more committed to their goals, they are more likely to adopt strategies that enable them to actively approach the stressor or their emotions (Monzani et al., 2015). Conversely, when people use emotion or problem avoidance coping responses, their personal goal pursuits are thus interfered with (Monzani et al., 2015).

Achievement goal states and goal orientations are also influenced by situational factors, such as the perceived motivational climate in the achievement environment (Smith, Cumming, & Smoll, 2006). This close relationship between achievement goals and motivational climates has been covered in depth in literature. Researchers have argued that an individual’s goal involvement during a specific situation is influenced by both their dispositional goal orientation and social climate (Dweck & Leggett, 1988; Nicholls, 1989; Treasure & Roberts, 1995). These dispositional and situational factors are in turn able to affect one’s use of coping strategies. A perceived performance climate was found to have no association with adaptive coping strategies, but an athlete with high perceived mastery climate was found to use more adaptive coping strategies (Kristiansen et al., 2008). Therefore, dispositional and situational factors are indeed able
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to affect one’s use of coping strategies in sports, and research looking at individual
personality and actual use of psychological skills is long overdue (Hardy, Roberts, Thomas, & Murphy, 2010). In a similar vein, some psychological skills may be more
effective than others, depending on the situation, but there is a dearth of research
looking at the relationships among personality or situational factors, and the subsequent
use of psychological skills (Hardy et al., 2010).

2.3 Achievement Goal Framework

To understand the links between personality or situational factors, and the
subsequent use of psychological skills, the theory behind these personality and
situational factors will first have to be understood. Goal orientation research has been
extensively conducted over the years, usually borrowing from the tenets of Nicholls’
AGT (Nicholls, 1984, 1989).

The AGT states that individuals are oriented to two different types of goals –
task and ego orientation. Being task-oriented means seeking to master a task at hand,
and only comparing with one’s previous standard (Nicholls, 1989). It is a self-
referenced state, where individuals focus on mastering the task, developing skill,
exerting effort, and also improving (Smith & Smoll, 2009). On the other hand, being
ego-oriented means attempting to outperform one’s peers, or avoiding unfavourable or
normative judgments (Nicholls, 1989). Hence, social comparison plays a huge role in
how one defines success, and the emphasis is on winning others (Smith & Smoll, 2009).
Therefore, a task-oriented individual would be mastery-oriented, striving towards
mastery goals. Conversely, ego-oriented individuals would be ego-involved, and seek to
attain performance goals.
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In sports settings, different goal orientations have resulted in fairly consistent patterns of relations. Mastery-oriented individuals have been found to attribute success to effort, cooperation, and intrinsic interest (Smith & Smoll, 2009). Mastery-oriented individuals, paired with a low ego-orientation, have also been found to experience lower levels of cognitive trait anxiety and pre-event state anxiety (Ommundsen & Pedersen, 1999). Additionally, mastery goal orientation is related to a variety of adaptive achievement behaviours such as exerting consistent effort, persisting when encountering obstacles, and also sustained and improved performance (Duda, 2005). Specifically, in the context of competitions, athletes high in mastery orientation were able to view difficulties as challenges and they adopted more self-regulatory cognitions and behaviours to deal with obstacles (Theodosiou, Mavvdis, & Tsigilis, 2018). However, ego-oriented individuals hold the mind-set that success is attributed to one’s own superior ability and being able to outsmart others (Smith & Smoll, 2009). Nonetheless, an ego goal orientation has been linked to high levels of achievement as well although it also has a number of less desired correlates such as inconsistent effort, reduced persistence or withdrawal upon encountering a setback, increased performance anxiety, decreased intrinsic motivation, and also a tendency to use underhanded means just to win (Duda, 2005; Roberts, Kuncel, Shiner, Caspi, & Goldberg, 2007).

Interestingly, being high in both achievement goals led to positive outcomes in the observation of physical activity intention and behaviour (Wang, Morin, Liu, & Chian, 2016). Therefore, achievement goals may not be as dichotomous as initially thought.
Over the years, the achievement goal framework has been reviewed and revised. In 2001, Elliot and McGregor proposed the amalgamation of both approach-avoidance dimensions and the original mastery-performance goal dichotomy into one single framework, resulting in a newly revised 2 x 2 conceptualisation of achievement goals. Competence is at the very core of the 2 x 2 achievement goal framework. The framework hinges on how competence is both defined and valenced (Elliot & McGregor, 2001). Competence is measured according to the different standards used in evaluating performance. Three different standards have been identified – absolute (fulfilling the requirements of the task at hand), intrapersonal (improving from one’s past achievements), and normative (winning others). Therefore, competence may be defined according to whether one managed to understand the task and master it (absolute), improved from one’s previous performance, or developed new knowledge and skills (intrapersonal), or managed to perform better than one’s peers (normative) (Elliot & McGregor, 2001). The other dimension of the framework is based on how competence is valenced. Competence can be seen as something positive, possibly resulting in something to be desired, or it can be seen as something negative, potentially resulting in something undesirable (Elliot & McGregor, 2001). This results in either an approach or an avoidance tendency. Therefore, in Elliot and McGregor’s 2 x 2 achievement goal framework (2001), the four different goals are – mastery-approach, mastery-avoidance, performance-approach and performance-avoidance.

For an individual holding a mastery-approach goal, competence is defined according to whether the absolute demands of the task, or personal improvement was accomplished. Someone who holds a mastery-approach goal is also likely to attempt
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approaching success and to actively engage in activities to achieve success. However, for an individual with a mastery-avoidance goal, despite also defining competence in absolute and intrapersonal terms, this individual will focus on avoiding a negative outcome at the same time (Elliot & McGregor, 2001). Conversely, for a performance-approach goal, competence is defined by outperforming one’s peers. An individual with a performance-approach goal will tend to make attempts to approach success and engage in trying to be better than others to win. Finally, for someone who has a performance-avoidance goal, the individual views how competent he/she is according to his/her performance amongst peers. This individual is also likely to try to avoid negative outcomes.

Previous studies using the 2 x 2 model demonstrate that the mastery-approach goals are linked to adaptive help-seeking behaviour (Ryan & Pintrich, 1997; 1998). It is postulated that the reason these students seek help is because they want to learn as much as they are able to, from both their teachers as well as their more academically-inclined peers (Yang & Cao, 2013). Conversely, students with a performance-approach goal were less likely to seek help (Karabenick, 2003).

2.3.2 3 X 2 Achievement Goal Framework.

Later on, Elliot, Murayama and Pekrun (2011) maintained that task- and self-based goals should be viewed separately. As such, the 3 x 2 model of achievement goals was birthed (Figure 3). The 3 x 2 model crosses the three different ways competence is defined with the two ways competence is valenced (Elliot et al., 2011). Hence, the model is composed of the following goals – task-approach goal (to do the task appropriately), task-avoidance goal (avoid completing the task incorrectly), self-approach goal (improve from one’s previous performance), self-avoidance goal (avoid
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doing worse than before), other-approach goal (to outperform others), and other-avoidance goal (avoid doing worse than others). Although the 3 x 2 framework is derived from the 2 x 2 achievement goal framework, it is also seen as a separate construct, distinct from the mastery-performance dimension. The case for separating task- and self- based goals from the general umbrella of ‘mastery goals’ stems from the fact that although task-and self-based goals emerge from the same antecedents, they may have different sets of consequences (Elliot et al., 2011).

Figure 3. The 3 x 2 achievement goal model. (Elliot, Murayama, & Pekrun, 2011).

A study conducted on students’ help-seeking behaviour comparing both the older 2 x 2 achievement goal model with the new 3 x 2 model, found the newer model to have superior predictive power over students’ help-seeking behaviour (Yang & Cao, 2013). Further, a significant difference was found in help-seeking behaviour between task-approach and self-approach goals, strengthening the argument that the two constructs are different and should be separated as in the 3 x 2 model (Yang & Cao, 2013). However, this study was conducted in a classroom setting and not in a sport setting. In the classroom, previous studies found that stress was more prevalent with homework and tests, a lack of time to complete assignments and not being able to understand the material (Díaz, 2010; Pulido et al., 2011; Román, Ortiz, & Hernández, 2008). All these stressors are arguably different in a sports setting. As such, whether the
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3 x 2 model is indeed a better predictor of coping behaviour as compared to the preceding 2 x 2 achievement goal model remains to be seen. For the present study, the 2 x 2 achievement goal model will be used, utilising the mastery-performance dimension to look into a sports setting.

2.3.3 Perceived Motivational Climate.

Like achievement goals, motivational climate is also described in terms of mastery (task) and performance (ego) states (Smith & Smoll, 2009). A mastery climate is one in which a person in authority defines success in terms of self-improvement, task mastery, and exhibiting maximum effort and dedication (Ames, 1992). In a mastery climate, athletes tend to adopt more adaptive achievement strategies, such as choosing tasks which are more challenging, putting in maximum effort, pressing on when encountering an obstacle, and taking pride in improving one’s own sporting standard. A performance climate, on the other hand, promotes social-comparison, where athletes compete against each other to determine how successful they are. Usually when coaches create a performance climate, they give athletes who are more instrumental to winning more of their time and attention, and skill development is emphasised as opposed to personal improvement or self-realization (Smith & Smoll, 2009). Similar to theoretical expectations, a mastery climate has been found to result in a greater mastery orientation in athletes, and an ego climate has been found to result in greater ego orientations (Duda, 2005). Hence, one’s goal orientation interacts with the context at present to determine one’s state of goal involvement. In turn, this influences the adoption of specific motivational patterns such as achievement goals (Gernigon, d’Arripe-Longueville, Delignières, & Ninot, 2004). In fact, goal orientations and motivational climate are so intertwined that researchers have also recommended that both constructs...
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be looked at together in motivational research (Bortoli, Bertollo, Comani, & Robazza, 2010). With respect to research done on motivational climate, Epstein (1989) suggested that there are six variables, based on which teachers are able to build classroom interactions. These six variables are Task (task design), Authority (position of decision-making), Recognition (rewards), Grouping (regularity and method of groups), Evaluation (standards of performance), and Time (speed of learning). Together, these six variables make up the acronym TARGET. It has been argued that how an individual perceives the motivational climate is a strong predictor of resultant motivation (Ames, 1992). In return, motivation levels especially during a competition are able to affect the amount of determination to cope with stressful situations, and hence affect the choice as well as effectiveness of coping strategies.

Coping options have been found to be influenced by one’s goal orientation (Lazarus, 1991). In a study by Ntoumanis et al. (1999), coping strategies were found to be a mediator between goal orientation as well as motivational climate, on affect in sport. It was believed that goals could relate to coping strategies as goals bring to a particular situation a set of beliefs, commitments, and also perception on what is at stake (Ntoumanis et al., 1999). For example, athletes with a greater task orientation believe in effort as a means of success, and hence tend to be more persistent in improving their potential (Ntoumanis et al., 1999). As such, they are more likely to apply coping strategies relating to effort and persistence. In contrast, an athlete who has a greater ego orientation will tend to be more preoccupied with winning and demonstrating their ability such that they are less likely to show signs of effort or persistence.
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2.3.4 Importance of Coping.

In a study by Baron et al. (1992), they observed that a competition setting indeed places a high degree of stress on a player. Therefore, it is critical that more emphasis is placed on the mental component, in order to keep stress levels low. Researchers have examined and measured how people cope in general situations perceived as threatening or challenging; for example, during job interviews or examinations (Folkman & Lazarus, 1980, 1985; Zeidner, 1994). However, only a few researchers have focused on coping in challenging situations, such as in a sports or competition setting (Haney, 2004; Haney & Long, 1995; Yoo, 2000). Little research has looked into the area of stress and coping in the context of training and competitions as well, which is surprising given that elite athletes spend an inordinate amount of time training and also competing (Nicholls et al., 2009). Thus, to understand the complete coping process especially in a sports competition context, and help identify intervention programs to improve coping effectiveness, we need to first understand the athlete’s thoughts, emotions, and actions that follow their use of coping strategies (Anshel, 2001).

As mentioned previously, coping may or may not translate into effective outcomes. However, when looking at effective coping, automaticity of coping responses was found to play a role. Gould et al. (1993a), found that Olympic wrestlers were able to cope more effectively as their coping methods were more automatic. This finding that coping efficacy is linked to coping automaticity is also supported in a study by Nicholls et al. (2009). However, coping efficacy research to date has focused purely on asking athletes to rate the effectiveness of their coping strategies, without considering variables (e.g. automaticity) that may affect coping efficacy (Nicholls et al., 2009). Nevertheless, in order to facilitate athletes to cope more effectively, enabling their coping strategies to
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be more automatic could possibly be a useful method. There is hence a need for coping interventions to be conducted, for athletes to be more aware and automatic in their use of coping strategies.

2.4 Coping Intervention

Research in the area of coping and coping interventions has progressed over the years. With regards to the development of interventions aimed at coping, and reducing stress, these interventions have mainly dealt with physically healthy people coping with work related stress (van der Klink, Blonk, Schene, & van Dijk, 2001) and depression, (Blumenthal et al., 2007), and also chronically ill patients dealing with various forms of diseases, such as cardiovascular disease (Rozanski et al., 2005), cancer (Antoni et al., 2001), HIV (Chesney et al., 2003), and diabetes (Ismail, Winkley, & Rabe-Hesketh, 2004). Most of these interventions were based on cognitive-behavioural methods, and all of them resulted in mostly positive outcomes. In the case of a study conducted on cancer patients, where cognitive-behavioural stress reduction techniques were taught to women who were undergoing treatment for early-stage breast cancer, it was found that the intervention reduced prevalence of depression, but did not affect other measures of emotional distress (Antoni et al., 2001). However, all these studies pertained to life and well-being, and few studies on coping interventions have been conducted in a sports context. Moreover, the type of stress felt in a general life situation, and a sports context are very different in nature. This is because the demands in a sports setting, during training and competition are very specific, and very different from those faced in everyday life.
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2.4.1 Cognitive-Affective Stress Management Training.

Within the scope of sport psychology, there are two coping skills training programs which have been more prominent in the field. They are namely the Cognitive-Affective Stress Management Training (SMT; Smith, 1980) and the COPE intervention (Anshel & Gregory, 1990). SMT is a training programme, which trains athletes on incorporating both relaxation and cognitive components into a coping technique for control of emotional arousal (Smith, 1980). It consists of three overlapping stages – conceptualization, skill acquisition and rehearsal, as well as skill application (Crocker, Aldermann, & Smith, 1988). One way of conducting SMT involves athletes first imagining distressing situations and generating high levels of emotional arousal, followed by these athletes using acquired coping skills to “switch off” the emotional arousal (Crocker et al., 1988). Hence, one assumption of the SMT is that it teaches athletes to acquire coping skills that can then be applied when they are required to manage potentially stressful situations (Crocker, 1989). However, in a study looking at the sustainability of the SMT in the long term, mixed results were found (Crocker, 1989). Therefore, it appears that the SMT may not be the most durable coping intervention program in the general sport psychology literature.

2.4.2 COPE Intervention.

The second prominent coping intervention program, the COPE intervention, consists of strategies to control emotions, organise and filter feedback, plan how to respond to the available information, and also execute the appropriate responses (Anshel & Gregory, 1990). A breakdown of the various strategies in the COPE model is provided below.
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(1) **C = Control emotions.** When faced with unpleasant stimuli e.g., jeering from supporters of the opponent, criticism of the coach or derision from the audience or teammates, the athlete will be asked to engage in two cognitive-behavioural processes (Anshel & Gregory, 1990). The athlete’s foremost objective would be to attain emotional regulation as a lack of it would be detrimental to his/her psychological state, which would in turn affect ensuing performance. Managing acute stress in an unpleasant environment can be achieved by engaging in the technique of relaxation, which involves taking one or two complete inhalations and exhalations to minimize manifestations of physiological stress, namely the “fight or flight response” (Kudlackova et al., 2013). Having control over one’s emotions allows the athlete to respond to the environment in a rational and efficient manner whilst sustaining self-confidence and other necessary cognitive aspects. The athlete’s second objective at this first stage of the model would be to perceive the cause of, and take responsibility for their performance though these two might not necessarily occur together (Anshel & Gregory, 1990). However, while in certain situations it may be possible to differentiate responsibility from controllability as a causal factor, it is impossible to distinguish between the two in other situations (McAuley, 1985). This inability to distinguish between responsibility and controllability brings about a mental state that prepares the athlete to cope with stimuli in the present environment as opposed to a more defensive attitude that impedes gathering, processing and responding to external information (Carver, 1979; Ziegler, Klinzing, & Williamson, 1982). This first stage quickly follows stress appraisal and might persist for a couple of seconds or extend over several minutes, depending on the athlete’s needs and perceived task demands.

(2) **O = Organize input.** The next stage of this intervention includes separating and selectively filtering out unpleasant and irrelevant data from useful information, which
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the athlete can utilize. This process can occur both deliberately and subconsciously. For example, when an athlete receives negative input from the coach, this athlete immediately and consciously processes several cues that may help reveal if the subsequent input is or will be desirable. Messages that come together with fault in performance, accompanying pitch or tone of the coach’s voice, the coach’s facial expression and the specific situation (e.g., during training, or when team is winning or losing a game) all contribute to the athlete’s perception of external cues that helps him/her to draw an informed conclusion on the content of subsequent and immediate information. Subconsciously, the athlete might attentively rehearse useful and meaningful information, whilst ignoring irrelevant and nonproductive input (Lazarus, 1974). Although it is probably that higher skilled athletes are better at discerning relevant cues, it is possible their less-skilled counterparts can also be taught to listen out for relevant cues and apply rehearsal strategies appropriately (Anshel & Gregory, 1990).

(3) P = Plan Response. In the third stage of this intervention, the athlete uses cognitive strategies to guide an apt response in light of the situation. A vital objective at this third stage is to avoid the use of self-reflection (Carver & Scheier, 1981). It is not recommended to rehearse emotions or events that induce negative images. This undesirable strategy tends to hinder risk-taking, self-confidence, anticipation of positive outcomes as well as response speed (Carver, 1979). The problem of self-reflection during a negative outcome is aggravated when the appropriate attentional focus during the situation is directed on external, rather than internal, features of the environment (Nideffer, 1985). At this stage of the model, the athlete’s objective would be to focus on and deal with incoming task demands as soon as possible. Cognitive strategies that can help facilitate this process include pre-cueing; which involves preparing what to visually and auditorily attend to even prior to the stimulus, covert rehearsal; whereby
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the athlete is actively planning his/her response and anticipation prior to response execution (Anshel, 1986).

(4) **E = Execute Response.** Advanced sport skills are characteristically executed freely without much conscious thought (Fitts & Posner, 1967), and skilled athletes are able to perform with a high degree of automaticity. In fact, in rapid motor tasks, the act of thinking slows down response time. The objective of this final execution stage is to prevent or remove negative thoughts, which tends to interfere with cognitive processes preceding, during and right after a performance. The athlete is asked to think about future events, and to eliminate unpleasant thoughts such as self-doubt, uncertainty, negative self-talk, and memories of past failures, especially recent stressful experiences.

Anshel and colleagues (1990) found that after attending three one-hour training sessions across three weeks using the COPE model, a sample of 39 athletes were less afraid of appearing incompetent and felt a greater sense of control over their sport. Therefore, the COPE framework helped these athletes increase their self-confidence levels. Another study conducted using the COPE model on motor performance and resultant affect, showed that the experimental groups did benefit from the cognitive-behavioural strategies taught to counter acute stress, as opposed to the control group (Anshel, 1994). For this particular study, there were three groups of participants. The first group was taught selected cognitive-behavioural strategies from the COPE model, the second group used strategies from the model’s organizing input (O) segments, and the third group was the control group. At the end of the study, both experimental groups experienced better performance, and less negative affect as opposed to the control group. Therefore, it seems that certain aspects of the COPE model are also able to lead to similar results as compared to when the entire model is used.
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2.4.3 Coping Effectiveness.

A lot of coping studies have hence focused on the cognitive aspect and found various benefits to performance. One study by Reeves and colleagues (2011) utilised coping effectiveness training for adolescent soccer players (CETASP), which involved soccer players receiving advice regarding cognitively based coping strategies as well as behaviourally based coping strategies. Workbooks and exercises were introduced to athletes with the purpose of encouraging them to focus on situations where they were successful at coping (Reeves et al., 2011). In this intervention study applying coping effectiveness training, intervention effects were found to varying degrees with respect to coping self-efficacy, coping effectiveness, and performance (Reeves et al.). Therefore, it appears that cognitive-behavioural based coping strategies have been found to be effective as shown in literature. However, previous intervention studies have often omitted the aspect of individual differences and how these affect coping. Differences in personality and perceived satisfaction of basic needs have all along resulted in different interpretations of one’s environment and the same has been found to be true for a sports context (Kee & Wang, 2008). Hence, it would be interesting to determine if differences in achievement goals and perceived motivational climates are also able to affect the effectiveness of relaxation techniques in helping one to cope, and how this may be so.

Furthermore, the stress process is a complex and dynamic process, often involving the use of both problem and emotion-focused coping, as the need arises (Folkman & Lazarus, 1985). Oftentimes, athletes are unaware of how and what mental skills to use, and when they start to feel stressed, they are unable to cope effectively in their sport. According to Carver and Scheier (1981), a stressed individual should not engage in self-focusing, where unpleasant feelings are continuously rehearsed. This is
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because such thoughts create and maintain self-doubt, which would then result in unfavourable expectancies about future outcomes. State anxiety is also heightened, confidence decreased and the individual would engage in thoughts about self-doubt. Instead, to effectively cope with acute stress in sports, self-focus would have to be minimized. The sport skill should be executed as soon as possible, after appropriate planning in terms of movement arrangements and alternative responses. If the response after planning is neither viable nor desirable, cognitive strategies such as anticipation, pre-cueing, or mental rehearsal should then be put into practice to help facilitate the performer’s state or readiness. Previous research in this area has found that skilled athletes cope with acute stress by blocking out harmful, unpleasant messages while integrating, learning and applying information that contributes to their successful performance (Anshel & Gregory, 1990). Therefore, learning how to use selective coping strategies may be useful for athletes, to help them discern what feedback to take in, and what to block out. In dealing with anxiety, learning how to utilise relaxation techniques are crucial (Kudlackova et al., 2013). Yet, relaxation is relatively understudied over the years. Hence, in the next section relaxation techniques that are to be used in the research study will be introduced and elaborated on.

2.4.4 Mental Skills Training.

There is abundant evidence that MST is an effective form of intervention in improving athletic performance (Ashbrook et al., 2018; Davidson & Edwards, 2014; Patrick & Hrycaiko, 1998). MST has often been used by athletes to cope with cognitive and emotional issues they face in their sport. This is because the use of mental skills demonstrates the ability of athletes to self-regulate, for example, by maintaining a state of optimal concentration or emotional control (Sharp et al., 2013). The advantages of
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MST include enabling athletes to deal with anxiety or concentration issues by developing skills and techniques such as anxiety management, imagery, goal setting, concentration, self-talk, and confidence (Weinberg & Williams, 2006). These outcomes developed from MST are considered to be mental qualities, which can be experienced across a spectrum where self-confidence can be either high or low (Holland, Woodcock, Cumming, & Duda, 2010; Woodcock, Holland, Cumming, & Duda, 2011). However, proficiency in these mental qualities require athletes’ regular and consistent use of mental techniques (Woodcock et al., 2011). A study of the literature surrounding MST revealed MST programmes conceptualised for elite athletes across diverse sports such as wrestling (Gould, Petlichkoff, Hodge, & Simons, 1990), golf (Ashbrook et al., 2018), rugby (Ong & Griva, 2017), and taekwondo (Lim & O’Sullivan, 2016), to name a few. All these programmes incorporated a range of psychological skills and techniques, which were found to have a positive impact on athletic performance. Furthermore, athletes reported greater awareness, perceived importance and application of the mental skills taught during MST programmes (Sharp et al., 2013).

Despite the abundant evidence regarding the effectiveness of MST programmes, these programmes usually span across six to nine weeks. However, during competitions, athletes sometimes require a brief intervention with only a short window of 15 to 20 minutes (Giges & Petitpas, 2000). This short window of time is critical with the focus on performance enhancement (Giges & Petitpas, 2000). Moreover, competitions bring with them stress, which on one hand is necessary for athletes to perform optimally, but too much stress leads to a decline in performance levels (Fraser, Steffen, Elfessi, & Curtis, 2001). Both cognitive and somatic anxiety were found to have a negative correlation with self-confidence, which was in turn found to have a positive impact on athletic performance (Kang & Jang, 2018; Muñoz et al., 2017; Wang, Hsu, & Huang,
COPING STRATEGIES OF TERTIARY ATHLETES IN SINGAPORE: THE INFLUENCE OF ACHIEVEMENT GOALS, MOTIVATIONAL CLIMATE AND A BRIEF RELAXATION INTERVENTION (2013). Therefore, increased anxiety leads to lower self-confidence levels, which ultimately leads to poor performance levels. One of the biggest factors found to affect golf performance was state anxiety (Bois, Sarrazin, Southon, & Boiché, 2009). In their study of Olympic champions, Gould and colleagues (2002) highlighted the importance of coping with and controlling anxiety as a key indicator of performance. Therefore, the ability to control tension and regulate anxiety would be crucial for athletes to perform in their sport. In fact, the best achievers in the golf performance study were found to use more relaxation strategies, seeming to indicate the important role relaxation strategies play in managing emotions and anxiety (Bois et al., 2009). In a similar vein, elite swimmers were found to use relaxation strategies, as well as other forms of mental skills, that were related to emotional control and relaxation strategies (Hanton & Jones, 1999). Relaxation techniques such as PMR were also found to enhance recovery and sleep in full-time dancers with high trait social evaluation anxiety (McCloughan, Hanrahan, Anderson, & Halson, 2016). Therefore, due to the negative influence of high anxiety levels on sporting performance and the positive impact of relaxation strategies in managing anxiety levels, in the rest of this section, I will elaborate on one particular MST technique that will be used in the intervention aspect of this study – relaxation.

Relaxation. Usually in the context of regulating arousal and stress, the technique of relaxation is often used (Williams & Harris, 2006). This is because, even though a little activation is beneficial in sports, too much activation is detrimental to performance (Williams & Harris, 2006). Moreover, athletes need to be at their optimal arousal state prior to performing, and not merely during the competition itself (Hanin, 2000). When one is anxious or worried, it results in heightened muscular tension. In turn, the more muscular tension experienced, the more difficult it is to execute good form or the adequate coordination required in a movement task (Williams & Harris,
Learning how to relax is hence crucial in dealing with over-activation, which often results from worry and anxiety about one’s performance. Moreover, relaxation techniques also enable an athlete to be able to focus on task relevant thoughts especially in sports such as endurance running, which require the athlete to constantly focus on muscle tension and breathing patterns (Thelwell & Greenlees, 2001).

Relaxation techniques consist of two forms – a) muscle-to-mind techniques, and b) mind-to-muscle techniques (Williams & Harris, 2006). Muscle-to-mind techniques would involve physical relaxation, and include breathing exercises, progressive muscular relaxation, or neuromuscular relaxation. These techniques would involve the individual first tensing his/her muscles, before relaxing them, and feeling the difference between tension and relaxation. The second category, mind-to-muscle techniques consist of mental relaxation and involve techniques such as meditation, imagery, or autogenic training. All these start from first relaxing the mind, and then allowing the relaxed mind to enable the individual to feel relaxed in the muscles.

Across literature, relaxation techniques have often been used as part of a mental skills training package. Accordingly, a MST package – comprising relaxation, imagery, goal setting and self-talk was found to be effective in helping to improve the performance of athletes competing in the 1,600-metre race (Patrick & Hrycaiko, 1998). Further, a positive relationship was found between participants’ use of mental skills, and their running performance. In another study looking at gymnasium triathlon performance, not only was their physical performance enhanced, but participants’ use of mental skills also increased after the experiment (Thelwell & Greenlees, 2001). However, despite relaxation being found to have a moderate effect on performance, few
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studies have actually looked at relaxation alone as a singular mental skill (Kudlackova et al., 2013).

In light of coping interventions, relatively brief coping interventions have been found to have encouraging results in helping individuals cope with drinking addictions (Bien, Miller, & Tonigan, 1993) on top of other things. Hence, a lengthy intervention process may not be necessary to bring about a change in behaviour. To determine the effectiveness of coping interventions, self-report measures before and after the intervention program are usually used as a basis for comparison. However, past literature has found that individuals may be unable to accurately self-report on their cognitions (Nisbett & Wilson, 1977). Therefore, it would be useful if another form of measure could help to supplement self-reporting forms of measurements.

2.5 Neurophysiological Measures

Neurophysiological measures of performance have become increasingly prevalent in the sporting scene over the past few years. Recent interest in studying the brain as a control centre is also relevant in bridging the gap between behaviour related research in sport sciences and neuroscientific models of basic mechanisms that support sporting performance (Folkman & Lazarus, 1988; Yarrow, Brown, & Krakauer, 2009).

Experiments carried out in a laboratory can be considered as well controlled and reproducible (Riley et al., 2008). However, because many other factors are involved in a field setting, laboratory studies may not be as applicable to field conditions. Riley et al. (2008) compared kinematic and kinetic parameters of over ground and treadmill running and found results to be comparable but not the same. Similarly, brain activity patterns were also found to be fairly comparable but not exactly equivalent in a golf putting task executed in both laboratory and field conditions (Reinecke et al., 2011).
These findings suggest that data obtained from laboratory experiments could be similar to results obtained from field conditions but should not be transferred unevaluated.

While much research have been carried out in the field of sport and exercise, specifically on biomechanics and training, research in the neuroscientific domain is lacking (Reinecke et al., 2011).

However, preparing participants for such experiments also require a lot of time and equipment. For instance, to conduct a study using EEG, the participant has to first have conductive gel placed on his or her head, followed by the placing of electrodes on very specific regions of the scalp. In addition, the process must be supervised and performed by a trained individual. Similarly, due to the bulkiness of the MRI equipment, studies utilising this form of technology are strictly restricted to laboratory settings. Most of these techniques are also usually invasive and require adherence to very strict protocols. Nonetheless, the use of brainwave frequency to help make sense of brain activity has been made easier with the use of tables such as Table 4 below. Studies that have utilised brainwave frequency involved the use of neurofeedback in improving specific skills like table tennis serves (Brown, Jamieson, & Cooper, 2012) and accuracy of rifle shots (Rostami, Sadeghi, Karami, Abadi, & Salamati, 2012).

Table 4

*Descriptions of Brainwave, Frequency and Corresponding Mental State. Adapted from http://salvonostrato.com/wp/01-b-c-s-m-j-p-a*  

<table>
<thead>
<tr>
<th>State</th>
<th>Frequency (cps)</th>
<th>Amplitude (microvolts)</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gamma</td>
<td>25 - 60</td>
<td>0.5 - 2</td>
<td>Hyper-aroused and quite dangerous to the brain</td>
</tr>
</tbody>
</table>
| Beta  | 12 - 25        | 1 - 5                 | Conscious brain state.  
                         |                 | Fast dyssynchronous activity.  |
| Alpha | 8 - 12         | 20 - 80               | Conscious brain state.  
                         |                 | Synchronous activity. |
| Theta | 4 - 8          | 5 - 10                | Usually unconscious.  
                         |                 | Slow rhythmic activity. |

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2.5.1 NeuroSky MindWave.

Advances in technology have resulted in the launch of NeuroSky headsets in the years 2009, and 2010/2011. Specifically, the NeuroSky MindWave EEG headset was launched in 2010/2011, and was designed to identify and monitor electrical signals generated by neural activity in the brain. The headset consists of a headband, an ear-clip, and a sensor arm containing the EEG electrode, which rests on the forehead above the eye (FP1 position, in accordance with the American Electroencephalographic Society’s (1994) 10-20 system of electrode placement). The reference and ground electrodes are clipped on to the earlobe, the use of gel or saline is not necessary for the use of this equipment, and no prior expertise is required for its setup. In a study conducted by Mostow, Chang and Nelson in 2011, they found that the NeuroSky MindSet, an earlier version of the NeuroSky MindWave EEG headset (see Figure 4), could distinguish two fairly similar mental states (neutral and attentive), with an 86% accuracy level despite the limitations of having just one electrode reading, and also no equipment training. As the main difference between both headsets (NeuroSky MindSet and NeuroSky MindWave) is that the MindSet is a complete headset with speakers and a microphone transmitting data using Bluetooth while the MindWave does not have a headset and transmits data through radio frequency (Vourvopoulos, & Liarokapis, 2014), the MindWave is believed to be accurate in distinguishing mental states.
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Figure 4. NeuroSky MindWave EEG Headset (NeuroSky, 2011)

Figure 5. A user wearing the NeuroSky MindWave EEG Headset

The NeuroSky MindWave headset is able to detect three different forms of measures. It is able to measure raw signal, EEG power spectrum (Delta, Theta, Alpha, Beta, and Gamma), has eSense meters for attention and meditation, is capable of blink detection, and also consists of on-head detection. The eSense meters for attention and meditation are able to determine how effectively the user is engaging in either attention, or meditation, by decoding electrical signals, and applying algorithms to provide readings on a scale of 1 to 100. A breakdown of these values can be found in Table 5 below.

Table 5

<table>
<thead>
<tr>
<th>Values</th>
<th>Descriptions</th>
</tr>
</thead>
</table>

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The eSense meter for attention is able to give an indication of the user’s level of mental focus to determine levels of concentration. Things such as distractions, unfocused thoughts, lack of attention, or anxiety, may all lower the attention meter level. The eSense meditation meter shows the user’s level of mental calmness, or relaxation. Distractions, wandering thoughts, anxiety, agitation, and sensory stimuli, may all help to lower the meditation meter levels.

Several studies have been conducted using these alternative forms of EEG measures, all created by NeuroSky. In a study conducted by Chang, Nelson, Pant and Mostow (2013), they achieved 99% authentication accuracy when investigating the usability and performance of user authentication using consumer grade EEG sensor technology (NeuroSky MindSet). They found that the results obtained from this study using the consumer grade EEG headset, was on par with results obtained from previous research, employing multiple-channel EEG signals using clinical-grade devices. Another group of researchers used the NeuroSky MindBuilder – EM (MB) device to investigate if MB readings can be combined with user-generated data (Rebolledo-Mendez et al., 2009). Results from the study suggest that the MB provides accurate readings with regards to measuring attention. This is due to a positive correlation between measured and self-reported attention levels. Therefore, due to the
advancements made in technology, it appears that the use of portable and non-invasive forms of neurological measurements is very plausible. Despite being limited to just a single-channel EEG signal, as opposed to multi-channel EEG signals on clinical-grade devices, results obtained from these smaller devices are still comparable to their clinical-grade counterparts. However, the continuous advancement of technology means that products are continuously being improved on, and new products are constantly being made. Therefore, there is a need to confirm if results from studies conducted on products made by the same company (NeuroSky) can be generalised.

2.6 Summary

2.6.1 Research Gaps and Purpose of Study.

Over the years, studies have looked at the role coping plays in the performance of mostly elite athletes. These studies have used various forms of coping scales, with more frequent use of the COPE inventory. Although first formulated for use in a health care setting, the COPE inventory was later modified and used in various sports settings. Research using the COPE inventory has been conducted in Western athletic populations such as in America, Europe, and New Zealand, but not on athletic populations in South East Asia (Dugdale et al., 2002; Kristiansen et al., 2008; Puente-Diaz & Anshel, 2005).

Moreover, extensive research in existing literature has shown that goal orientation and perceived motivational climate have an effect on subsequent performance. With that in mind, it is worth noting that less work has been done in exploring the interaction between the 2 x 2 achievement goals and motivational climate, with the adoption of mental skills and the use of coping strategies. Previous studies have found that goal orientation has been able to affect the use of coping strategies in athletes (Ntoumanis et al., 1999). Hence it would appear that one’s achievement goal, coupled
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With motivational climate would likewise be able to affect the use of coping strategies in athletes. On top of that, it would be interesting to see how the 2 x 2 achievement goals and motivation climate are able to affect the efficacy of relaxation techniques in enabling athletes to deal with stress and anxiety.

Finally, research has usually been conducted in an objective or subjective manner, but seldom using both objective and subjective measures. Therefore, this research study is designed to bridge this gap by using an objective measure to supplement subjective ones. The feasibility of using the portable NeuroSky headset as an objective measure is also being investigated in this study. This can help pave the way for future psychologically related studies to be able to incorporate this headset in their study design as well.

In light of the above, this study will be conducted with an emphasis on the coping strategies of athletes. The ability to cope in competition is crucial in an athletes’ performance. How athletes cope, and what factors affect the way they cope will be investigated. The use of coping strategies was found to be influenced by constructs such as achievement goals and perceived competence. On top of that, mental skills also have an important role to play in sustaining sporting performance. Hence for this research study, the relationships between achievement goals, perceived competence, and the use of relaxation techniques will be investigated as well.

2.6.2 Research Questions and Hypothesis.

In summary, the main factors being investigated in this study include the use of coping strategies, 2 x 2 achievement goals, perceived motivational climate, factors behind the use of coping strategies as well as application of mental skills.
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Specifically, the following research questions will be examined over the course of the aforementioned three studies:

**Study 1**

i. Does the full COPE inventory have an adequate factor structure when measuring coping in an Asian sports context?

ii. Can the COPE be represented in a higher-order factor model?

**Study 2**

i. What are the multivariate relationships between achievement goals, motivational climate, mental skills adoption and coping strategies at the intraindividual level?

ii. What are some antecedents of coping strategies?

iii. How do athletes respond in the face of sport-related stress?

**Study 3**

i. How can a brief relaxation intervention affect athletes with different achievement goals, in different motivational climates?

ii. How can the presence of different motivational climates affect the adoption of achievement goals?

From a review of the related literature, it is hypothesized that the COPE inventory can indeed be represented in a higher-order factor model. Furthermore, 2 x 2 achievement goals and perceived motivational climate would allow for the prediction of mental skills adoption and use of coping strategies. A mastery-inducing climate would result in a greater mastery goal orientation, whereas a performance-inducing climate would result in a performance goal orientation. Mastery goal orientations would also result in the use of more approach coping strategies, whereas performance goal
orientations would result in more avoidant coping strategies. However, how relaxation techniques are able to assist athletes to cope more effectively in light of both their achievement goals and perceived motivational climate is a relatively understudied area. These relationships will be explored in Study 2 (experiment looking at achievement goals, motivational climate, coping strategy, and mental skill adoption) and Study 3 (experiment comparing achievement goals, perceived competence and relaxation techniques).
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Chapter 3: Study 1 – Testing of Psychometric Properties of the COPE Inventory

Stress and coping have been widely studied in the context of the sport scene due to the competitive nature of the sporting environment, as well as the high level of involvement of those present in the environment (Christiansen & Smith, 2016). It was found that elite athletes were more likely to cope with negative appraisals than non-elite athletes, with a wider use of coping strategies (Calmeiro, Tenenbaum, & Eccles, 2014). Even at a lower participation level, athletes are required to cope effectively with sport-related stressors so as to be able to achieve their highest potential and make sport an enjoyable experience (Nicholls & Polman, 2007). Christiansen and Smith (2016) have identified several characteristics athletes should possess in order to enhance their athletic performance such as having technical and tactical capabilities in order to yield from instruction, as well as being able to regulate attentional and emotional processes in order to focus on task relevant cues. In addition, athletes have to be able to adapt to various situations in order to continue performing consistently in their sport especially in pressure situations (Hardy et al., 1996). In short, it is important for athletes to learn to cope with stress effectively in various situations in order to maintain or better their levels of performance.

Stress consists of three processes (Lazarus, 1966). At the primary appraisal, the individual perceives a threat in the situation at hand whilst the secondary appraisal is the process of thinking through an appropriate response to that threat. Coping is the third and final action of effecting that response. Coping refers to a variety of cognitive and behavioural strategies implemented to manage stress (Folkman & Moscovitz, 2004). More specifically, Lazarus and Folkman (1984) have defined coping as efforts taken to manage external and/or internal demands that are appraised as exceeding one’s ability to
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manage. The inability to cope effectively with stress has been found to affect both psychological well-being and physical performance (Lazarus, 2000). Consequently, being able to cope effectively with stress has been found to lead to positive outcomes (Folkman, 1992).

However, Lazarus and Folkman (1984) ascertained that due to the complexity of the coping process, two key conditions help determine the effectiveness of the process itself. Firstly, it is crucial that coping strategies are selected appropriately, befitting the demands of the situation. However, appropriate selection in itself does not guarantee a successful outcome. The coping strategy has to also be executed appropriately (Christiansen & Smith, 2016). A few factors have been found to affect the appropriateness of selection and execution of coping strategies, one of which is the amount of control individuals perceive themselves to have in the situation. It is expected that when individuals perceive a greater amount of control in the situation, problem-coping strategies tend to be more effective (Poliseo & McDonough, 2012). Another factor that affects the appropriateness of selection and execution of coping strategies is the presence of an immediate achievement outcome. When goal attainment is reduced or eradicated as in a sports injury, avoidance coping strategies were found to be more effective in facilitating short-term emotional states and appearing to have long-term benefits for the injured players (Carson & Polman, 2010). However, in a sample of American undergraduate students, approach-oriented coping strategies were found to be linked to more positive traits whilst avoidance coping strategies were linked to more negative traits (Litman, 2006). This adds to the complexity of coping research, where on top of the perceived degree of control over the stressor and achievement outcome, culture seems to play a role as well. In a sample of predominantly Singaporean undergraduate medical students, it was discovered that respondents tend to use problem-
focused coping over emotion-focused coping with managing relationship stress (Li, Farquhar, Ma, & Vidyarthi, 2008). However, the coping strategies used were also closely linked to the relationship with the individual involved. When dealing with family members and clinical supervisors, respondents used more planning and problem-solving coping strategies. However, when dealing with peers, respondents reported higher usage of emotion-focused coping strategies and avoidance coping. In this instance, the type of coping strategy used depended largely on the original stressor and led to neither positive nor negative traits. Hence, different coping strategies appear to be more effective in different situations. It is therefore imperative that when athletes are placed in stressful situations, they are aware of both the nature of the situation they are in as well as their coping response.

Taking a closer look at the coping response, Folkman and Lazarus (1980) first differentiated between two different styles of coping: problem-focused coping as well as emotion-focused coping. Later, Carver et al. (1989) noted that although these two dimensions were important, further differentiation was needed to include other distinct coping styles and strategies. Hence, the COPE inventory was created with the purpose of incorporating a greater diversity of potential coping responses into a measure, based on theoretical models (Carver et al., 1989). These two models are the Lazarus model of stress and a model of behavioural self-regulation (Scheier & Carver, 1980; 1985). Pre-existing measures were also referenced to generate the final COPE inventory (Carver et al., 1989). The eventual COPE consists of 15 distinct subscales developed on theoretical and functional grounds. Out of these 15 subscales, 13 of them were evaluated in initial validation studies, whilst the last two were added on the basis of observations from these studies (Carver et al., 1989). The popularity of the COPE inventory was largely due to it best reflecting categories that emerged from qualitative studies of elite athlete
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coping with their respective stressors. (Gould et al., 1993a; Gould et al., 1993b). In the conceptualisation of the COPE inventory, results showed acceptable internal consistency of the COPE scales. Cronbach’s alpha reliability coefficients across all scales were acceptably high, with the exception of the alpha score of the mental disengagement scale being less than .60. Nonetheless, Carver et al. (1989) argued that due to the mental disengagement scale having a multiple-act criterion, the lower reliability is acceptable and not unexpected. However, despite the factor structure of the COPE inventory being seemingly stable across samples and stressors, few psychometric evaluations of the instrument have been made with reference to athletic populations or sports-related issues (Eklund, Grove, & Heard, 1998).

When Carver et al. (1989) developed the COPE inventory, he identified three factors in a second-order factor analysis. The first factor was represented by problem-engagement and included the subscales of active coping, planning as well as suppression of competing activities. The second factor combined both instrumental and emotional social support subscales with the focus on emotion subscale. The third factor was represented by avoidance coping and consisted of behavioural and mental disengagement subscales, denial and turning to religion. The fourth factor was represented by positive reappraisal and consisted of acceptance, restraint coping as well as positive reinterpretation and growth. Similarly, Litman (2006) also found a four-factor solution with the first factor emphasising problem-focused coping with planning, active coping and suppression of competing activities. The second factor involved avoidance coping with denial, substance use, mental disengagement and behavioural disengagement. The third factor corresponded with socially-supported coping, consisting of seeking emotional social support, seeking instrumental social support and focus on venting of emotions. The fourth factor was made up of emotion-focused
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coping with acceptance, restraint, positive reinterpretation and growth as well as humour. In this instance, religious coping did not have a clear loading on any factor. On the other hand, a number of studies have identified the use of 3-factor models to represent the COPE (Cook & Heppner, 1997; Lyne & Roger, 2000; Park & Levenson, 2002; Stowell, Kiecolt-Glaser, & Glaser, 2001). Hasking and Oei (2002) also found support for both a 14-factor primary structure and a 3-factor higher order structure using CFA with the deletion of several items, based on data from a community sample but were not able to generate any findings from an alcohol-dependent sample. In fact, Cook and Heppner (1997) argued that coping instruments, including the COPE inventory, should ideally consist of a three-factor model consisting of a Problem Engagement dimension (e.g., task-oriented and problem-focused efforts), a Social/Emotional Factor (e.g., social support and emotion-focused efforts) and an Avoidance factor (e.g., denial and mental disengagement strategies). These three factors were similar to those identified in the second-order factor analysis of the COPE inventory by Carver et al. (1989), as mentioned earlier. Therefore, despite numerous studies identifying fairly similar higher order factors (Litman, 2006), different researchers have still found different numbers of factor models and different factors underlying the COPE inventory, which reveals the fact that the internal structure of the COPE inventory is in fact highly unstable across samples (Donoghue, 2004). Hence, there is a need to examine the reliability and validity of the COPE inventory in different samples and contexts, such as a cultural context. Examining instruments in a cultural context is also essential when evaluating their applicability. (Maneesriwongul & Dixon, 2004).

Looking at the coping mechanisms of athletes in Singapore, the current understanding is insufficient. Few studies have examined the coping mechanisms of individuals in Singapore, let alone in sports. These studies mainly surveyed coping in
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healthcare (Lim, Griva, Goh, Chionh, & Yap, 2011; Rozario, 2016), social (Ling, 2000) and education (Li et al., 2008; Lim-Chua, 2004; Teh, 2004) settings. The closest study conducted on coping and sports looked at Muslim athletes in Malaysia and how they coped with training during the Ramadan fasting month (Roy, Ooi, Singh, Aziz, & Chia, 2011). Li et al. (2008) highlighted the need for more specific coping research as their findings hinted at the influence of culture on subsequent use of coping strategies. They discovered that the methods medical students used to cope with stressors were found to be hierarchically related (Li et al., 2008), which is more commonly linked to an Asian culture. Hence, there is a huge dearth in the area of stress and coping especially in Singaporean athletes, which shows the need to develop understanding of coping efficacy in this regard.

Taken together, there is a need to explore the coping strategies employed by different populations and across different demographics to see if the COPE inventory is indeed applicable in different samples. In this study, the psychometric properties of the COPE inventory were tested for its factorial validity and reliability with a sample of Singaporean tertiary-based athletes. A series of CFAs were conducted to determine the best model fit to data. In addition, the current coping strategies being employed by these tertiary athletes in Singapore were also explored through the COPE inventory.

The research questions being investigated in this study are:

i. Does the full COPE inventory have an adequate factor structure when measuring coping in an Asian sports context?

ii. Can the COPE be represented in a higher-order factor model?

In answering the research questions above, the following hypothesis pertaining to the COPE inventory will be examined in Study 1:
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Hypothesis: The COPE can be represented in a four-factor model (Carver et al., 1989; Litman, 2006).

In summary, the series of psychometrical tests conducted in the current study are to testify that the COPE inventory is indeed applicable in a sample of Singaporean tertiary-based athletes. Due to the novelty of sport coping research in Singapore, it is also hoped that the psychometric properties of the COPE inventory can be refined through this process. The refined questionnaire from this study would be subsequently used in Study 2a, investigating the relationship among dispositional factors, situational factors, coping strategies and the use of performance strategies in Singapore athletes. Should the robustness of the COPE inventory be verified, future analyses involving the use of the COPE inventory can also proceed with confidence. The rest of this chapter will thoroughly explore and attempt to answer these questions.

3.1 Method

3.1.1 Participants.

The participants for Study 1 were student athletes recruited from local tertiary institutions (N = 301; 164 males, 131 females, 6 gave no indication). These athletes reported playing at national inter-school level (n = 182), external club level (n = 58), as well as regional and international competition level (n = 50), with the remainder not indicating their highest level of competition (n = 11). These athletes also participated competitively in sports from a range of half a year to 18 years (M = 8.00, SD = 4.36).

3.1.2 Procedure.

Ethical clearance was first obtained from the Institutional Ethical Review Board of Nanyang Technological University (see Appendix A). After which, consent was sought from the local tertiary institutions, specifically from their Sport Officers, for
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their students to participate in the various studies. Upon approval and dissemination of the study information from the Sports Officers, the principal investigator approached the athletes or sports teams to explain the purpose of the study and recruit them as participants.

Before conducting the study, the purpose and outline of the study were highlighted to participants. They were also informed that their participation is entirely voluntary, and they were free to withdraw from the study at any time, with no consequences whatsoever. In addition, participants were told that there was no correct answer, to just respond accordingly and that their responses would be kept confidential. As participants were all above the age of 18, parental consent was unnecessary, and participants all provided their own consent for participation (see Appendix B). The questionnaire was administered in a quiet environment, with the presence of the principal investigator to facilitate the clarification of any questions by the participants.

3.1.3 Measure.

The dispositional version of the original 60-item COPE inventory (Carver et al., 1989) was used to measure how athletes usually coped with stress in their sport. Athletes were asked to think about how they usually respond to stress in their sport, or rate how likely they would respond according to each question. The scale consists of 15 different factors, which are positive reinterpretation and growth (e.g., “I try to grow as a person as a result of the experience”), mental disengagement (e.g., “I sleep more than usual”), focus on venting of emotions (e.g., “I get upset and let my emotions out”), use of instrumental social support (e.g., “I try to get advice from someone about what to do”), active coping (e.g., “I take direct action to get around the problem”), denial (e.g., “I pretend that it hasn’t really happened”), religious coping (e.g., “I put my trust in
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God”), humour (e.g., “I laugh about the situation”), behavioural disengagement (e.g., “I give up the attempt to get what I want”), restraint (e.g., “I restrain myself from doing anything too quickly”), use of emotional social support (e.g., “I discuss my feelings with someone”), substance use (e.g., “I use alcohol or drugs to make myself feel better”), acceptance (e.g., “I get used to the idea that it happened”), suppression of competing activities (e.g., “I keep myself from getting distracted by other thoughts and activities”), and planning (e.g., “I make a plan of action”). The items are scored on a seven-point Likert scale, where participants respond to how often they use different strategies to cope with stress in their sport (1 = “I usually don’t do this at all”, to 7 = “I usually do this a lot”). The scales were changed from four points to seven so as to ensure uniformity across all scales for the subsequent studies. Based on the overall score of the given scale, a higher score on each construct would indicate a greater tendency towards that coping strategy.

3.2 Data Analysis

3.2.1 Single Scale Analyses and Internal Consistency.

The one-factor structure was used to construct a confirmatory measurement model. To construct a single-factor structure, all items for each scale were included as a single factor and fit statistics were tested (Ng, Wang, & Liu, 2015). Internal consistency, convergent and divergent validity of the COPE inventory were examined in the process of testing the measurement model. Internal reliability was measured using Cronbach’s α, which was suggested to be at least .70 to ensure adequate internal consistency (Nunnally & Bernstein, 1994). Average variance extracted (AVE) values were used to determine construct validity and an AVE value of >.50 indicates adequate construct validity (Fornell & Larcker, 1981). As chi-square tests are sensitive to sample
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size, researchers addressed the $\chi^2$ limitations by developing additional goodness-of-fit indices, which were also compared in the present study to evaluate model fit (Byrne, 2006). To determine a good model fit, Hu and Bentler (1999) suggested a value of >.95 for both Comparative Fit Index (CFI) and Non-Normed Fit Index (NNFI), as well as <.06 for root mean square error of approximation (RMSEA). In fact, a RMSEA value of <.05 indicates a close fit (Marsh, Martin & Jackson, 2010). Additionally, a GFI value of $\geq$.95 is also an indicator of a good fit (Kline, 2015). However fit indices can only indicate the model’s overall fit to the data but are unable to specify any misfit of the parameters being estimated (Byrne, 2006). In addition to looking at fit indices, the fit of the measurement model was evaluated by looking at factor loadings and error estimates. Single-factor CFAs were also conducted to look deeper into the individual factors in order to confirm an adequate fit of the eventual model.

To scrutinise the psychometric properties of the full measurement model of the COPE inventory, CFA was conducted using EQS for Windows 6.3 using maximum likelihood (MLE) estimation derived from covariance matrices. MLE is a typical approach in looking at parameter estimation as well as inference statistics (Myung, 2003). Moreover, it is also a pre-requisite for the chi-square test and inference with missing data, which seeks the desired probability description (Ng et al., 2015). Initial analysis revealed that there were three missing cases, which were subsequently filled in with the mean score of the corresponding item using EQS 6.3. Another concern was the ratio of the number of participants to the number of estimated parameters. Nevertheless, the present study managed to fulfil the recommended minimum ratio of 5:1 for number of participants to number of estimated parameters (Bentler & Chou, 1987).
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Next, the data from Study 1 was used to test for the model fit adapted from Carver et al. (1989) and Litman (2006). The fit statistics across both the 15-factor model and adapted four-factor model were then compared to determine which was more adequate. Finally, the fit between latent variables of the final model to the data was tested for construct reliability and validity.

3.3 Results

3.3.1 Descriptive Statistics.

Looking at the mean statistics of participants’ responses, the most common coping response used was that of positive interpretation and growth ($M = 5.62$, $SD = .72$). On the other hand, the least commonly used coping response was that of substance use ($M = 1.46$, $SD = 1.03$). Across all 15 factors, athletes also engaged more in approach coping strategies ($M = 4.97$, $SD = .95$) as compared to avoidance coping strategies ($M = 3.22$, $SD = .12$). Approach coping strategies are: acceptance, active coping, use of emotional social support, positive reinterpretation and growth, planning, use of instrumental social support and suppression of competing activities. On the other hand, avoidance coping strategies are: behavioural disengagement, denial, humour, mental disengagement, restraint, substance use, venting of emotions and religion.

Table 6

<table>
<thead>
<tr>
<th>Subscale</th>
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<th>Maximum</th>
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<th>S.D</th>
<th>Skewness</th>
<th>Kurtosis</th>
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<td>4.74</td>
<td>1.06</td>
<td>-.21</td>
<td>.14</td>
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<td>5.25</td>
<td>.76</td>
<td>-.70</td>
<td>.14</td>
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<td>.14</td>
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<th>4.03</th>
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<th>-.17</th>
<th>.14</th>
<th>-.45</th>
<th>.28</th>
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<td>-.45</td>
<td>.14</td>
<td>-.38</td>
<td>.28</td>
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<td>Positive Interpretation and Growth</td>
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<td>.14</td>
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<td>.28</td>
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Single-factor CFAs were run by including all items from a scale as one factor and testing the fit statistics. Upon examining the residuals and indices of each single-factor CFA, one item was deleted from the suppression of competing activities scale, one item was deleted from the seeking social support-emotional scale and one item was deleted from the restraint scale. The Mental Disengagement scale also resulted in a low Cronbach’s α coefficient (α =.57). However, in the original conceptualisation of the questionnaire, even with a low Cronbach’s α coefficient, it was still included as Carver et al. (1989) justified that the scale consists of multiple activities, and hence the lower reliability is not unexpected. Moreover, when looking at coefficient alpha, reliability increases with the number of items (Skinner, Edge, Altman and Sherwood, 2003). Skinner et al. (2003) have proposed that five to six items per subscale are necessary for
COPING STRATEGIES OF TERTIARY ATHLETES IN SINGAPORE: THE
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acceptable internal consistencies. As the COPE inventory has only four items per

subscale, it does not meet this criterion. Therefore, this scale is still included as well in

the rest of the study. Table 7 displays the item loadings, internal consistency and fit

statistics for all remaining items of the COPE inventory.

Table 7
Fit Indices and Item Loadings of Factors After Item Deletion

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### COPING STRATEGIES OF TERTIARY ATHLETES IN SINGAPORE: THE INFLUENCE OF ACHIEVEMENT GOALS, MOTIVATIONAL CLIMATE AND A BRIEF RELAXATION INTERVENTION

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Cronbach’s α coefficient values for all remaining scales ranged from .57 to .97, indicating adequate internal reliability for these remaining factors. For all factor models, item loadings were mostly significant. With the exception of two items from the mental disengagement scale and one item from the positive reinterpretation and growth scale, all remaining item loadings range from .50 to .98. With regards to fit statistics, NNFI, GFI and CFI values were statistically acceptable, with the exception of RMSEA. The RMSEA value should be below .05 to achieve a close fit (Marsh et al., 2010) or even less than .06 to achieve a satisfactory model fit (Hu & Bentler, 1999). However, several models (e.g., restraint and substance use) did not meet the recommended cut-off value for RMSEA. As RMSEA is greatly influenced by degree of freedom, these models were accepted on the basis of NNFI, GFI and CFI. In addition, majority of the factor loadings were acceptable and did not reveal any ambiguity that might affect the overall fit of the model. Therefore, these one-factor models proceeded to the next stage of the analysis, which was to test the overall fit of the model and to determine if higher order factor analysis is adequate.

Pearson’s correlation coefficients were conducted on the 15-factor first-order model (Table 8) and four-factor higher-order model (Table 9). The first-order model showed good correlation amongst items. However, behavioural disengagement was negatively correlated with both active coping as well as planning. In terms of the four-factor higher-order model, all four factors showed significant correlation.
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Venting of Emotions</td>
<td>.092</td>
<td>.156**</td>
<td>.267**</td>
<td>.262**</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emotional Social Support</td>
<td>.068</td>
<td>-.102</td>
<td>.002</td>
<td>.034</td>
<td>.249**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Positive Interpretations and Growth</td>
<td>.299**</td>
<td>.555**</td>
<td>-.102</td>
<td>.002</td>
<td>.249**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Humour</td>
<td>.246**</td>
<td>.554**</td>
<td>.280**</td>
<td>.250**</td>
<td>.324**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mental Disengagement</td>
<td>.131*</td>
<td>.012</td>
<td>.418**</td>
<td>.366**</td>
<td>.307**</td>
<td>.208**</td>
<td>.104</td>
<td>.328**</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Planning</td>
<td>.301**</td>
<td>.740**</td>
<td>-.225**</td>
<td>.005</td>
<td>.176**</td>
<td>.591**</td>
<td>.195**</td>
<td>.000</td>
<td>.1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Religion</td>
<td>.076</td>
<td>.149**</td>
<td>.118*</td>
<td>.089</td>
<td>.137*</td>
<td>.123*</td>
<td>.079</td>
<td>.022</td>
<td>.061</td>
<td>.136*</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Restraint</td>
<td>.254**</td>
<td>.155**</td>
<td>.215**</td>
<td>.244**</td>
<td>.252**</td>
<td>.201**</td>
<td>.278**</td>
<td>.303**</td>
<td>.233**</td>
<td>.093</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Instrumental Social Support</td>
<td>.101</td>
<td>.395**</td>
<td>.090</td>
<td>.066</td>
<td>.307**</td>
<td>.688**</td>
<td>.373**</td>
<td>.228**</td>
<td>.164**</td>
<td>.381**</td>
<td>.125*</td>
<td>.301**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Substance Use</td>
<td>.131*</td>
<td>.115**</td>
<td>.109</td>
<td>.240**</td>
<td>.154**</td>
<td>.053</td>
<td>.107</td>
<td>.260</td>
<td>.249**</td>
<td>.137*</td>
<td>.075</td>
<td>.169**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Suppression of Competing Activities</td>
<td>.276**</td>
<td>.544**</td>
<td>.047</td>
<td>.249**</td>
<td>.202**</td>
<td>.247**</td>
<td>.309**</td>
<td>.183**</td>
<td>.284**</td>
<td>.550**</td>
<td>.152**</td>
<td>.423**</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

** Correlation is significant at the 0.01 level
*Correlation is significant at the 0.05 level
Table 9

**Correlations of 15-factor COPE Inventory Items**

<table>
<thead>
<tr>
<th></th>
<th>Problem-focused</th>
<th>Emotion-focused</th>
<th>Avoidance</th>
<th>Social Support</th>
</tr>
</thead>
<tbody>
<tr>
<td>Problem-focused</td>
<td>1</td>
<td>.474**</td>
<td>.193**</td>
<td>.257**</td>
</tr>
<tr>
<td>Emotion-focused</td>
<td>1</td>
<td>1</td>
<td>.341**</td>
<td>.270**</td>
</tr>
<tr>
<td>Avoidance</td>
<td>.193**</td>
<td>.341**</td>
<td>1</td>
<td>.307**</td>
</tr>
<tr>
<td>Social Support</td>
<td>.257**</td>
<td>.270**</td>
<td>.307**</td>
<td>1</td>
</tr>
</tbody>
</table>

** Correlation is significant at the 0.01 level
*Correlation is significant at the 0.05 level

3.3.2 Model Fit Statistics.

Analysis of the revised 57-item, 15-factor COPE inventory showed marginally adequate model to data fit ($\text{SB} \chi^2 = 2447.08$, df = 1431, NNFI = .88, GFI = .78, CFI = .90, RMSEA = .049, 90% confidence interval (CI) = .045, .052). This is due to the marginally satisfactory values for CFI and RMSEA, but less than acceptable values for GFI and NNFI (Hu & Bentler, 1999). However, in examining model fit, researchers have shown a preference for CFI and RMSEA but not GFI and NNFI (Hasking & Oei, 2002; Hu & Bentler, 1999). Moreover, researchers have found it hard to replicate the original factor structure of the COPE as proposed by Carver et al. (1989) yet the COPE inventory is still considered an important research tool in measuring coping (Hasking & Oei, 2002). Next, the fit statistics of a four-factor model was tested with the revised 57-items, based on an adapted four-factor model based on Carver et al. (1989) and Litman (2006). This four-factor model is based on the table below.

Table 8

**Four-factor Model of COPE**

<table>
<thead>
<tr>
<th>Factor</th>
<th>Subscales</th>
</tr>
</thead>
<tbody>
<tr>
<td>Problem-focused</td>
<td>Active coping, Planning, Suppression of competing activities</td>
</tr>
<tr>
<td>Emotion-focused</td>
<td>Acceptance, Restraint, Positive interpretation &amp; growth, Humour</td>
</tr>
<tr>
<td>Avoidance</td>
<td>Behavioural disengagement, Mental disengagement, Denial, Religion, Substance use</td>
</tr>
</tbody>
</table>
From this model, the fit statistics were slightly lower than that of the 15-factor model and showed moderate model fit ($\chi^2 = 2638.46$, df = 1507, NNFI = .87, GFI = .77, CFI = .88 RMSEA = .050, 90% confidence interval (CI) = .047, .053). The 15-factor model established on the 57 items was found to be slightly superior to the higher order factor model comprising four higher order factors on the 15 scales. Nevertheless, a study by Cook and Heppner (1997) parallel findings in this study, whereby fit indices for two different factor models showed a better fit for the model with more factors (14 factors) and yet based on parsimony the model with fewer factors (12 factors) was preferred. Eventually, factor analyses in that study went on to display an optimal three-factor model. Moreover, the fit indices of this present study are comparable to fit indices from previous studies comparing a 14-factor model (without the religion scale) and a four higher order factor model as seen in Table 9 below.

**Table 9**  
*Fit Indices of the COPE Inventory*

<table>
<thead>
<tr>
<th></th>
<th>$\chi^2$</th>
<th>df</th>
<th>NNFI</th>
<th>GFI</th>
<th>CFI</th>
<th>RMSEA</th>
<th>90% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>15-factor (present study)</td>
<td>2447.08</td>
<td>1431</td>
<td>.88</td>
<td>.78</td>
<td>.90</td>
<td>.049</td>
<td>.045, .052</td>
</tr>
<tr>
<td>14-factor (Hasking &amp; Oei, 2002)</td>
<td>2296.07</td>
<td>1379</td>
<td>.79</td>
<td>-</td>
<td>.90</td>
<td>.048</td>
<td>-</td>
</tr>
<tr>
<td>4 higher order factors (Hasking &amp; Oei, 2002)</td>
<td>2501.16</td>
<td>1461</td>
<td>.88</td>
<td>-</td>
<td>.89</td>
<td>.049</td>
<td>-</td>
</tr>
<tr>
<td>4 higher order factors (present study)</td>
<td>2638.46</td>
<td>1507</td>
<td>.88</td>
<td>.77</td>
<td>.88</td>
<td>.050</td>
<td>.047, .053</td>
</tr>
</tbody>
</table>

Therefore, based on very close results and researchers arguing that the existing 15-factor model is overly complex and inappropriate (Cook & Heppner, 1997), it appears that higher order factor structures might be more appropriate for future studies. The higher order four factor structure also has strong support from other researchers.
COPING STRATEGIES OF TERTIARY ATHLETES IN SINGAPORE: THE INFLUENCE OF ACHIEVEMENT GOALS, MOTIVATIONAL CLIMATE AND A BRIEF RELAXATION INTERVENTION (Carvel et al., 1989; Litman, 2006) and hence based on parsimony of results, will be accepted for use in the next study.

3.3.3 Deleted COPE Items.

To understand why some measurement models did not have good fit indices, it is necessary to look beyond the figures. One approach is to inspect the questionnaire wording closely as participants may perceive or comprehend the statement differently (Ng et al., 2015). Table 10 shows the total items on the suppression of competing activities subscale.

Table 10

<table>
<thead>
<tr>
<th>Item Code</th>
<th>Item Wording</th>
</tr>
</thead>
<tbody>
<tr>
<td>SUPCOM1</td>
<td>(Deleted item) I keep myself from getting distracted by other thoughts or activities.</td>
</tr>
<tr>
<td>SUPCOM2</td>
<td>I focus on dealing with this problem, and if necessary let other things slide a little.</td>
</tr>
<tr>
<td>SUPCOM3</td>
<td>I try hard to prevent other things from interfering with my efforts at dealing with this.</td>
</tr>
<tr>
<td>SUPCOM4</td>
<td>I put aside other activities in order to concentrate on this.</td>
</tr>
</tbody>
</table>

A closer examination of SUPCOM1 shows that there is an emphasis on both thoughts and activities, whereas the other three items seem to imply a greater focus on the ‘doing’ aspect of activities. Therefore, athletes could have mis-read the item to read thoughts and activities, despite being worded as “thoughts or activities”.

Table 11 below shows on the items on the seeking emotional social support subscale. The third item of this subscale was deleted due to low factor loadings.

Table 11

<table>
<thead>
<tr>
<th>Item Code</th>
<th>Item Wording</th>
</tr>
</thead>
<tbody>
<tr>
<td>ESOCSUP1</td>
<td>I discuss my feelings with someone.</td>
</tr>
<tr>
<td>ESOCSUP2</td>
<td>I try to get emotional support from friends or relatives.</td>
</tr>
<tr>
<td>ESOCSUP3(Del)</td>
<td>I get sympathy and understanding from someone.</td>
</tr>
<tr>
<td>ESOCSUP4</td>
<td>I talk to someone about how I feel.</td>
</tr>
</tbody>
</table>
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The wording of ESOCSUP3 might appear to be ambiguous to some athletes as they might not “get sympathy and understanding” from just anyone. In a conservative society such as Singapore, individuals might not be comfortable seeking sympathy and understanding from people who are not their friends or relatives. Therefore, ESOCSUP3 might not apply in this context as athletes might not apply this strategy.

Table 12 displays the total items on the restraint subscale.

Table 12 
*Items from the Restraint Subscale (with Deletion).*

<table>
<thead>
<tr>
<th>Item Code</th>
<th>Item Wording</th>
</tr>
</thead>
<tbody>
<tr>
<td>RESTRNT1</td>
<td>I restrain myself from doing anything too quickly</td>
</tr>
<tr>
<td>RESTRNT 2 (Deleted item)</td>
<td>I hold off doing anything about it until the situation permits.</td>
</tr>
<tr>
<td>RESTRNT 3</td>
<td>I make sure not to make matters worse by acting too soon.</td>
</tr>
<tr>
<td>RESTRNT 4</td>
<td>I force myself to wait for the right time to do something.</td>
</tr>
</tbody>
</table>

Again, the wording on the RESTRNT2 item might appear to be ambiguous to our local athletes as they might not understand “until the situation permits”. More commonly used and understood terms would include “until the right time” or “until the right moment”. Moreover, in the context of sports, most events happen in a short span of time and it might not be necessary to do anything after some time even if “the situation permits”.

### 3.3.4 Specific CFA Evidence of Convergent and Divergent Validity.

Factorial validity was confirmed using the analyses of covariance structures. Table 13 below displays the average variance extracted (AVE) index and composite reliability (rho) of the four subscales. An AVE index which is close to or above .50 accounts for 50% or more variance of the indicators (Fornell & Larcker, 1981). All of the factors had AVE values of close to .50 and above. All factors had a rho value of
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close to .90 and above, indicating adequate reliability. Other than convergent validity, it is crucial that the discriminant validity is established to ensure that the latent constructs used for measuring the causal relationships in the study are truly distinct (Hamid, Sami, & Sidek, 2017). In terms of discriminant validity, the square root of the AVE of each construct should be much larger than the correlation between the construct and any other constructs for it to be acceptable (Zait & Bertea, 2011). Looking at the discriminant validity of the latent constructs in the COPE inventory, it appears to be mostly robust, indicating strong measurement invariance. For example, the correlation coefficient of acceptance and active coping was .35. Moreover, several latent constructs were negatively correlated (e.g., acceptance and denial), which enables us to draw the same conclusion for the higher order factors these latent constructs belong to such as emotion-focused and avoidant coping. This contributes to the robustness of the discriminant validity for the COPE inventory.

<table>
<thead>
<tr>
<th>Factor</th>
<th>AVE</th>
<th>rho</th>
</tr>
</thead>
<tbody>
<tr>
<td>Problem-focused coping</td>
<td>.44</td>
<td>.89</td>
</tr>
<tr>
<td>Emotion-focused coping</td>
<td>.48</td>
<td>.93</td>
</tr>
<tr>
<td>Avoidance</td>
<td>.59</td>
<td>.96</td>
</tr>
<tr>
<td>Social support</td>
<td>.57</td>
<td>.94</td>
</tr>
</tbody>
</table>

3.4 Discussion

The main objective of Study 1 was to examine psychometric properties of the COPE Inventory in a sample of Singaporean athletes as well as to determine if a higher order factor model was appropriate for future use. Additionally, trends in the current coping strategies being employed by athletes here in Singapore were also investigated.
Overall, results from the present study provided adequate support for the factorial validity as well as reliability of the COPE Inventory. The COPE inventory also had adequate internal consistency scores, demonstrating evidence for internal structure validity.

In Study 1, a series of statistical tests were conducted on the sample of tertiary athletes to obtain the final 57-item COPE inventory. Previous studies exploring the psychometric properties of the COPE inventory failed to come to a conclusive viewpoint on the validity of the COPE inventory (Lyne & Roger, 2000; Zuckerman & Gagne, 2003). Researchers have previously rejected the religion subscale on the COPE inventory due to its low factor loadings (Lyne & Roger, 2000). However, this study showed that the religion subscale was found to be adequately acceptable with good factor loadings. CFA results demonstrated a good data to model fit after the deletion of one item from the suppression of competing activities subscale, one item from the restraint subscale and one item from the seeking emotional social support subscale. This final model differs from previous modifications to the COPE inventory with minimal changes required. The data from Study 1 was also used to test the data to model fit for an adapted four-factor model of the COPE inventory (Carver et al., 1989; Litman, 2006). With regards to the hypothesis for Study 1, the four-factor model of the COPE inventory was tested and found to be acceptable. Nevertheless, looking at fit indices alone may not be sufficient to draw a conclusive picture of construct validity. There is a need to examine convergent validity as well. The convergent and discriminant validity of all four higher order factors were examined and found to be acceptable.

The AVE indexes for two factors (problem-focused coping and emotion-focused coping) were slightly below .50 and were above .50 for the other two factors (avoidant
COPING STRATEGIES OF TERTIARY ATHLETES IN SINGAPORE: THE INFLUENCE OF ACHIEVEMENT GOALS, MOTIVATIONAL CLIMATE AND A BRIEF RELAXATION INTERVENTION (coping and social support). With regards to AVE, the convergent validity may be concluded as adequate despite approximately 50% of variance being due to error. This is because as AVE is a more conservative measure than construct reliability, low AVE values will have to be looked at in light of the bigger picture (Fornall & Larcker, 1981).

Given the acceptable construct reliability of the COPE inventory, the convergent reliability can be considered as satisfactory with AVE values of close to .50. Taking the above into account, these statistical findings are satisfactory and display the overall acceptable convergent validity of the current measurement model.

On the other hand, discriminant validity can be observed by comparing the AVE for each factor with the squared correlation coefficients (Wong & Lo, 2012). Looking at the discriminant validity of latent constructs in the COPE inventory, it was found to be fairly robust despite Carver et al. (1989) having previously acknowledged that the original latent structure of the COPE inventory was problematic.

One interesting point to note was the outstandingly low mean ($M = 1.46$) for the subscale of Substance Use. Nonetheless, this low occurrence of athletes using substance to cope with competition anxiety could be due to cultural and societal reasons, such as the high cost of substances like alcohol and cigarettes or extremely strict drug laws in Singapore. Therefore, despite substance use being a substantially used coping strategy in other countries, there is a very low occurrence of it being used as a coping strategy here in Singapore.

It can also be observed that the most common coping strategy is that of positive reinterpretation and growth; meaning athletes take the stressor, see a positive meaning to it and grow from the experience. It is surprising that the most common coping strategy is a more cognitive form of approach coping strategy as previous studies have
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found that athletes tend to engage in a more action-focused coping strategy, such as setting clearly defined goals to cope with the stressor, or being motivated and concentrating during competitions (Belem, Camzzo, Junior, Vieira, & Vieira, 2014; Litwic-Kaminska, 2010). However, the context of these studies investigated coping strategies in light of some other construct such as gender or resilience. Similarly, looking at coping strategies alone tells little in how this information can be used in the applied field. This paves the way for the next study where the use of coping strategies can be observed together with other dispositional and situational characteristics.

Moreover, as mentioned in the previous chapter, most of the earlier studies looking at coping in the sport domain have focused mainly on athletes based in a Western context. However, coping with competition related stress in Western contexts has been found to vary from an Asian context in terms of the use of coping styles and strategies. Therefore, these findings may not be generalizable in our present sports scene. Hence, the results from the present study provide evidence that the COPE inventory is applicable to our athletes here in Singapore and can be utilised to further measure their coping responses to sport-specific stress. Through this study, we were also given a clearer insight into the sporting scene here in Singapore, more specifically in athletes’ use of coping strategies. By being more aware of how athletes are currently coping with stressors in their sport, we are also able to keep track of how effectively athletes cope with sporting stress.

3.5 Conclusion

In summary, the present study has established adequate internal consistency and factorial validity for the COPE inventory in Singaporean athletes. The four factor COPE inventory was tested and found to have a good data to model fit. To give a complete
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picture of the construct validity of the COPE inventory, goodness-of-fit indices and convergent validity values of the COPE were found to be psychometrically sound.

Going beyond fit indices, the convergent validity using AVE values was used to check the construct validity and confirm that the items in the revised COPE inventory indeed do reflect the theoretical constructs. In addition, comparison of the fit indices across both the original 15-factor COPE and higher order four-factor COPE helped to ensure that the resultant four-factor model has a good construct validity. This study has also confirmed that athletes in Singapore are generally coping effectively with stressors and display low use of maladaptive coping strategies such as substance use. This provides greater empirical support and a case for the next study, which focuses on looking at how additional factors such as dispositional traits and motivational climate are able to affect coping strategies used.
Chapter 4: Study 2a – Exploration of Coping Strategies

From Study 1, the four-factor COPE inventory was shown to have adequate factorial validity and reliability in a sample of Singaporean athletes. However, as previously mentioned, coping has to be examined in relation to other factors and not as a standalone construct. The above findings do not give any insight as to how other factors, such as dispositional or situational ones, can affect the way one copes with sport-related stress. Nor does it help us understand the coping process of athletes more. Hence, this study will delve deeper into how various other factors are able to affect the coping mechanism of athletes. More specifically, the influence of achievement goal profile, motivational climate and use of mental skills on coping strategies will be examined.

Lazarus (1991) noted that how a person copes depends not only on how the situation is appraised or the coping possibilities available, but also on what the person wants to achieve from the encounter. Hence, Lazarus (1991) proposed that goals create a framework for how an individual interprets and responds to events during goal pursuit. Specifically, he contended that an individual’s goal type influences the application of specific coping strategies. In line with these theorizing, there is empirical research suggesting that achievement goal type is indeed linked to the use of coping strategies. Additionally, in the transactional model of stress and coping, Lazarus and Folkman (1984) emphasised the mutual and bi-directional relationship between the person and the environment in stress and coping situations. This relationship between person and environment parallels the goal disposition of individuals (person) and the motivational climate (environment) (Kristiansen et al., 2008), highlighting the effect they have on each other. In fact, dispositional goal orientations and motivational climate
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have been closely linked in sport literature. Dispositional goal orientations are based on how competence is defined and valanced, and are typically examined using the 2 x 2 AGT framework (Elliot & McGregor, 2001). This framework consists of four different types of achievement goals: mastery-approach (focus on attaining personal improvement or to achieve absolute standards), mastery-avoidance (focus on not performing worse than previous attempts), performance-approach (focus on performing better than others) and performance-avoidance (focus on not being the worst performer).

Similar to goal involvement, the motivational climate is measured in relation to task/ego involvement and are termed mastery and performance climate respectively (Ames, 1992; Kristiansen et al., 2008). Duda and Balaguer (2007) found that a mastery or task-involving climate in sport is best understood as evaluating and recognizing athletes based on their own effort and self-referenced improvement, encouraging athletes to pursue personally challenging tasks, and providing time and opportunities to grow and learn from mistakes. On the other hand, a performance or ego-involving climate is characterized by rewarding and assessing athletes based on social comparison (e.g., winning or outperforming their peers), giving the most attention to the higher performing athletes and punishing individuals for mistakes. A perceived task-involving climate was found to be positively associated with adaptive motivational outcomes (Gano-Overway, Steele, Boyce, & Whaley, 2017; Harwood, Keegan, Smith, & Raine, 2015; Meroño, Calderón, & Hastie, 2016). Motivational climate has been closely associated with achievement goal profiles and researchers have ascertained that when a mastery climate is perceived, the athlete is more likely to be task (mastery) involved, whereas when a performance climate is perceived, the athlete is more likely to be ego (performance) involved in sport (Kristensen et al., 2008; Skjesol & Halvari, 2005).
Previous studies looking at goal profiling and how it relates to the use of coping strategies have found that different goal profiles also follow certain trends in their use of coping strategies. Mastery-approach goals were found to be related to problem-focused and emotion-focused coping (Yeatts & Lochbaum, 2013) whilst negatively predicting avoidance coping strategies such as behavioural disengagement (Toh, 2010). Conversely, performance-approach goals were found to be strongly related to avoidant coping strategies such as denial as well as behavioural and mental disengagement when faced with setbacks (Shively & Hall, 2006). On that note, performance-avoidance goals positively predicted maladaptive coping strategies such as self-blame (Toh, 2010). In a similar vein, looking at coping strategy from both a goal orientation and motivational climate perspective, a task (mastery) orientation and a mastery climate were found to relate to problem-focused coping, whereas having an ego (performance) orientation and a performance climate were found to relate to emotion-focused coping (Ntoumanis et al., 1999). Adding on to this finding, a mastery goal orientation has been found to lead to more approach coping strategies when athletes do not perceive much of a performance climate (Kim, Duda, & Gano-Overway, 2011). On the other hand, the use of avoidance coping strategies was predicted by a performance climate alone, and not by the presence of performance goals (Kim et al., 2011). Nonetheless, adaptive coping strategies (acceptance, active coping, planning, religion, emotional support, instrumental support positive reframing and humour) were found to be correlated with both a task (mastery) orientation and a mastery climate (Kristiansen et al., 2008). Therefore, it appears that a mastery climate coupled with a mastery goal orientation leads to adaptive coping outcomes such as approach and problem-focused coping strategies whereas a performance climate together with a performance goal orientation results in avoidant and maladaptive coping. However, the presence of a performance
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Climate seems to hold a greater influence on the use of coping strategies than the achievement goal orientation one has.

It is also important to examine achievement goals from an approach and avoidance perspective on top of a mastery and performance one as recent literature found that approach goals appear to lead to more adaptive outcomes as compared to avoidance goals. In an education setting, mastery-approach and performance-approach goals were found to lead to better grades (Céline, Mickaël, & Cristina, 2017; Mouratidis, Michou, Demircioğlu, & Sayil, 2018). However, care has to be taken to consider other factors as social class was found to affect goal orientation and final grades, where performance-approach goals predicted the final grade for upper-class students whereas mastery-approach goals predicted the final grade for lower-class students (Céline et al., 2017). Nonetheless, a parallel trend was found in a sport setting, where both mastery-approach and performance-approach goals were found to have a similarly positive impact on sport performance (Lochbaum & Gottardy, 2015).

Therefore, in order not to miss out on important information such as the approach-avoidance dimension of achievement goals, the 2 x 2 achievement goal model will be used in this study to look at the relation between motivational climate and achievement goals.

Due to the association they share, the constructs of goal orientation, motivational climate, perceived competence, and the use of coping strategies have often been examined together. Using cluster analysis, researchers have examined constructs from different theories (e.g., achievement goal theory) in order to identify subgroups with different profiles in both physical activity as well as sport (Sarmento, Peralta, Harper, Vaz, & Marques, 2018; Wang, Biddle, & Elliot, 2007; Wang, Koh, & Chatzisarantis,
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2009; Wang, Liu, Sun, Lim, & Chatzisarantis, 2010). These studies identified three to four clusters. In the Wang et al.’s (2007) study, four clusters were being identified with one moderate achievement goal profile (all four achievement goals close to standard scores of zero), one low achievement goal profile (all achievement goal scores were very low), one high achievement goal profile (very high scores for all four goals) and one mastery achievement goal profile (high mastery-approach and mastery-avoidance scores). The results from the other studies (Wang et al., 2009; Wang et al., 2010) parallel findings in this study where cluster analyses reveal a moderate achievement goal profile, a low achievement goal profile, a moderately low achievement goal profile and a high achievement goal profile. As half of these studies (Wang et al., 2007; Wang et al., 2009) were conducted on Singaporean students and found three to four different clusters, it can be argued that similar results would be observed in a sample of Singaporean tertiary athletes. Nonetheless, these studies prove that cluster analysis is a valid method that can identify homogeneous subgroups based on certain constructs in order to understand inter-group differences better.

Building on the notions presented above, this study aims to contribute to the existing literature by further exploring how one’s goal orientation, motivational climate and also use of performance strategies can affect the way one copes with stress in sport, by examining them in clusters. Examining the interactions among these constructs from a cluster level can enable a clearer and more in-depth investigation of the unique characteristics within each cluster. A follow-up qualitative study was conducted to obtain a deeper understanding of the coping process and will be discussed in the subsequent chapter.
Given that an effective coping process is crucial in helping an athlete maintain his/her peak performance state, especially during competitions, it is beneficial to utilise both quantitative and qualitative methods to have a holistic view of the construct of coping. Taken together and individually, both sources of data can help to paint a clearer picture of the coping process for Singaporean athletes. The present study employs the use of quantitative questionnaires so as to look deeper into this complex process of coping.

The key research question explored in this study is presented below:

a) What are the multivariate relationships between achievement goals, motivational climate, mental skills adoption and coping strategies at the intraindividual level?

In answering the research questions above, the following hypotheses pertaining to achievement goals, motivational climate, use of mental skills and coping strategies will be examined in Study 2a:

Hypothesis 1a: There would be at least three distinct achievement goals/motivational climate profiles (one moderate, one low and one high achievement goal profile).

Hypothesis 1b: More adaptive goal/climate profiles would display high mastery-approach goals in a mastery climate and the use of more approach and problem-focused coping strategies. On the other hand, less adaptive goals/climate profiles would display high performance-avoidance goals in a performance climate and the use of more avoidance coping strategies.
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4.1 Method

4.1.1 Participants.

The participants for Study 2a were student athletes recruited from local tertiary institutions (N = 290; 160 males, 128 females, 2 missing). Participants were actively recruited through different means from Study 1. These athletes reported playing at national inter-school level (n = 151), external club level (n = 61), regional and international competition level (n = 59), with the remainder not indicating their highest level of competition (n = 19). Athletes reported participating competitively in sports from a range of half a year to 22 years (M = 7.30, SD = 4.38).

4.1.2 Procedure.

Similar to the previous study, ethical clearance was first obtained from the Institutional Ethical Review Board of Nanyang Technological University. Following which, consent was sought from the local tertiary institutions to allow student athletes to participate in the study. Upon approval and dissemination of the study information from the Sports Officers, the Principal Investigator approached the athletes or sports teams to explain the purpose of the study and recruit them as participants. The research procedure for this study is similar to that used in Study 1. Due to the presence of outliers in the questionnaire data obtained, one case was excluded from the final analysis. A rough breakdown of all 290 athletes can be observed in the table below.

Table 14
Demographics of Athletes in Study 2a

<table>
<thead>
<tr>
<th>Gender</th>
<th>Number of years in sport</th>
<th>Participation Level</th>
<th>Sport</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Team</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>sports</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Time-</td>
</tr>
<tr>
<td>Male</td>
<td>1-5 years</td>
<td>1</td>
<td>163</td>
</tr>
<tr>
<td>Female</td>
<td>6-10 years</td>
<td>2</td>
<td>47</td>
</tr>
<tr>
<td></td>
<td>11-15 years</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>16-22 years</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Missing</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

Note: For participation level, 1 = School Level, 2 = External Club Level, 3 = Regional or International Level; for sport, skill-based = Archery, Bowling, Badminton, Cue sports, Golf, Weightlifting, Table-
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4.1.3 Measures.

In the first part of the questionnaire, participants were asked to provide some background information regarding their participation in sport. The information included participants’ demographical information such as gender, type of sport played, number of years playing sport and highest level of sport participation achieved. In the subsequent paragraphs, the following validated instruments were used to look at how perceived competence, mental skills adoption and coping strategies were related in participants.

Coping Strategies. The dispositional version of the modified four-factor, 57-item COPE inventory (Carver et al., 1989) validated in Study 1 was administered to measure how athletes’ usually cope with stress in their sport. Athletes were asked to think about how they regularly respond to stress in their sport, or rate how likely they would respond according to each question. The scale consists of four different factors, which are problem-focused coping (e.g., “I take direct action to get around the problem”; $\alpha = .85$), emotion-focused coping (e.g., “I get used to the idea that it happened”; $\alpha = .80$), socially-supportive coping (e.g., “I try to get advice from someone about what to do”; $\alpha = .77$) and avoidant coping (e.g., “I pretend that it hasn’t really happened”; $\alpha = .84$). The internal consistencies of all subscales were found to be adequate. The items were scored on a seven-point Likert scale, where participants responded to how often they used different strategies to cope with stress in their sport (1= “I usually don’t do this at all”, to 7= “I usually do this a lot”).

Mental Skills Adoption. The Test of Optimal Performance Strategies 2 (TOPS 2; Hardy et al., 2010) was used as a measure of mental skills utilised by athletes. The
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TOPS 2 specifically measures the types of mental skills used by participants in both training and competition settings. Adapted and modified from the original TOPS questionnaire (Thomas, Murphy, & Hardy, 1999), the TOPS 2 consists of eight practice and eight competition subscales. For this research, only the 32-item competition subscales were used to obtain a state response. The eight competition subscales comprise four items for activation (e.g., “I do what needs to be done to get psyched up for competitions”), four items for relaxation (e.g., “When pressure is on at competitions, I know how to relax”), four items for imagery (e.g., “I imagine my competitive routine before I do it at a competition”), four items for goal setting (e.g., “During competition I set specific result goals for myself”), four items for self-talk (e.g., “I have specific cue words or phrases that I say to myself to help my performance during competition”), three items for emotional control (e.g., “My emotions keep me from performing my best at competitions”), four items for negative thinking (e.g., “During competition I have thoughts of failure”) and five items for automaticity (e.g., “During competition, I play instinctively with little conscious effort”). Each subscale consists of responses made on a seven-point Likert scale (1= “Never”, to 7= “Always”). The internal consistency for all eight subscales, namely, activation (α = .82), relaxation (α = .81), imagery (α = .83), goal setting (α = .87), self-talk (α = .79), emotional control (α = .70), negative thinking (α = .70 and automaticity (α = .63) were found to be satisfactory.

Achievement Goal. The 2 x 2 Achievement Goal Questionnaire for Sport (AGQ-S; Conroy, Elliot, & Hofer, 2003) was used to measure athletes’ achievement goals. The AGQ-S was developed by modifying items from Elliot and McGregor’s (2001) 12-item 2 x 2 AGQ; which was originally intended for use in an education domain, to make the items more applicable to sport. The AGQ-S consists of 12 items as well, and each of the items describes different ways in which participants can strive for
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competence or avoid incompetence. The AGQ-S measures four different achievement goal dimensions in sport and the internal consistency of these four dimensions, namely, Mastery-approach (e.g. “It is important to me to perform as well as I possibly can”; $\alpha = .95$), Mastery-avoidance (e.g. “I’m often concerned that I may not perform as well as I’d like”; $\alpha = .93$), Performance-approach (e.g. “It is important to me to do well compared to others”; $\alpha = .87$), and Performance-avoidance (e.g. “My goal is to avoid performing worse than everyone else”; $\alpha = .88$) were all satisfactory. Participants also responded on a seven-point Likert scale, where they rated how consistent each way of evaluating competence was with their own achievement goals (1 = “not at all like me”, to 7 = “completely like me”).

Motivational Climate. The Motivational Climate Scale for Youth Sports (MCSYS; Smith et al., 2006) was initially developed to provide a questionnaire that could evaluate the motivational climate for lower age limits. It is based on the Perceived Motivational Climate in Sport Questionnaire and was meant to address the question of whether children as young as nine years old were able to differentiate between coach-initiated mastery and ego climates. Due to the length of the questionnaire pack to be administered in this study, it was decided that the MCSYS would be used, as it is shorter yet still able to measure perceived motivational climate in sport. The MCSYS has been subjected to both EFA and CFA analyses, and reliability and validity results support the scale on psychometric and construct validity grounds (Smith et al., 2006). The MCSYS consists of 12 items and two subscales with six-items for mastery-initiating items (e.g., “The coach encouraged us to learn new skills”; $\alpha = .85$) and six-items for ego-initiating items (e.g., “The coach spent less time with the players who weren’t as good”; $\alpha = .70$). The internal consistency of each subscale was found to be
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satisfactory. Each subscale consists of responses made on a seven-point Likert scale (1=“Never”, to 7=“Always”).

4.2 Data Analysis

As a preliminary check for group differences, independent t-tests via SPSS IBM Statistics 21 were conducted. Skewness and kurtosis were found to be acceptable for the data set (within +2 or -2; George & Mallery, 2010). Pearson correlations were used to examine the associations among all measured variables in this study and are presented in Tables 17, 18 and 19 below. Scores for all questionnaires were also converted to z scores, by calculating the difference between the score and the mean score before dividing that by the standard deviation, and used in subsequent analyses. Standardisation to z scores helps to prevent variables using larger units from contributing more to the distance measured than variables using smaller units in the cluster analysis (Wang et al., 2007).

When that was done, the hierarchical method was used and cluster analysis was conducted using IBM SPSS Statistics 21 to profile the athletes based on their achievement goals and motivational climates. To further examine the associations between the clusters and outcomes, a one-way MANOVA was thereafter executed. All multivariate F values were reported based on the Pillai’s Trace value (Tabachnick & Fidell, 2007). Follow-up ANOVAs and Tukey post-hoc tests were conducted to determine exactly where the differences between the clusters and outcomes lie.

4.3 Results

Descriptive statistics of all constructs used in Study 2a are presented in Table 15 below. Participants were found to be higher in both mastery goals and lower in both performance goals. The presence of a mastery climate was also indicated more as...
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Table 15
Description Statistics of Achievement Goals and Motivational Climate in Study 2a

<table>
<thead>
<tr>
<th></th>
<th>Mean (S.D)</th>
<th>Skewness</th>
<th>Kurtosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mastery Approach</td>
<td>4.91 (1.95)</td>
<td>-.95</td>
<td>-.54</td>
</tr>
<tr>
<td>Mastery Avoidance</td>
<td>4.63 (1.83)</td>
<td>-.65</td>
<td>-.81</td>
</tr>
<tr>
<td>Performance Approach</td>
<td>4.30 (1.56)</td>
<td>-.36</td>
<td>-.77</td>
</tr>
<tr>
<td>Performance Avoidance</td>
<td>3.82 (1.67)</td>
<td>.10</td>
<td>-.96</td>
</tr>
<tr>
<td>Mastery Climate</td>
<td>5.46 (.97)</td>
<td>-.79</td>
<td>1.07</td>
</tr>
<tr>
<td>Performance Climate</td>
<td>3.78 (1.17)</td>
<td>.00</td>
<td>-.70</td>
</tr>
<tr>
<td>Problem-focused coping</td>
<td>4.95 (.77)</td>
<td>-.64</td>
<td>1.02</td>
</tr>
<tr>
<td>Emotion-focused coping</td>
<td>4.60 (.71)</td>
<td>-.28</td>
<td>.38</td>
</tr>
<tr>
<td>Social support</td>
<td>4.56 (1.01)</td>
<td>-.30</td>
<td>-.21</td>
</tr>
<tr>
<td>Avoidance</td>
<td>2.76 (.79)</td>
<td>.63</td>
<td>.70</td>
</tr>
<tr>
<td>Activation</td>
<td>5.17 (1.00)</td>
<td>-.66</td>
<td>.98</td>
</tr>
<tr>
<td>Relaxation</td>
<td>4.42 (.76)</td>
<td>-.34</td>
<td>.58</td>
</tr>
<tr>
<td>Imagery</td>
<td>4.98 (1.22)</td>
<td>-.65</td>
<td>.41</td>
</tr>
<tr>
<td>Goal-setting</td>
<td>5.20 (1.05)</td>
<td>-.83</td>
<td>1.37</td>
</tr>
<tr>
<td>Self-talk</td>
<td>4.89 (1.16)</td>
<td>-.58</td>
<td>.67</td>
</tr>
<tr>
<td>Emotional control</td>
<td>3.76 (1.19)</td>
<td>.05</td>
<td>-.36</td>
</tr>
<tr>
<td>Negative thinking</td>
<td>3.82 (.88)</td>
<td>.23</td>
<td>-.23</td>
</tr>
<tr>
<td>Automaticity</td>
<td>4.50 (1.09)</td>
<td>-.20</td>
<td>-.09</td>
</tr>
</tbody>
</table>

Inter-correlations between the independent variables of achievement goals and motivational climate are presented in Table 16 below. Most variables were significantly correlated, with the exception of mastery-approach with performance-avoidance and a performance climate with both mastery and performance-avoidance goals. These correlational analyses revealed significant relationships along the approach-avoidance dimension as well as mastery and performance dimensions. More specifically, mastery-approach goals were strongly correlated with mastery-avoidance goals (r = .81, p < .001), performance-approach goals (r = .47, p < .001) and a mastery climate (r = .12, p < .005). No significant relationship was revealed between mastery-approach goals and
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performance-avoidance goals or a performance climate. Interestingly mastery-avoidance goals were correlated to both performance-approach (r = .43, p < .001) and performance-avoidance goals (r = .21, p < .001). There were also significant associations of performance-approach goals with both mastery goals (approach and avoidance). A significant negative correlation was found between a mastery and a performance climate (r = -.25, p < .001). Generally, both climates correlated with only the approach goals, not the avoidance ones.
Table 16  
**Correlations of Independent Variables in Study 2a**

<table>
<thead>
<tr>
<th></th>
<th>Mastery-approach</th>
<th>Mastery-avoidance</th>
<th>Performance-approach</th>
<th>Performance-Avoidance</th>
<th>Mastery</th>
<th>Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mastery-approach</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mastery-avoidance</td>
<td>.81**</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Performance-approach</td>
<td>.47**</td>
<td>.43**</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Performance-avoidance</td>
<td>.00</td>
<td>.21**</td>
<td>.46**</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mastery</td>
<td>.12*</td>
<td>.11</td>
<td>.02</td>
<td>-.02</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Performance</td>
<td>-.11</td>
<td>-.09</td>
<td>.13**</td>
<td>.06</td>
<td>-.25**</td>
<td>1</td>
</tr>
</tbody>
</table>

**Correlation is significant at the 0.01 level**  
*Correlation is significant at the 0.05 level*
4.3.1 Cluster Analysis.

Before conducting cluster analysis, the current data was checked again to ensure there were no missing values or outliers. The dendrogram and agglomeration coefficient suggested that a four-cluster solution was appropriate for the current sample as there was a larger increase (13.5%) when four clusters were merged into three as opposed to a slight increase (8.2%) when five clusters were merged into four. Using the Ward Method, cases were sorted according to their 2 x 2 achievement goals and motivational climate, leading to four distinct clustering profiles.

The athletes in Cluster 1 (n = 26) had moderate z scores across all mastery and performance goals. In addition, athletes had a negative z score for mastery climate, but a high z score for ego climate. Therefore, Cluster 1 was labelled as “moderate mastery-goals, moderate performance-goals and performance climate”.

Next, Cluster 2 (n = 102) was characterized by high z scores across all four achievement goals. Athletes also reported negative z scores for ego climate but a high mastery climate. As such, Cluster 2 was labelled “high mastery-goals, high performance-goals and mastery climate”.

Cluster 3 (n = 104) athletes reported high mastery-approach goals, moderately high mastery-avoidance goals, moderately negative performance-approach goals and negative performance-avoidance goals. Athletes in this cluster also had higher z scores for the mastery climate. Hence, athletes in this cluster were labelled, “high mastery-goals, low performance-goals and mastery climate”.

Finally, the characteristics of Cluster 4 (n = 58) was low z scores across all achievement goals. However, athletes in this cluster reported a negative z score for
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mastery climate but a slightly positive z score for an ego climate. This cluster was labelled “low mastery goals, low performance goals and absence of mastery climate”.

A graphical representation of all four clusters can be found in Figure 6 below, where Mastery and Performance refer to the climates and the subsequent four bars refer to the achievement goals.

Figure 6. Characteristics of each cluster. This figure illustrates the climate/achievement goals differences within each cluster.

Majority of participants were in the clusters with high mastery-goals and a mastery climate, whereas the least number of participants were in Cluster 1 with moderate mastery goals, moderate performance goals and the absence of a mastery climate. As the TOPS-2 and four-factor COPE inventory both had multiple dependent variables with these variables being correlated (see Tables 17 and 18), multivariate analyses of variance (MANOVA) were conducted (Mertler & Reinhart, 2016).

However, care has to be taken that the dependent variables is not too closely correlated (Emerson, 2018). Looking at the correlation among subscales in Tables 17 and 18,
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Correlations are mainly moderate with the highest correlation between emotional control and imagery being .64. There is also a fair amount of negative correlations among the subscales of the TOPS-2.

Hence, MANOVAs were conducted on the subscales of the TOPS-2, with cluster, gender and level of competition as independent variables. The multivariate result was not significant for cluster and level of competition, (Pillai’s Trace = .24, \( F(48,1470) = 1.27, p > .05 \)) or cluster and gender, (Pillai’s Trace = .10, \( F(24,726) = 1.08, p > .05 \)), showing that participants were evenly mixed in terms of gender and level of competition across all four clusters in their use of performance strategies. However, there was a statistically significant difference in use of performance strategies across cluster (Pillai’s Trace = .26, \( F(24, 726) = 2.83, p < .005 \)). To determine how the performance strategies differed across cluster, the test of between subject effects was examined. An Alpha correction using the Bonferroni correction was conducted to account for multiple ANOVAs being run and to reduce the risk of Type 1 error. As such, statistical significance was accepted at \( p < .00625 \) (Napierala, 2010). Cluster had a statistically significant effect on goal-setting \( (F(3, 247) = 4.28; p < .00625) \), emotional control \( (F(3, 247) = 6.58; p < .00625) \), imagery \( (F(3, 247) = 4.27; p < .00625) \) and negative thinking \( (F(3, 247) = 5.72; p < .00625) \). Tukey post hoc tests were also conducted to see how the different clusters varied in their use of performance strategies.

---

\( 1 .05/n, \text{ where } n = \text{ number of dependent variables} \)
Table 17

Correlations of TOPS-2 Subscales

<table>
<thead>
<tr>
<th></th>
<th>Goal-setting</th>
<th>Automaticity</th>
<th>Emotion-control</th>
<th>Imagery</th>
<th>Activation</th>
<th>Self-talk</th>
<th>Relaxation</th>
<th>Negative thoughts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goal-setting</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Automaticity</td>
<td>-.47**</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emotional-control</td>
<td>-.30**</td>
<td>.40**</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Imagery</td>
<td>-.38**</td>
<td>.52**</td>
<td>.64**</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Activation</td>
<td>-.14*</td>
<td>.29**</td>
<td>.51**</td>
<td>.59**</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self-talk</td>
<td>.52**</td>
<td>-.49**</td>
<td>-.04</td>
<td>-.14*</td>
<td>-.01</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Relaxation</td>
<td>-.17**</td>
<td>.28**</td>
<td>.41**</td>
<td>.51**</td>
<td>.50**</td>
<td>-.07</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Negative thoughts</td>
<td>-.13*</td>
<td>.28**</td>
<td>.20**</td>
<td>.21**</td>
<td>.15*</td>
<td>-.10</td>
<td>.07</td>
<td>1</td>
</tr>
</tbody>
</table>

** Correlation is significant at the 0.01 level
*Correlation is significant at the 0.05 level
Table 18

*Correlations of COPE Subscales*

<table>
<thead>
<tr>
<th></th>
<th>Problem-focused</th>
<th>Emotion-focused</th>
<th>Avoidance</th>
<th>Social Support</th>
</tr>
</thead>
<tbody>
<tr>
<td>Problem-focused</td>
<td>1</td>
<td>.50**</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Emotion-focused</td>
<td>.11</td>
<td>.31**</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Avoidance</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social-support</td>
<td>.45**</td>
<td>.29**</td>
<td>.31**</td>
<td>1</td>
</tr>
</tbody>
</table>

**Correlation is significant at the 0.01 level
*Correlation is significant at the 0.05 level
The scores for goal-setting were statistically significant between Clusters 1 and 2 (p < .00625) but not the rest. In terms of emotional control, Clusters 1 and 2 (p < .00625), 2 and 3 (p < .00625) as well as 2 and 4 (p < .00625) were found to be statistically significant. Imagery displayed statistical significance between 2 and 3 (p < .00625). Finally, there was significant difference across cluster 2 and 3 (p > .00625) as well as cluster 2 and 4 (p > .00625) for negative thinking. Closer inspection of the clusters revealed that Cluster 1 had the highest use of goal-setting and high use of automaticity, but average use across all other six strategies. Cluster 2 had comparatively high usage of activation, imagery and relaxation strategies. However, Cluster 2 had a significantly low use of emotional control and negative thoughts as compared to all three other clusters. On the other hand, Cluster 3 reported higher use of performance strategies with significantly higher usage of automaticity, emotional control, activation and self-talk. Yet, Cluster 3 also reported the highest use of negative thoughts. Cluster 4 reported a generally low use of performance strategies, having significantly lower usage across all eight strategies. A graphical representation of use of performance strategies characterized by cluster can be seen below.

Figure 7. Use of performance strategies by cluster. This figure illustrates the differences in performance strategies within each cluster.
Next, MANOVAs were conducted on the subscales of the COPE inventory, with cluster, gender and level of competition as independent variables. The multivariate result was not significant for cluster and level of competition, (Pillai’s Trace = .12, $F(24,988) = 1.32, p > .05$) or cluster and gender, (Pillai’s Trace = .08, $F(12,738) = 1.62, p > .05$). However, a significant result was found with regards to cluster and use of coping strategies (Pillai’s Trace = .13, $F(12, 738) = 2.83, p < .005$). Once again, the test of between subject effects was observed to explore how coping strategies were affected by cluster. An Alpha correction using the Bonferroni correction was conducted to account for multiple ANOVAs being run and to reduce the risk of Type 1 error. As such, statistical significance was accepted at $p < .0125^2$ (Napierala, 2010). Cluster had a statistically significant effect on avoidance coping ($F(3, 285) = 10.73; p < .0125$) and social support ($F(3, 285) = 5.07; p < .0125$). Similarly, Tukey post hoc tests were conducted to see how the different clusters varied in their use of coping strategies. In terms of avoidance coping strategies, there was a significant difference between Clusters 2 and 3 ($p < .0125$) as well as 2 and 4 ($p < .0125$). Finally, with regards to social support, there was a significant difference between Clusters 2 and 3 ($p < .0125$) as well as 3 and 4 ($p < .0125$).

Upon closer scrutiny, Cluster 1 reported lower use across problem-focused coping, emotion-focused coping and avoidant coping but average use of social support coping strategies. Cluster 2 had generally decent use of problem-focused coping, emotion-focused coping and use of social support but had low use of avoidant coping. Cluster 3 reported the highest use of all four coping strategies, especially avoidant coping strategies. Finally, Cluster 4 displayed low use across problem-focused coping,

---

2 $\cdot .05/n$, where $n =$ number of dependent variables
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emotion-focused coping and social support but higher use of avoidant coping strategies.

A graphical representation of the use of coping strategies by cluster can be found in the figure below.

![Graphical representation of coping strategies by cluster](image)

**Figure 8.** Use of coping strategies by cluster. This figure illustrates the differences in coping strategies within each cluster.

In summary, the cluster analysis revealed four distinct clusters based on achievement goals and motivational climate in a sample of tertiary athletes in Singapore. Taking the findings of the cluster analysis together, Cluster 3, which was represented by high mastery but low performance goals in a mastery climate displayed high use of all coping and performance strategies. On the other hand, Cluster 2, which was characterised by both high mastery and performance goals in a mastery climate also exhibited high use of several coping and performance strategies but had the lowest use of maladaptive strategies such as negative thoughts and used avoidant coping strategies the least. Nevertheless, the most maladaptive cluster was found to be Cluster 4, epitomised by low mastery and performance goals in the absence of a mastery climate.
This cluster was found to have the lowest use of performance and coping strategies. In the next section, these findings will be discussed in light of current literature.

4.4 Discussion

This study investigates how cluster analysis can guide the examination of achievement goals, perceived competence, mental skills adoption, and coping strategies in a sample of athletes. Further, how mental skills adoption and coping strategies are influenced by achievement goals and performance climate were also studied. In accordance with Hypothesis 1a, findings revealed four distinct cluster profiles in line with achievement goal profiles identified by previous researchers (Sarmento et al., 2018; Wang et al., 2010). Similar to findings from these studies, achievement goal profiles found in this study were represented by a high achievement goal profile, a moderate profile, a low profile and also a mastery profile. This is despite both prior studies being conducted in samples different from the present study. Therefore, it appears that achievement goal and climate profiles can transcend culture and external validity can be concluded. Moreover, findings can also help to guide recommendations and suggestions that may be useful for athletes, coaches or practitioners in future. With a comprehensive view of this study, the results are discussed from first a cluster perspective, before discussing implications of results based on relevant literature.

From the four distinct clusters, there is interestingly no cluster that is high in performance goals, yet low in mastery goals. Mastery and performance goals went hand in hand, with the exception of a high mastery goals and low performance goals cluster. Majority of athletes were found to be in Clusters 2 and 3, which were the more adaptive clusters. The fewest number of athletes were found to be in Cluster 1, which was representative of moderate mastery and performance goals in a performance climate.
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This low number in Cluster 1 can be explained by the strong mastery climate indicated across all the participants in Study 2a (M = 5.46, SD = .97), yet the presence of a performance climate within the cluster. This finding is also in line with previous research, which observed that Singaporean athletes scored higher in both mastery approach and mastery avoidance goals (similar to Cluster 3), when compared with Korean athletes (Wang, Pyun, Li, & Lee, 2016). This indicates a preference for mastery goals over performance ones, with mastery goals generally having a greater presence than performance ones. Findings also revealed the presence of a mastery climate in a high mastery and high performance goals cluster. In fact, although perceived motivational climate has been found to influence achievement goal orientation (Duda, 2005; Gernigon et al., 2004), there are discrepancies in Clusters 1, 2 and 4. These findings extend previous research to suggest that instead of the traditional mastery climate inducing the adoption of mastery goals and performance climate inducing the adoption of performance goals (Duda, 2005), mastery and performance goal adoption can in fact occur simultaneously in a mastery climate. The presence of a high mastery climate is essential in effecting adaptive coping strategies.

Corresponding to Hypothesis 1b, high mastery goal profiles and mastery climates were found to have the most adaptive performance and coping strategies. These profiles are represented by Clusters 2 and 3. This finding is aligned to previous research, which found adaptive outcomes for mastery goals such as high persistence and performance, high intrinsic motivation and pursuit of optimal challenge (Elliot & Conroy, 2005). On the other hand, performance goals were found to lead to maladaptive outcomes such as low persistence and performance, low intrinsic motivation and avoidance of challenge (Elliot & Conroy, 2005). From Cluster 3, represented by high mastery and low performance goals in a mastery climate, the highest use of performance
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and coping strategies was indicated. This finding extends current research, where high mastery-approach and high mastery-avoidance goals were found to lead to positive outcomes such as mental toughness (Gucciardi, 2010) and long-term development in sport (Wang et al., 2016). This could be because high mastery-approach and high mastery-avoidance goals are able to lead to high use of coping and performance strategies, which in turn enable athletes to be mentally tough and remain in the sport for longer. On the other hand, Cluster 2, which was represented by both high mastery and high performance goals in a mastery climate, had high use of several performance and coping strategies but interestingly had the lowest use of maladaptive performance and coping strategies such as negative thoughts. These findings extend research in the area of education, which found that a goal profile of high mastery-approach and performance-approach goals, combined with low performance-avoidance goals was most beneficial for learning amongst Singapore students (Luo, Paris, Hogan, & Luo, 2011). Moreover, mastery-approach and performance-approach goals were found to contribute to help-seeking behaviour in students (Karabenick, 2003; Ryan & Pintrich, 1997; 1998; Yang & Cao, 2013). However, these findings were discovered in the context of education and little is known of mastery-approach and performance-approach goals in a sport setting. Nevertheless, there appears to be advantages in having both mastery and performance goals, but care is to be taken that the goal is in the form of approach and not avoidance.

This study also examines motivational climate in light of both achievement goals as well as coping and performance strategies. Firstly, Cluster 2, which had the highest indication of mastery climate, had the lowest use of maladaptive strategies. Therefore, having a high mastery climate could have contributed to the low use of maladaptive strategies such as negative thoughts and significantly less denial. Past
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research have linked a mastery climate with enjoyment and a belief that effort leads to achievement, whilst associating a performance climate with boredom, lack of interest as well as the notion that ability leads to achievement (Granero-Gallegos et al., 2017; Seifriz, Duda, & Chi, 1992). A performance climate has also been linked to the venting of emotions, which in certain cases might be deemed as a maladaptive coping strategy. (Ntoumanis et al., 1999). Taking all these together, the low use of maladaptive strategies by Cluster 2 could be a combination of both a high mastery climate and a low performance climate in the presence of both mastery and performance goals. Secondly, use of avoidant coping strategies were the lowest in Cluster 2 but relatively high in Cluster 3. Although literature found strong relationships between an avoidance temperament and avoidance goals (Yeats & Lochbaum, 2013), findings from this present study indicated the highest occurrence of avoidance coping with high mastery goals, low performance goals and a mastery climate. The lowest occurrence of avoidance coping was correspondingly found in the cluster with high avoidance goals. However, this cluster showed the highest presence of a mastery climate, which could indicate a deeper influence from the motivational climate on coping strategies but these findings reveal the need for further scrutiny into other factors that might influence the adoption of coping strategies. This will be observed and discussed in Study 2b. Thirdly, the use of social support coping strategies was much higher in Cluster 3 as compared to all other clusters. In this cluster with high mastery but low performance goals, athletes with mastery-approach goals could be investing in their social sport environment by establishing instrumental social relationships (Poortvliet, Anseel, & Theuwis, 2015). In a similar vein, the cluster with the lowest use of social support coping strategies was Cluster 4, with low achievement goals. Therefore, it appears that mastery goals and a
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Mastery climate, with low performance goals, can lead to greater occurrence of social support coping strategies.

Altogether, the findings from the study can help to guide interventions in the applied field. Extensive research coupled with the findings from this study point practitioners to the most adaptive goal/climate conditions, which would result in the most adaptive performance and coping strategies. These most adaptive goal/climate solutions are seen in Clusters 2 and 3, represented by high mastery goals in a mastery climate, where they displayed the highest use of coping and performance strategies as well as the lowest use of maladaptive strategies respectively. Therefore, practitioners can have a better indication of the ideal achievement goal/motivational climate they can structure for athletes in order to enable them to further their sporting performance. Specifically, coaches can construct a mastery climate for their athletes and ensure the development of mastery goals to enable the adoption of mastery goals in a mastery climate. This can be achieved when coaches define success in relation to their athletes’ self-improvement, mastery of the task at hand and exhibit maximum effort as well as dedication (Ames, 1992). The findings from this present study also point to the need for future studies to further inspect the relationship between achievement goal/motivational climate profiles and their influence on athletes in Singapore. Follow-up studies could further review the effects of a high mastery-approach and high performance-approach goal orientation in a mastery climate, on subsequent performance. Nonetheless, the use of resultant performance and coping strategies have to also be studied in light of the factors, which cause them. Stress appraisals and resultant use of coping strategies will be examined in the following Study 2b.
4.5 Conclusion

In the present study, new perspectives were gained on the sporting context in Singapore by looking at athletes from a cluster level as well as looking at how this may affect the use of both performance and coping strategies in athletes. Findings were generally consistent and backed up by literature across countries and contexts, suggesting that athletes generally thrive in high mastery goal conditions with a mastery climate. In the same way, low mastery and performance goals led to maladaptive outcomes such as poor use of coping and performance strategies. Findings from this study also extend current research in the field of goal/climate profiles and coping responses by examining how the motivational climate can influence achievement goal profiles. Instead of a mastery climate merely inducing the adoption of mastery goals, a mastery climate was found to lead to adoption of both mastery and performance goals as well. However, there is insufficient knowledge on the factors contributing to these profiles. In fact, the results from the present study actually reveal the need for more research done in the area of performance and coping strategies, specifically in investigating how stress appraisals can lead to the use of these strategies. Therefore, the next study will look at stress appraisals and how they contribute to coping strategies from a comprehensive and qualitative approach.
Chapter 5: Study 2b – Exploration of Coping Strategies

From Study 2a, a four-cluster solution was found to be appropriate for the data set with the cluster high in mastery and low in performance goals being the most ideal with the greatest use of adaptive coping and performance strategies. On the other hand, the cluster low in all four goals was found to be the least adaptive cluster. Results also showed that majority of Singapore tertiary athletes belong to the most adaptive clusters high in mastery goals in a mastery climate. However, looking at coping strategies alone and factors that affect it are insufficient in understanding the complexity of coping. Coping strategies have to be examined together with stressors that cause harm/loss, threat or challenge in specific circumstances (Nicholls & Polman, 2007).

From Lazarus and Folkman’s (1984) transactional model of stress and coping, two forms of stress appraisals are proposed to be crucial mediators of stressful individual-environment relations, namely cognitive appraisal and coping. Firstly, cognitive appraisal comprises two forms of appraisal – primary and secondary. The primary appraisal involves individuals deciding whether stressful situations are threats to their well-being and if so, in what way. The individual assesses if he or she has anything at stake in this encounter and whether there is a potential harm or benefit with respect to commitments, values or goals. In secondary appraisal, individuals determine whether they have the resources to deal with the stressor and what can be done to overcome the stressor or prevent harm. Primary appraisals are typically categorized into four subtypes (Lazarus & Folkman, 1984). Benign appraisals are made when individuals believe the situation has no threat to their wellbeing. Next, harm/loss appraisals occur when individuals believe the stressor has hurt them. Third, threat appraisals involve the possibility of future harm. Finally, challenge appraisals are made when individuals see the stressors as opportunities to learn and grow. Next, primary and
secondary stress appraisals converge to determine if this person-environment transaction is regarded as significant to well-being, and if so, whether it is threatening or challenging. Coping strategies then occur as a result of a threatening or challenging stress appraisal.

Stress appraisal and achievement goals have also been found to be related to each other. Adie, Duda and Ntoumanis (2008) previously examined the relationship between goal type and stress appraisal and found that challenge appraisals were positively associated with mastery-approach goals but negatively associated with performance-approach goals. On the other hand, threat appraisals were found to be positively associated with performance-approach, performance-avoidance and mastery-avoidance goals but negatively associated with mastery-approach goals (Adie et al., 2008). Therefore, it appears that the stress appraisal leading to the most adaptive goal type of mastery-approach goals is that of challenge appraisal. These findings provide support for the association between the 2 x 2 achievement goals and stress appraisal but also present a case for further research looking at the stress appraisals of local athletes in light of their achievement goals.

Other than scrutinising stress appraisal, coping has to be examined as well due to its position as an outcome of stress appraisal. Coping, as mentioned earlier, is known to be “constantly changing cognitive and behavioural efforts to manage specific external and/or internal demands that are appraised as taxing or exceeding the resources of the person” (Lazarus & Folkman, 1984). Researchers have highlighted three key aspects of this definition to draw attention to and elaborate on (Folkman et al., 1986). Firstly, coping is process oriented, meaning it focuses on what the person actually thinks and does in a specific stressful encounter and how the individual’s thoughts and behaviour
change as the encounter progresses. Next, it is contextual, which indicates that it is
affected by the individual’s appraisal of the actual demands in the encounter and his/her
resources in managing it. Thirdly, the outcome of coping is defined as simply attempts
to manage these stressful demands, regardless of the outcome. Hence, the type of coping
strategy used by different people were found to change over time, depending on the
situational contexts in which the stressors occur (Lazarus, 1993), in response to the
appraisal of these stressors.

Moreover, many factors have been found to affect the level of stress felt by
athletes. Athletes experience different types of stressors, some common across countries
and cultures, whilst others are unique to that particular sport or culture. Context
(whether training or competition) and the importance of the competition were found to
be two huge factors influencing the stress and coping process of Malaysian ten-pin
bowlers (Wong, Teo, & Polman, 2015). On the other hand, high school golfers in the
United States found playing a difficult shot, playing up to their own expectations and
parental pressure as sources of stress (Cohn, 1990). Even in two close-skilled individual
sports, the sources of stress vary from competition-related, to intra and interpersonal
factors. Nevertheless, athletes are also able to face similar sources of stress.
Interpersonal factors were found to similarly cause stress in Kenyan, Chinese and
Serbian athletes (Gan, Anshel, & Kim, 2009; Tišma & Ćokorilo, 2015; Rintaugu,
Litaba, Muema, & Monyeki, 2014). These interpersonal factors are largely coach and
audience related. Additionally, the Kenyan and Chinese athletes also derived stress from
the environment such as the referee, weather and training attitudes of teammates, which
hence affects the training culture (Gan et al., 2009; Rintaugu et al., 2014). Subsequently,
the use of coping strategies was also found to be affected by interpersonal factors such
as gender and skill level (Gan et al., 2009). Therefore, stress appraisal and coping can
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be affected by many factors, some of which are culture and type of sport. Hence, it is necessary to examine the various stressors faced by local athletes, together with their coping responses so as to identify the stressors unique to Singapore and have a better awareness of the situation here. Data gathered from athletes on their stressors and coping responses can help to add to current understanding on the stress and coping process of athletes in Singapore.

The present study seeks to uncover various antecedents of coping strategies and how athletes respond in these situations through the use of one-to-one interview sessions. Over the years, researchers have chosen to utilise qualitative methods of data collection due to its richness and ability to provide thick descriptions (Geertz, 1973). It enables researchers to gain an alternative and more in-depth insight to the context being examined. Moreover, qualitative data has been found to be useful when supplementing, validating, or illuminating quantitative data gathered from the same setting (Miles, Huberman, & Saldaña, 2014). However, it has been argued that due to the unique characteristics of qualitative data, comprehensiveness might be a more realistic goal than internal validity (Mays & Pope, 2000). This is due to the ability of qualitative data to examine a research question from all angles (Richardson, 1991). Despite having the potential to look at a research question holistically, qualitative data also has to be approached with caution so as to not be caught up in its depth and entirety but with the research question in mind.

Given that an effective coping process is crucial in helping an athlete maintain his/her peak performance state, especially during competitions, it is beneficial to utilise qualitative methods in supplementing quantitative methods to have a comprehensive view of the construct of coping. Taken together and individually, both sources of data
COPING STRATEGIES OF TERTIARY ATHLETES IN SINGAPORE: THE INFLUENCE OF ACHIEVEMENT GOALS, MOTIVATIONAL CLIMATE AND A BRIEF RELAXATION INTERVENTION can help to paint a clearer picture of the coping process for Singaporean athletes. The aptitude to perform successfully under pressure is a critical aspect of sport performance (Mesagno & Mullane-Grant, 2010). Athletes able to excel under the pressures of competition often end up with sponsorships and celebrity status whereas those who collapse under the immensity of pressure are defamed and embarrassed to have ‘choked under pressure’ (Mesagno & Mullane-Grant, 2010). Therefore, due to the important role successful coping plays in sport performance, understanding the coping processes of local athletes can help to improve the sporting scene in Singapore. The present study employs the use of a follow-up interview session with randomly selected athletes, so as to delve deeper into this complex process of coping.

Two key research questions explored in this study are presented below:

b) What are some antecedents of coping strategies?

c) How do athletes respond in the face of sport-related stress?

In answering the research questions above, the following hypotheses pertaining to stressors and subsequent use of coping strategies will be examined in Study 2b:

Hypothesis 2a: Variations in goal/climate profiles would affect the way athletes view and interpret stressors.

Hypothesis 2b: How athletes view and interpret stressors affect the way they cope with them.

5.1 Method

5.1.1 Participants.

Participants for Study 2b were 22 student athletes recruited from Study 2a (Male = 16, Female = 6) to participate in a follow-up interview session. Participants were
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specifically selected to represent all four clusters from Study 2a. These athletes have been involved in their sport from a range of one and a half to 18 years. Out of these 22 athletes, 12 have participated in nation-wide competitions, three have participated at an external club level, and seven have participated in international competitions.

5.1.2 Procedure.

Semi-structured interview protocols were developed for the interview sessions, which focused on designing questions to dig deeper into athletes’ experiences with coping strategies. A semi-structured interview design is able to complement the quantitative questionnaire responses obtained and has the flexibility to explore experiences brought out by participants. Interview sessions were conducted in a quiet environment and consent was acquired from participants before audio recording each session. Each interview session began with open-ended questions about the athlete’s experience in their niche sport. This was to enable rapport building between the interviewer and the interviewee. Athletes were first asked about how they started off on their sporting journey, as well as what they liked most about their sport. The following question then asked athletes about stressful situations that brought about a coping response, specifically in their sport. Each athlete was requested to explain what happened during these situations, and how they responded.

5.1.3 Interview Guide.

An interview guide was developed to enable the principal investigator to have a framework on which to base the interview sessions. Questions were structured according to a rough sequence but allowed flexibility in the event participants wanted to surface relevant issues. Due to the scope of the study, key questions included in the guide were structured around determining factors leading to stress in athletes and the
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subsequent use of coping strategies themselves. The Principal Investigator first developed the interview guide, then received critical feedback from more experienced researchers regarding revisions to be made. The interview guide was then used in a pilot study involving three participants. Feedback was obtained from participants with regards to suggestions on the wording and ordering of the interview questions.

Participants were also asked if questions should be excluded or incorporated into the interview guide. A demographic breakdown of the three participants are provided in the table below. All feedback obtained was considered, and the initial interview guide was amended until a satisfactory version was established. The finalised version of the interview guide can be found in Appendix C.

<table>
<thead>
<tr>
<th>Gender</th>
<th>Sport</th>
<th>Number of Years in Sport</th>
<th>Participation Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>F</td>
<td>Dragon Boat</td>
<td>4</td>
<td>School Level</td>
</tr>
<tr>
<td>M</td>
<td>Running</td>
<td>10</td>
<td>School Level</td>
</tr>
<tr>
<td>F</td>
<td>Table-Tennis</td>
<td>14</td>
<td>International Level</td>
</tr>
</tbody>
</table>

5.2 Data Analysis

All 22 interview sessions were audio recorded, with permission from participants, and thereafter transcribed verbatim by the Principal Investigator. The qualitative analysis software NVivo was drawn on to help thematically code all transcripts. All transcripts were also coded to preserve the anonymity of participants. The Principal Investigator listened, read and re-read the transcriptions to ensure that the transcripts were what the participants were trying to communicate during the interview sessions. Next, raw data quotes were extracted from the interview transcripts and
recurring themes were highlighted and reviewed by the Principal Investigator. The frequency of their mention by participants was tracked using the Nvivo software (Miles et al., 2014). Following which, these themes were coded and organised into larger and more comprehensive categories by grouping similar themes. This process of grouping also ensured that the larger categories were distinct from one another. This technique was repeated until saturation of data was reached and no new themes or codes could be formed from the raw data. Causal-chains were also drawn on to look at the plausible sequence between common factors which cause stress, and the resultant action athletes take to deal with these stressors (Miles et al., 2014). Using investigator triangulation (Carter, Bryant-Lukosius, DiCenso, Blythe, & Neville, 2014), the themes that emerged from the coding were then verified by one independent PhD student from the National Institute of Education who had two years of experience in sport-related research. Discrepancies in the coding and themes were discussed to the point of agreement. The final themes are subsequently discussed in the rest of this chapter. The results from this qualitative data analysis also serve as a means to support results obtained from the quantitative questionnaires (in Chapter 2a).

5.3 Results

5.3.1 Descriptives.

In order to further examine how athletes in the four clusters differ in terms of their stress appraisals and coping processes, an interview following-up from Study 2a was conducted with 22 of them. These 22 athletes were selected by ensuring that at least all four achievement goal types were represented. Using numeric coding to maintain athletes’ anonymity, their participation level, achievement goals and motivational climate profiles are presented in Table 20 below.
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Table 20

Mean Scores of the Achievement Goals and Climate of Athletes in Study 2b

<table>
<thead>
<tr>
<th>Participants</th>
<th>Participation Level</th>
<th>MAp</th>
<th>MAv</th>
<th>PAp</th>
<th>PAv</th>
<th>Climate</th>
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</thead>
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<tr>
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<td>3</td>
<td>5.67</td>
<td>6.67</td>
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<td>Mastery</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>6.67</td>
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<td>6.00</td>
<td>7.00</td>
<td>Mastery</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
<td>5.33</td>
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<td>5.67</td>
<td>1.67</td>
<td>Mastery</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
<td>6.33</td>
<td>1.00</td>
<td>1.00</td>
<td>1.67</td>
<td>Mastery</td>
</tr>
<tr>
<td>5</td>
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<td>6.67</td>
<td>7.00</td>
<td>5.33</td>
<td>2.67</td>
<td>Mastery</td>
</tr>
<tr>
<td>6</td>
<td>3</td>
<td>5.67</td>
<td>4.00</td>
<td>3.67</td>
<td>2.33</td>
<td>Mastery</td>
</tr>
<tr>
<td>7</td>
<td>1</td>
<td>2.67</td>
<td>2.67</td>
<td>4.67</td>
<td>5.33</td>
<td>Mastery</td>
</tr>
<tr>
<td>8</td>
<td>3</td>
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<td>2.76</td>
<td>1.00</td>
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<td>9</td>
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<td>4.67</td>
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<td>1.00</td>
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<td>2.00</td>
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<td>3.33</td>
<td>6.33</td>
<td>6.67</td>
<td>Mastery</td>
</tr>
</tbody>
</table>

Note: MAp = Mastery-approach goals, MAv = Mastery-avoidance goals, PAp = Performance-approach goals, PAv = Performance-avoidance goals; for participation level, 1 = School Level, 2 = External Club Level, 3 = Regional or International Level

It can be seen that majority of athletes perceived a Mastery climate in their sport, with just four of them perceiving a Performance one. With regards to their achievement goals, athletes are generally well spread out across all four different types of goals on the 2 x 2 framework. Moreover, the type of achievement goals held do not appear to be affected by their highest level of competition participation or motivational climate.

Demographics and corresponding clusters of the 22 participants are presented in Table 21 below. All the four clusters are represented in the 22 participants below.
5.3.2 Thematic Analysis.

From the interview data obtained, common stressors as well as the resultant use of strategies to cope with these stressors were all interpreted by the Principal Investigator and correspondingly coded. The transactional model of stress and coping (Lazarus & Folkman, 1984) as well as the subscales in both the COPE Inventory
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(Carver et al., 1989) and TOPS-2 (Hardy et al., 2010) will be used to guide the thematic analyses in this section.

Stress appraisal statements were examined and classified according to the subtypes of stress appraisal (with the exclusion of benign stress appraisals), namely, “harm/loss”, “threat” and “challenge”. Subsequently, coping strategies were similarly observed and categorised according to the four dimensions from Study 1, which are namely, “problem-focused”, “emotion-focused”, “avoidance”, “social support” and “performance strategies”. Figure 9 shows all the themes being identified under stress appraisal based on the three subtypes and Figure 10 shows the themes identified under coping strategies used. All smaller themes, bigger overarching themes as well as their occurrence are also displayed in both Figures 9 and 10.

5.3.3 Stressors.

From Figure 9 below, the most prevalent form of stress appraisal is that of ‘threat’, where harm is anticipated from the stressor. Some of the themes that resulted from this stressor are, “Competition-related”, “Interpersonal”, “Negative thoughts”, “Training” and “Being overwhelmed”. On the other hand, the least prevalent form is that of ‘harm/loss’, where harm or loss has already occurred. Some of the themes that evolved are, “Physical harm”, “Psychological harm”, “Coach-related” and “Opponent-related”. In terms of ‘challenge’ appraisals, athletes reported them along four themes that are, “Expectations”, “Something new”, “Importance of competitions” and “Opponents”. Looking at these general themes, it appears that concepts of competitions, self and opponents occur fairly often. However, upon closer scrutiny, negative thoughts had the greatest variation of sub-themes and expectations on self was mentioned by the
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greatest number of athletes. The following sections will proceed to look at these themes
in more detail.
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- Physical Harm
  - Injury whilst running
    - 21, 22
  - Past or current injury
    - 3, 14, 22

- Psychological Harm
  - Getting blamed for shooting
    - 2
  - Seniors shouting at her
    - 16

- Coach
  - Coach starts feeding overloading information
    - 1
  - Coach not helping
    - 18

- Opponent
  - Opponent’s luck
    - 6

- Crowd
  - 6, 11, 17

- Venue
  - 11

- Close game
  - 1, 2, 15

- Poor warm-up
  - 4

- Illegal side coaching
  - 6

- Team mates underperforming
  - 16

- Team politics
  - 18

- Afraid of coach
  - 11, 14

- Negative thoughts when lagging
  - 9

- Fear of not completing
  - 22, 13

- Trend of losing close matched
  - 6

- Overthinking
  - 12, 4

- Thinking of performance
  - 7

- Fear of being last
  - 14

- Fear of disappointing others
  - 14, 16

- Overtraining
  - 5, 13

- Insufficient training
  - 19

- Short time frame to prepare
  - 7

- Juggle role of player and coach
  - 5

Psychological Harm → Harm/loss
Coach → Interpersonal
Opponent → Threat

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<table>
<thead>
<tr>
<th>Expectations on self</th>
<th>Expectations from coach</th>
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<tbody>
<tr>
<td>Changed position</td>
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<tr>
<td>Starting a new sport</td>
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<tr>
<td>New stunt</td>
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<td>SEA Games</td>
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<td>Finals</td>
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<tr>
<td>Selections</td>
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<tr>
<td>Playing people of equal skill</td>
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**Figure 9.** Thematic breakdown of stress appraisals and their occurrence
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5.3.3.1 Harm/Loss.

Harm/loss stressors are those that have already caused harm or loss to individuals and it is interesting to note that this is the least common form of stressor for athletes here in Singapore. Athletes have been found to experience some form of physical harm, psychological harm, facing stress from their coaches’ actions and one athlete highlighted how his opponent being lucky caused him stress as the opponent was winning more points due to luck rather than skill, which he was unable to do anything about. Firstly, having an injury whilst running was highlighted by both long-distance runners involved in the study. As mentioned by one of them, the reason that injury causes stress is because it affects the race performance.

Maybe suffer from like muscle cramps and stuff like that, which can also affect the race performance… You might feel nervous that you might not be able to sustain throughout the whole race. (Participant 22)

This causes further stress as muscle cramps are able to affect race performance and might also lead to an incomplete race. On top of the stress obtained from being injured during a race, being injured before a competition also brings with it a decent amount of stress. Being injured in turn affects training, which has a carry-on effect to competition performance. These injuries also cause a substantial amount of worry and stress before competitions as can be seen in the statements below.

Prior to this IVP (intervarsity polytechnic championships), I was injured… Worrying that your performance at that moment is not up to standards for whatever competition that you are actually playing at. (Participant 3)

I have persisting shoulder injuries. So sometimes during the warmup, I feel oh, my shoulder’s going to get impinged. (Participant 14)
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However, other than physical harm, another area of stress is that of psychological harm, where athletes have previously been blamed for poor game performances.

But he said, “You should have drive, don’t shoot the ball”. (Participant 2)

My seniors were like shouting at me for like doing it wrongly and stuff, so that was very stressful. (Participant 16)

From the quotes above, getting scolded and blamed on court caused a lot of stress to both these athletes. This leads to them being psychologically affected and not in the right mind to compete further. In extreme cases, especially when the situation is not moderated after occurrence, it could also lead to negative behavior change. Additionally, the two scenarios above highlight the intensity of competition stress, where there is a strong transference of blame onto others when something goes wrong. It appears that not only do these two athletes have to cope with psychological stress from their team mates, their team mates also have to cope with their own ability to manage stress from the competition.

A third key stressor is the coach. A lot of what the coach does or does not do, influences the athlete (Baker, Côté, & Hawes, 2000; Mageau & Vallerand, 2003) as can be seen in the two instances being mentioned below.

When your coach starts feeding you information and it’s overloading. (Participant 1)

Indirectly he (the coach) added to the stress by not intervening when he needed to. (Participant 18)

In both situations, both active and passive forms of coaching have led to stress in athletes, contributing to existing literature on the vast effect coaches have on athletes. With regards
to the first quote, the athlete is unable to control his attention, made worse by his coach, which in turn adds on to the amount of stress he feels. Attentional focus is impaired, where attentional focus is defined as the ability to direct attention towards relevant information in the environment, sustain that attention over time and change the direction of that attention where appropriate (Weinberg & Gould, 2015). Coaches might be unaware of this and continue to feed athletes with more and more information to the point of overloading. Consequently, athletes become increasingly stressed leading to increased performance errors. A vicious cycle hence ensues. On the other hand, when roles are not explicitly discussed and the coach does not do something the athlete expected him to, the athlete gets stressed from the encounter.

The fourth and last stressors in this category of harm/loss being mentioned by athletes consists of the opponent being “very lucky”, or the athlete “blank(ing) out”, which led to “no confidence”. All these in turn were noted to affect competition performance.

5.3.3.2 Threat.

The most common form of stressor perceived by Singapore athletes were those that were likely to result in harm. A number of these stressors came from the competition environment where they are aspects of the competition or involve interactions with others such as team mates or coaches. However, a great number of athletes attributed stress as coming from themselves in the form of negative thoughts. In fact, one of the more common stressors faced by Singapore athletes was that of having negative thoughts. Stressors also came from training as well as being overwhelmed by certain situations that cropped up either before or during competitions.
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Firstly, aspects of the competition environment were found to cause stress in athletes. One prominent aspect was the presence of an audience, which was highlighted by three participants as a stressor affecting their performance. In the example below, the reason why having an audience leads to competition stress is explained.

Influence of crowd… something like stage fright. (Participant 17)

Conversely, the presence of an audience has been well-established in literature to lead to improved performance (Kay, 2016; Rhea, Landers, Alvar & Arent, 2003). However, this study has established that instead, having an audience brings stress to athletes participating in competitions. Therefore, whether the presence of an audience enhances or diminishes performance depends largely on how the athlete appraises this environmental trigger. Other stressors occurred when athletes were in an “unfamiliar venue”, going to a competition venue for the first time. Sometimes, when “the points are very close… (such that) it’s close to whether you win the set or not”, could also lead to athletes being stressed. Having poor warm-ups where “(she) can’t get the shot in”, caused stress to an athlete as it affected how prepared she felt leading up to the competition. Unfair circumstances such as “illegal side-coaching” was also found to cause stress as athletes feel disadvantaged and hence threatened as there is a possibility they might lose the competition. All these instances are in fact representative of situations where athletes were placed in a disadvantaged position, which might cause their performance to suffer. Athletes across the different clusters were all similarly stressed by being placed in a disadvantaged position.

Secondly, interpersonal factors could also lead to stress in athletes. Having team mates underperform on court or unpleasant team politics contribute to the stress athletes feel in their sport, as can be seen in the narratives below.
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That was quite stressful cause our team was just like, I don’t know what our team mates were doing. They were just performing very badly. (Participant 16)

The only thing that was stressful was handling the team politics. Cause… when you put 22 people in the same boat and everyone has their own opinion…(Participant 18)

Therefore, in a team sport, albeit one that places people in close proximity such as dragon boat, how the team behaves has a strong influence on everyone else in the team to the point of causing stress to one another. Two athletes also indicated being “afraid of their coach” as a source of stress in their sport. This is surprising, as one athlete belongs to Cluster 2, the cluster representative of being high in mastery and performance goals with the presence of a mastery climate. Hence, despite having good scores in self-reported questionnaires, the athlete in Cluster 2 revealed a fear of his coach as seen below. This fear led to the need to perform and actually hints at aspects of a performance-induced climate.

I’ll feel more stressed because I know he (the coach)’s not happy with my technique and I need to like practise more in order to actually meet … the standard that he wants. (Participant 14)

This shows that even though athletes report a mastery climate being constructed by their coach, they may still fear their coach due to various other reasons. It also highlights the need to triangulate findings in order to ensure findings obtained are representative of the sample being studied.

Thirdly, having negative thoughts was a very common stressor across athletes. These negative thoughts took many forms and mostly involved competition-related scenarios such as fear of coming in last, fear of disappointing others, fear of not
sustaining throughout a race, negative thoughts when lagging, overthinking and having a trend of losing close matches. In fact, these thoughts generally revolved around the outcome of losing in a competition. Other forms of negative thoughts included thinking of a current injury as well as anxiety when performing a new stance. Having a new stance in the sport of cheerleading brings with it a fair share of stress as seen in the narrative below.

If we’re doing a new stunt, I think definitely there’ll be certain amount of stress anxiety. (Participant 7)

Therefore, the presence of negative thoughts is extremely common in Singaporean athletes and when left unchecked, could potentially lead to impeded performance.

Fourthly, another form of stressor faced by athletes that might lead to a potentially harmful outcome is related to training. Both extremes of training – overtraining and having insufficient training were found to be stressful. This points to the need of having an optimum amount of training as having too much training not only leads to stress appraisal, it can also lead to overreaching (short-term overtraining), which can eventually lead to overtraining syndrome (Kargarfard, Amiri, Shaw, Shariat, & Shaw, 2018). Overtraining syndrome is defined as impaired and lengthened recovery periods, inability to sustain intense training sessions and a chronic decrement in athletic performance (Urhausen & Kindermann, 2002). By this time, it would be too late to mediate the situation and on top of suffering consistently decreasing performance, athletes could also face burn-out or even other extreme outcomes. Comparing the definitions above with Participant 5’s description of overtraining below, it is possible that she experienced overreaching and could be on the verge of overtraining syndrome if nothing was done to mediate the situation.
I think I was training… too much. The intensity increased and the frequency increased. So, I was actually feeling… a little bit burnt out. I think I couldn’t perform as well. Then somehow my time trial timings don’t seem to be getting better also. I kind of dreaded going training a lot. (Participant 5)

For this reason, the need to monitor athletes’ training loads and ensure they are in an appropriate condition is crucial to prevent overtraining syndrome in athletes.

Conversely, in the case of insufficient training, the stressor was appraised as a threat as it was potentially leading to an undesired outcome of losing upon appraisal. Nevertheless, both these stressors interestingly led the athlete involved to turn to seek help, be it to find a solution or just to gain social support, which will be explored in the next section.

Finally, “being overwhelmed” also led to athletes feeling stressed and falls under the category of “threat” appraisals. Examples of this are when the athlete has a short time frame to prepare for competition due to the way school terms and hence competitions are structured, as well as when the athlete has to juggle both the role of player and coach, which is narrated below. In both instances, athletes involved felt that the demands of the task far exceed their current capabilities whether it is due to time restrictions or attentional restrictions.

I found that it was very difficult to juggle… like it’s easier to stand outside to watch and give advice or it’s easier to just be on court and perform. But it’s difficult to stand outside to watch and give advice. (Participant 3)

Here, another instance is observed where attentional focus is impaired (Weinberg & Gould, 2015). In this case, the athlete is not sure of where to direct his attention as there
are too many things to focus on. Therefore, having a clear knowledge of the expected role in sport is critical in enabling athletes to fulfil that role.

5.3.3.3 Challenge.

Despite not being the most or least commonly cited form of stressor, challenge appraisals had the highest occurrence on one subtheme, “expectations on self”. More than half (n = 12) of the participants cited “expectations on self” as a stressor and one athlete cited expectations his coach placed on him as a challenge appraisal. One example of each scenario can be found below.

In the competition you don’t want to be last. (Participant 14)

The coach told me the outcome of this game will be very dependent on how (I) perform today…hearing this kind of words, putting a lot of burden on your shoulders makes you feel very sluggish as an athlete. (Participant 3)

This highlights the fact that many athletes place the expectation to win on themselves as they enter competitions. This could be a result of culture, where individuals in society are constantly reminded of the need to do well be it from their parents or coaches. In turn this expectation on them is translated to their own expectations of themselves.

A second theme under challenge appraisals is when athletes have to do “something new”. When they are asked to change position in their sport, start a new sport or try out a new stunt, athletes get stressed. When athletes are placed an entirely new situation, it brings uncertainty, which could in turn lead to stress. Interestingly, both athletes who mentioned starting a new sport as a stressor originated from the same sport – Handball. It might be worth observing if on top of achievement goals, certain sports lead to similar stressors as well. This could in turn enable coaches and parents to
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keep a look out for and better prepare athletes to cope with more commonly perceived stressors in these sports they might participate in.

Thirdly, the importance of competitions also cause stress. Participating in “important competitions” adds stress to athletes, with these competitions being the finals of a meet, selection trials as well as the Southeast Asian (SEA) Games, which is a biennial sports meet comprising Southeast Asian nations. Although various aspects of competition bring with them their fair share of stressors as previously mentioned, the importance placed on these competitions also cause stress to athletes. This could be because such competitions have huge stakes where a loss in selection trials would cause inability to play on the team, and competitions such as finals as well as SEA games determine how well your school or country can be placed.

Lastly, “playing people of equal skill” was also found to add stress to athletes. This is actually representative of a performance-avoidance goal, where the athlete’s goal is not to be the worst performer (Elliot & McGregor, 2001). Not surprisingly, this athlete belongs to Cluster 4, which has low mastery and low performance goals, with an absence of a mastery climate. As a mastery climate is associated with adaptive behaviours such as perceived competence, self-esteem, objective performance and intrinsic forms of motivational regulation (Harwood et al., 2015), having the absence of a mastery climate would lead to low perceived competence and self-esteem, which in this instance is seen through stress when playing someone of a similar skill level. This is because when playing someone of similar skill level, the outcome is extremely unpredictable. This athlete already has a loss in confidence even before playing, which could be due to low perceived competence resulting in a lack of confidence in his own ability.
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Therefore, the most common form of stress appraisal was that of threat, specifically in the form of negative thoughts. However, majority of athletes perceived the challenge appraisal of putting expectations on themselves as a cause of stress in their sporting experience. Taken together, Singaporean athletes are strongly desirous of winning and are immensely afraid of the idea of losing. The next step would be to take a look at how these forms of stressors guide the use of coping strategies in athletes as well as their coping effectiveness.

5.3.4 Coping Strategies.

Upon the appraisal of all these various forms of sport stressors, athletes respond accordingly in various ways as can be seen in Figure 10 below. Coping strategies are accordingly analysed using the themes of problem-focused, emotion-focused, avoidance social support and performance strategies. Some of the themes under problem-focused coping strategies are, “Approach others”, “Preparation” and “Competition”. Under the category of emotion-focused coping, themes that were derived are, “Reflection”, “Self” and “Others”. Next, avoidance coping involved “Physical”, “Mental” and “Behavioural” forms of avoidance. In terms of social support, “Team mates” and “Others” were found to be source of support in times of stress. Finally, performance strategies comprised of “Relaxation”, “Positive imagery”, “Negative imagery”, “Positive self-talk”, “Negative self-talk”, “Goals” and “Routines”.

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Approach Others
- Talk to teacher-in-charge
- Ask coach

Problem-focused

Preparation
- Game plan
- More preparations
- Video review
- Cross training
- Practise

Competition
- Try different strategies
- Focus on technique

Reflection
- Self-reflection
- Reflection journal

Emotion-focused
- Shout
- Lower expectations
- Splash water to calm down
- Confidence decrease

Self

Others
- Crowd vibe

Mental
- Try not to think about bad games
- Not wanting to face consequences

Behavioural
- Stopped calling for ball after bad experience
- Play safer shots
- Chill with team mates
- Walk away and close eyes

Avoidance
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**Sharing with team mates**
3, 10

**Getting support**
4, 7

**Seeking advice**
8, 13, 16, 28

**Team cheer**
10, 18

**Communication**
26

**Seek comfort**
29

**Closer friends**
19

**Previous coach**
19

**People she trusts**
19

**Imagery**
3, 6, 7, 8, 9, 10, 12, 14, 15, 18, 19, 20, 21

Imagine a burning flame as performance
9

**Imagine losing**
9

**Positive self-talk**
1, 3, 4, 6, 8, 9, 14, 16, 17, 19, 20, 21

**Negative thoughts**
1, 6, 17, 19, 22

**Set goals for individual games**
3, 8, 15

Build confidence through simple processes
8, 15

**Have routines to re-focus**
4, 12

**Relaxation**

**Positive Imagery**

**Negative Imagery**

**Positive Self-talk**

**Negative Self-talk**

**Goals**

**Routines**

**Social Support**

**Team Mates**

**Others**

—

**Figure 10.** Thematic breakdown of coping strategies and their occurrence
5.3.4.1 Problem-focused.

Problem-focused coping strategies relate to things athletes do upon appraisal of stressor, in the attempt to lessen or resolve it. Athletes engaged in problem-focused strategies the most, right after performance strategies. Firstly, athletes cope by talking to others such as their teacher-in-charge in the case of overtraining and their coach in terms of performance issues from undertraining.

One day I just talked to my teacher-in-charge and ask her for opinions. (Participant 5)

I went back to my coach, my secondary school and JC coach. So, I cried to him and everything and then he gave me some advice. (Participant 19)

These two athletes had the same response to a similar stressor relating to training, which could have stemmed from the acknowledgement that the teacher-in-charge could directly solve the stressor of overtraining and the coach could assist in the stressor of undertraining and performance issues. Therefore, knowing who can help in which situations could also support athletes in coping with stressors in sport.

Secondly, athletes attempt having more preparations in place to cope with sport-related stressors. One example of such preparation includes having a game plan, be it in an individual sport like running or a team sport like dragon boat. Other forms of preparation comprise the type of food to eat before a race, ensuring there is sufficient people around to help out and doing sufficient amounts of release during warm ups. Of the three athletes citing this coping response, two are in response to an injury. Therefore, an injury could prompt a desire to be better prepared so as to avoid a relapse or a repeat of an unpleasant experience. Having an injury and being placed in a new of
uncomfortable situation was also found to result in the coping strategy of more preparation and practise. Two examples are shown below.

You reach the court earlier than people, you try to leave later than them.

(Participant 3)

Practise a bit more at that venue. (Participant 11)

Finally, athletes also attempt various things during competitions when they are stressed by losing, such as, trying different strategies and focusing on their technique. All these involve attempts to change something in the competition in the hope of also changing the outcome of losing. One example of how an athlete does this is seen in the quote below.

Normally I’ll try to break the momentum. For example, when the opponent is leading, maybe 4 or 5 points. I’ll just either talk to umpire, drag the game, and like maybe do something out of the norm. Like, maybe try to get a water break, change the shuttlecock, walk longer and all those. (Participant 17)

Interestingly, problem-focused strategies were used by athletes to cope with stressors that were out of their control such as overtraining and the presence of an injury. However, athletes engaged in a fair amount of problem-focused strategies such as approaching others who are able to help, having greater preparation and also changing things in the game.

5.3.4.2 Emotion-focused.

Emotion-focused coping strategies involve regulating the emotional response to a stressor (Lazarus & Folkman, 1980) and relate to strategies attempted to deal with emotions involved through the stressful situation (Baker & Berenbaum, 2007). In this
regard, athletes respond to subpar performance by either cognitively reflecting or physically writing it down in a reflection journal.

Maybe on the spot reflect a bit about how I can hit better. (Participant 12)

We also have a reflection journal. (Participant 21)

Secondly, other coping responses cited by athletes involve their own emotions. Athletes were found to lower their expectations and one athlete cited a decrease in confidence as a result of stress. Athletes also made use of various things to regulate their emotions such as shouting to increase their confidence or using the physical element of water to calm themselves down by splashing water on themselves, in the case of a water sport.

One final way athletes regulate their emotions is through the use of others, such as the crowd. As mentioned by Participant 7 below, the vibe from the crowd helps him to hype himself up, which he uses to enhance his performance.

There’s a crowd vibe cheering you on. So, you use that to help you to ease your tension. (Participant 7)

Together, emotion-focused coping strategies were utilised the least in athletes interviewed. However, it appears that there is still a place for the use of emotion-focused strategies especially with regards to enabling athletes to ease performance anxiety levels.

5.3.4.3 Avoidance.

Avoidance coping strategies involve athletes attempting to avoid the stressor at hand and research has found that avoidance coping strategies are often used when the stressor is deemed uncontrollable (Roth & Cohen, 1986). The first form of avoidance
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Coping is in the use of mental avoidance. This can occur by not wanting to think about bad games or not wanting to face certain consequences. These are all in response to competitions and the former occurred when there are back to back competitions, hence athletes have to let go of bad games so as to not let previous setbacks affect them. The latter desire to avoid certain consequences such as losing occurred during competition amidst insecurity in one’s own performance. This athlete actually belongs to Cluster 3, which has high mastery and low performance goals in a mastery climate. This is interesting as insecurity in one’s own performance seems to be more indicative of a performance-avoidance goal. However, both situations note a lack of confidence in ability where the first was due to a previous experience and the second was of a more chronic nature.

The second form of avoidance coping is behavioural, where the stressor resulted in playing safer shots, led to a complete change in behaviour or it involved engaging in totally unrelated behaviour. Athletes who cited playing safer shots as a coping response came mostly from the sport of badminton, once again hinting at the effects of sport on stress appraisal and hence an athlete’s coping response. In terms of changing behaviour, an athlete shared how a bad experience from a team mate caused him to stop attempting to shoot, which is shown below.

But he said, “You should have drive, don’t shoot the ball”. Then ever since then, I shot the ball less often. (Participant 2)

In this instance, the cause of stress was so poignant that it resulted in a behavioural change. Some of these stressors might have already occurred, but their effects last a long time. This is a crucial point to note especially for practitioners working with athletes as some of their behaviours might be driven by past experiences. It is also evidenced that
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one way of coping with sport related stress, is to engage in activities totally unrelated to the sport they are participating in.

Just enjoy, play some Play Station in the hotel. Ya. Take my mind off the hockey. (Participant 8)

Ya, have a nap. Then there’s a lot of other things we do. So, for climbers we have a lot of weird stuff. Like, you heard of slack lining? It’s like a tight rope. Ya, so we have that to have fun. And it’s a sports hall so we play ping pong also. We’ll play darts also. It’s like a lot of other things. I mean in the case that we are too tired to climb, we just play the other things, to relieve stress. (Participant 13)

This is an interesting revelation into coping strategies as coping strategies have often been grouped into approach and avoidance categories with particular emphasis on a stressor, where coping strategies were employed based on perceived control over the stressor (Alsentali & Anshel, 2015) or on the direct source of stress itself (Anshel & Si, 2008). However, it appears that avoidance coping strategies could also be employed on stress stemming from the generic notion of competitions.

5.3.4.4 Social Support.

Social support coping strategies occur when athletes turn to people around them in order to gain support when stressed. Athletes largely seek support from their team mates and most athletes who engaged in this strategy participate in team sports such as dragon boat, volleyball, handball, hockey and so on, revealing the close bond athletes have within a team. However, social support was also prevalent in the sport of rock climbing despite it being more of an individual sport. This could be due to the athlete constantly being in close proximity to his team mates, hence fostering a strong bond with them as the athlete did mention often being with his team mates outside of
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curriculum time. The social support athletes get from their team mates could be an objective one where they aim to seek advice or communicate, a subjective one where they seek comfort, share and gain support, do a team cheer together to boost morale or just chill with one another. Athletes who share, get support and seek comfort from their team mates often do so in response to a poor performance or when they are burdened and need to offload. One example of this is shown below.

(After making a bad pass) Sometimes I talk to my friends, we’re on the bench… then I try to be positive and when they say yes it kind of encourages me also.

(Participant 4)

On the other hand, athletes who seek advice tend to do so when they are new to the sport and more uncertain or require some external help.

I asked around, I asked more experienced coxswains... (Participant 18)

One athlete also approached other people like close friends, her coach and people whom she trusts to seek social support when stressed.

Talking to the people that I trust… my coach, sometimes I will talk to my mom also. (Participant 19)

Significant others have always been found to play a role in an athlete’s sporting experience. Past research has shown that significant others have an influence on youngsters’ achievement motivations, however the relative influence of these significant others change according to the developmental status of the individuals and the context (Chan, Lonsdale, & Fung, 2012; Weigand, Carr, Petherick, & Taylor, 2001). Over time as athletes grow and mature, the amount of influence that significant others (coaches, parents, and peers) have on their motivational patterns also change. Therefore, one interesting observation was that of all 22 participants, just one participant found
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significant others still relevant and play a role in enabling her to cope with stressors she faces in her sport.

5.3.4.5 Performance Strategies.

The most common form of coping strategy used was that of performance strategies. Athletes engaged in the four mental skills of goal-setting, relaxation, imagery and self-talk fairly often, also establishing routines to help them cope. However, athletes also displayed negative coping responses in the case of imagery and self-talk. When coping with competition stress by relaxation, athletes engaged in deep breathing in order to calm themselves down and focus on what they have to.

I’ll just take deep breaths, or try to focus, concentrate, get back into the game.

(Participant 1)

However, the skill of relaxation contains a lot more components than just deep breathing and it is possible that athletes might be able to cope more effectively if only they utilised other aspects, inclusive of cognitive and somatic relaxation techniques.

The performance strategy of imagery is one of the two most commonly used coping responses. More than half of the athletes interviewed cited positive imagery as a way to cope with stress. One athlete even imagines a burning flame to keep himself going during competitions.

I just think of a burning flame… like you know people always say that when you’re on form you’re on fire right. So, I’ll imagine the fire. (Participant 9)

However, this same athlete also revealed imagining himself losing as something that he does when he is on the verge of a loss, eventually leading to a loss. This shows a lack of
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Controllability in his imagery where what he imagines is dependent on the situation happening on court.

But sometimes in the not so good situation, I will visualise that I lose.

(Participant 9)

Therefore, the coping strategy of imagery can serve to both aid and impede performance, depending on how it is being used by athletes.

Athletes also constantly engage in self-talk to either motivate or cue themselves. Some examples of this can be found in the excerpts by two athletes below.

Like just giving myself cue words. Like “Come on” or something like that. I’ll just say it to myself or sometimes I’ll just shout it out. (Participant 1)

So, I must tell myself, “okay, just do this”. And then do (it). (Participant 4)

These forms of self-talk help to either encourage athletes or to help them push themselves to do what they have to.

On the other hand, athletes also tend to respond to stress with negative thoughts either with regards to competition related aspects or based on past trends from previous competitions. One example of a competition-related negative thought could be a negative arousal right before going on court as seen in the narrative below.

Ohno, it’s my turn, ohno it’s the time, everyone’s looking, everyone’s going to look at me now… this is it… (Participant 17)

Other forms of negative thought also include bringing in experience from previous competitions and applying these trends to the current one.

If I have a lead in the fourth set and I lost the lead and the set, I would eventually go on to lose the match… (Participant 6)
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Once again, mental skills, which conventionally is used to improve sporting performance can also lead to negative results if not controlled properly.

The penultimate way of coping with stress through the use of performance strategies is by setting goals for individual games or by building confidence through the setting and achieving of small process goals. Goal-setting can be used to build confidence as achieving these goals help to increase competence level in athletes.

The goals I set are very very simple… I’ll just do the simple thing. Just get the ball, pass it off and then slowly build my confidence. (Participant 8)

Finally, athletes engaged in using routines to focus when a stressor has distracted them from their game or just to help them get into the right frame of mind to compete. These routines can be sport related or non-sport related.

So maybe I felt that my serves will go into the net instead of going over, I try to calm myself down by bouncing the ball a few more times before I serve. So usually I bounce in sets of three. (Participant 12)

Before warmup I must go to the toilet. And then after warmup, which is dynamic warmup, I must go to the toilet again. (Participant 4)

Taken together, athletes engage in a variety of coping strategies in response to stressors they face in their sport. Not surprisingly, the most common coping strategy is that of mental skills, which is well applied in the field of sport. However, mental skills were found to lead to both positive and negative coping outcomes, which emphasises the need to be able to control the use of mental skills in order to utilise them for performance enhancement. Problem-focused coping and social support coping strategies were also relatively well-used but social support coping strategies were specifically found to be more well-used by athletes in team sport. Therefore, it appears that coping
strategies might be affected by stress appraisals, but could also be affected by other factors such as sport.

5.4 Discussion

Results from the semi-structured follow-up interview identified themes of stress appraisals based on the categories of “harm/loss”, “threat” and “challenge”, as well as themes of coping responses according to the four categories based on the higher order factors of the COPE Inventory in Study 1 (“problem-focused”, “emotion-focused”, “avoidance”, and “social support”) and performance strategies. Slight discrepancies were found in participants’ questionnaire response and comments during the interview session. Some new themes that were highlighted during the interview and not picked up by the questionnaire lie in the category of “social support”, and include having a team cheer or doing unrelated activities with the team. Therefore, having a follow-up interview session allowed researchers to have a deeper understanding of the stressors and coping responses athletes faced, whilst confirming the responses obtained.

In terms of stressors, it is encouraging to note that out of a sample of 22 athletes, less than a fifth of them reported physical injuries as a form of stress. This could either be due to a lower rate of injury or other athletes not feeling stress from their injuries. On the other hand, there was a strong trend of mental injury, in the form of negative thoughts, being appraised as a stressor. This strong trend of negative thought is worrying as certain forms of negative thought such as a fear of failure or coming in last have been found to be related to burnout (Gustafsson, Sagar, & Stenling, 2017). With that in mind, it is important to identify negative thoughts early and ensure athletes do not dwell on such negative thoughts to the point of burnout.
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Going back to Hypothesis 2a, it appears that contrary to what was predicted, achievement goals/motivational climate profiles did not show much difference in resultant stress appraisals. Athletes across different cluster groups reported similar stress appraisals across all three forms of stressors, namely, “harm/loss”, “threat” and “challenge”. Nevertheless, certain stressors mentioned were indicative of achievement goal/motivational climate profiles. One example of this is where being stressed when playing someone of equal skill came from someone belonging to Cluster 4 and is in fact akin to being in the absence of a Mastery climate. Majority of athletes who experienced a challenge appraisal in the form of “putting expectations on themselves” came from Clusters 2 and 3, contributing to research findings of challenge appraisals being related to mastery approach goals, which both clusters are representative of. One athlete in the more adaptive cluster, Cluster 2 reported a fear of his coach despite reporting a mastery climate in the questionnaire segment of this study. This discrepancy highlights the need for in-depth interviews to supplement questionnaire results. It is interesting to note that one athlete did not report any stressor whatsoever. This athlete also came from Cluster 2, which has in fact been found to show the lowest use of maladaptive strategies but moderate use of performance and coping strategies.

Out of the 12 athletes who found “expectations on self” as stressful, five of them came from Cluster 2, whilst the rest came from all the other clusters. Contrary to previous researchers who found challenge appraisals to be related to mastery approach but not performance approach goals (Adie et al., 2008), Cluster 2 is representative of both high mastery and high performance goals. However, in the study conducted by Adie et al. (2008), multi-section questionnaires were used, which once again emphasises the importance of triangulating findings in order to draw a more holistic picture.
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The need to triangulate is also highlighted through the case of an individual having discrepancies in goal orientation and statement given. Despite being profiled into Cluster 3, with the most adaptive profile, Participant 2 revealed strong hints of a performance avoidance achievement goal in the interview session through statements like, “you just want to pass the ball away” and “but if I miss the ball, they might blame me”. In return, this performance avoidance goal helps to explain his eventual extreme behavioural change of avoiding situations to shoot the basketball into the hoop as individuals with a performance-avoidance goal seek to avoid situations where they might appear incompetent as compared to others (Elliot & McGregor, 2001) Once again, this finding reveals the need to have in depth interviews in order to fully check and comprehend athletes’ responses.

Finally, according to Hypothesis 2b, stress appraisals had a slight influence on the eventual coping response. Certain stressors such as a subpar performance led to the use of reflection in athletes. When placed in a seemingly “uncontrollable” situation, both athletes in this study actively approached someone they thought could help them and whom they perceived could have better control over the situation. This is despite research findings that athletes do not actively engage in coping strategies in a stressor of low controllability (Roth & Cohen, 1986). Both athletes came from different clusters and different sports, which indicates that culture might also play a part in the way athletes cope with sport-related stressors.

Coping responses were mostly positive, with a handful of negative responses involving a loss of confidence, playing safer shots, negative thoughts and negative imagery. The most commonly used coping strategy is that of “Performance Strategies”, which is not unexpected as the usefulness of performance strategies in enhancing sport
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Performance has long been established in literature (Gould, 2006; Sadeghi et al., 2010; Vealey, 1988). Therefore, it is almost expected that in a sample of athletes, the use of mental skills takes up the majority of coping responses.

There were also trends observed in coping responses based on the type of sport athletes engaged in. Social support was primarily engaged by athletes from team sports and using different strategies was predominantly used by athletes from racquet sports such as table-tennis and badminton. Interestingly, both athletes who cited being new to the sport as a source of stress came from the same sport of Handball. Hence, the type of sport athletes engage in might also affect their use of coping strategies and this might be worth delving into for future research.

Although performance strategies were the most commonly used coping response amongst the athletes interviewed, there is a lack of depth in the relaxation techniques being employed. Athletes were found to only use deep breathing in trying to relax themselves when stressed. However, other relaxation techniques were found to have a positive impact on sport performance as well. One relaxation technique, meditation, was found to reduce lactate response to a standardised training programme (Solberg et al., 2000). Meditation, breathing, together with progressive muscular relaxation were also found to have a positive correlation with sport performance (Parnabas, Mahamood, Parnabas, & Abdullah, 2014). This paves the way for the next study where a greater variety of relaxation techniques will be taught to athletes in the face of stress to determine their efficacy in regulating anxiety.

From this, the crucial role that culture and sport play in goal adoption, stress and coping can be observed. Different athletes in different cultures and sports perceive and interpret stress in diverse ways due to the different structures present. Taken together,
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these can help shed new light on the different types of stressors faced by athletes and the different ways they cope with the stressors here in Singapore, in our current sporting context. Moreover, due to the influence of relaxation techniques on arousal regulation but the lack of prevalence in Singapore athletes, relaxation techniques will be used in the following study to determine their efficacy in a task-based intervention.

5.5 Conclusion

From this study, new perspectives were gained in terms of the different stress appraisals faced by athletes and their coping responses. Athletes were found to engage in more threat appraisals such as having negative thoughts as well as placing expectations on themselves. In the same way, coping responses were also found to comprise more of performance strategies such as self-talk and imagery. However, athletes engaged in both positive and negative aspects of these performance strategies, showing their incapability of controlling the performance strategy. In light of this, further research is required to understand how the theoretical findings from this study can help to advance applied work in sports psychology. The next study will proceed to look at the efficacy of a brief relaxation intervention in various climates and how this may be mediated by the goal orientation of athletes.
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Chapter 6: Study 3 – Efficacy of a Relaxation Intervention

Findings from Study 2a revealed four distinct clusters – “moderate-mastery, moderate-performance and performance climate” (Cluster 1), “high-mastery, high-performance and mastery climate” (Cluster 2), “high-mastery, low-performance and mastery climate” (Cluster 3), and “low-mastery, low-performance and absence of mastery climate” (Cluster 4). These four distinct clusters display unique characteristics about athletes based on their achievement goals, motivational climate, use of coping strategies and mental skills adoption. However, the above findings tell us little about how all these come together to actually improve athletic performance. Through the in-depth interviews conducted in Study 2b, it was found that the most common stressor occurred when athletes perceived the stressor as a challenge by placing huge amounts of pressure on themselves. On the other hand, the most common form of competition stress occurred when athletes perceived threat from the various stressors in the form of negative thoughts, often leading to anxiety and impaired performance.

The debilitating effects of anxiety on sporting performance have long been established in literature, and efforts have been made to enable athletes to counter those (Garza & Ford, 2009). This has led to research looking at athletes’ profiles to further understand athletes as well as the way they respond to stress. Researchers have found that individuals with different goal profiles do follow different trends in their use of coping strategies (Toh, 2010; Yeatts & Lochbaum, 2013). Mastery-approach goals in a mastery climate seemed to lead to the most adaptive coping strategies such as problem-focused coping whilst performance-approach goals seemed to be strongly related to avoidant coping strategies (Shively & Hall, 2006; Yeatts & Lichbaum, 2013). However, despite advantages in profiling and seeing links to coping strategies, there is little
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An explanation of how achievement goal profiling can help counter competition anxiety and improve sporting performance (Smith, Balaguer, & Duda, 2006; Vosloo, Ostrow, & Watson, 2009). In order to better understand how profiling can contribute to sport performance, the construct perceived competence has also been closely linked to achievement goal profiles in the context of physical activity. Specifically, a correlation between performance-approach goals and physical activity involvement was found to be mediated by high perceived competence, whereas the negative correlation between performance-avoidance goals and physical activity involvement was found to be mediated by low perceived competence (Skjesol & Halvari, 2005). Research has also found that low perceived competence, coupled with a mastery avoidance goal negatively affected intrinsic motivation in tertiary students from physical activity classes (Wang, Liu, Lochbaum, & Stevenson, 2009). Therefore, perceived competence should not be overlooked, but further examined to see how it relates to achievement goals and contributes to eventual performance.

One method that has been found to contribute to performance through countering stress is the use of mental skills. The use of mental skills such as goal-setting, relaxation techniques, imagery and self-talk was repeatedly listed by participants in Study 2b to help them cope with performance anxiety. More specifically, mental skills are generally taught using MST programmes. MST is used to enhance tasks and activities in specific settings, especially that of exercise and sport (Weinberg & Gould, 2015). MST programmes are made up of the learning and development of several psychological skills to aid athletes in their sport (Dale & Stephen, 2014). Although early MST interventions only targeted single skills such as cognitive arousal or mental imagery, MST interventions over the last 20 years have evolved to include package programmes to train a variety of skills (Dale & Stephen, 2014). Elite athletes
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not only possess superior technique and fitness levels, they have also been found to have exceptional mental skills (Vealey, 2007). Therefore, the role of mental skills in sports has often been under the scrutiny of researchers and athletes have been found to benefit from systematic MST programmes (Thelwell & Greenless, 2001). In an interview with university soccer players, players revealed that the four main mental skills of imagery, relaxation, goal-setting and self-talk were most useful for them (Sadeghi et al., 2010). However, in a group of rugby schoolboys, a 2-week mental skills training programme was found to only influence the intensity of their somatic anxiety but not their competitive anxiety (Ong & Griva, 2016). This shows that despite the effectiveness of MST programmes being established over the years, there are also situations whereby MST programmes might not be as effective in enabling athletes to regulate their anxiety levels. Hence, there is a need to have a closer look at MST programmes to determine the factors that might influence their effectiveness. Over the years, mental skills adoption has predominantly been looked at collectively, instead of singularly (Davidson & Edwards, 2014; Lim & O’Sullivan, 2016).

When considering competition anxiety management, however, one mental skill has been found to be effective in enhancing performance – relaxation. In a group of professional golfers, better performing golfers reported higher use of relaxation strategies, which seems to indicate that even elite golfers are distinguished by the use of strategies that reflect better competencies to manage anxiety (Bois et al., 2009). Elite swimmers also reported higher use of relaxation strategies to aid in their performance (Hanton & Jones, 1999). In a similar vein, the importance of relaxation techniques was established across literature as researchers explored how differentially skilled athletes applied relaxation techniques (Kudlackova et al., 2013). Interestingly, professional athletes were found to engage in more relaxation techniques than college or recreational
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level athletes, and more physical relaxation techniques (e.g., muscle relaxation) were found to be used in relation to coping with competitive anxiety (Kudlakova et al., 2013). In the case of individualised relaxation techniques, breathing techniques contributed to the management of performance anxiety in softball players, leading to improvements in their performance (Garza & Ford, 2009). PMR was also found to improve the recovery and sleep in dancers with higher trait social evaluation anxiety (McCloughan et al., 2016). Therefore, it appears that relaxation techniques have been utilised by elite athletes to manage anxiety levels and have been effective in enhancing performance. However, the use of relaxation techniques was largely limited in participants from Study 2b. Moreover, despite the prevalence of relaxation usage, the effectiveness of these techniques has yet to be objectively measured.

One method of objectively measuring relaxation states is through the observation of brainwave patterns, in the form of EEG. In recent years, the use of BCI devices have drastically increased in both research and application (Ekandem, Davis, Alvarez, James, & Gilbert, 2012). Inexpensive and portable commercial headsets were increasingly being developed and in particular, NeuroSky has been developing headsets which have received much attention in both personal and research use (Ekandem et al., 2012; Navalya & Gavas, 2014). The NeuroSky MindWave (NeuroSky, 2011) was also extensively validated and found to be comparable to clinical grade EEG devices, despite its primary purpose being for commercial usage (Chang et al., 2013; Mostow et al., 2011). In a classroom setting, the NeuroSky MindBuilder – EM (MB) equipment found readings parallel to students’ attention levels (Rebolledo-Mendez et al., 2009). Moreover, NeuroSky’s MindBuilder equipment was proven to be a valid and reliable instrument for measuring attention levels in two cognitive tasks – The Stroop Test and Towers of Hanoi (Crowley, Sliney, Pitt, & Murphy, 2010). As such, the NeuroSky
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MindWave EEG headset (NeuroSky, 2011), was used to record EEG data for the purpose of objectively measuring the effectiveness of the relaxation intervention used in this study.

Therefore, competition anxiety is a huge obstacle athletes will face and managing anxiety levels is critical in enhancing competition performance (Holt & Dunn, 2004; Lazarus, 2000). Athletes will need to cope effectively with their competition anxiety, whereby their use of coping skills are able to be influenced by their achievement goals and motivational climate (Toh, 2010, Shively & Hall, 2006; Yeatts & Lochbaum, 2013). Nevertheless, the specific use of relaxation techniques has been found to enable athletes to effectively cope with competition anxiety levels as well as improved athletic performance (Bois et al., 2009; Hanton & Jones, 1999; Kudlackova et al., 2013; McCloughan et al., 2016). Therefore, how achievement goals and motivational climate, coupled with one particular mental skill – that of relaxation, can help athletes cope more effectively with performance anxiety will be examined through the use of an intervention study. Moreover, due to the nature of competitions, athletes need to self-regulate their anxiety levels within a short amount of time (Giges & Petitpas, 2000). This means that whatever techniques they apply need to be completed within a short time frame. Given the link between relaxation techniques and the management of performance anxiety, it is beneficial to objectively observe the effects of a brief relaxation intervention session with athletes under two different conditions – Mastery and Performance, when coupled with their individual achievement goals. This can help provide additional evidence to support or possibly refute the impact of relaxation techniques on performance anxiety in a sporting context.

Two key research questions explored in the present study are listed below:
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a) How can a brief relaxation intervention affect athletes with different achievement goals, in different motivational climates?

b) How can the presence of different motivational climates affect the adoption of achievement goals?

In answering the research questions above, Study 3 attempts to test the following hypotheses pertaining to achievement goals, perceived competence, motivational climates and the technique of relaxation:

Hypothesis 3a: The NeuroSky MindWave EEG headset is adequate as an objective measure to measure the efficacy of a coping intervention.

Hypothesis 3b: The technique of relaxation would enable participants in the intervention group to score better than participants in the control group.

Hypothesis 3c: Participants in a mastery climate would be more likely to adopt mastery goals in spite of their trait achievement goals.

Hypothesis 3d: Participants in a mastery climate coupled with mastery-approach goals would have the best scores after the intervention.

6.1 Method

6.1.1 Participants.

120 tertiary student athletes (Male = 58, Female = 62) in Singapore, aged 18 to 35 years old (M = 22.66, S.D. = 3.22) were recruited to participate in this third study. Participants were from a variety of sports. These athletes reported playing at national inter-school level (n = 68), external club level (n = 26), as well as regional and international competition level (n = 16), with the remainder not indicating their highest
level of competition \( (n = 10) \). All participants noted that it was their first time participating in a golf-putting task, yet a handful of participants have had experience in playing golf at an outdoor course.

### 6.1.2 Procedure.

Ethical procedures were obtained from the Institutional Ethical Review Board of Nanyang Technological University. This was followed by the dissemination of the study information to sports teams in Nanyang Technological University. Prior to beginning the study, informed consent was obtained from participants above 18 years old. As all the participants were above 18 years old, no parent’s or guardian’s consent was sought.

Participants were first given the AGQ-S to complete, so as to determine their dispositional goal characteristics. Following which, an experimental session was conducted. During the experimental sessions, participants were randomly allocated into three different conditions – performance-inducing climate, mastery-inducing climate and control, with four participants present during each session. Motivational climates were constructed according to the TARGET framework (Epstein, 1989), a framework that has been shown to impact perception of climate (Bowler, 2009; Cecchini, Fernandez-Rio, & Mendez-Gimenez, 2014). This framework focuses on the six variables of Task (task design), Authority (decision-making), Recognition (rewards), Grouping (regularity and grouping method), Evaluation (standard of performance) and Time (speed of learning) to structure the environment (see Appendix H). A golf-putting task was chosen as the performance task, as golf-putting is a fairly novel task that takes place in a closed environment hence allowing for fewer signal interference when collecting brainwave data. A mini indoor 2m golf-putting mat was used for participants.
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to complete the golf-putting task. A point was awarded when participants managed to get the ball into the hole. The final score obtained by participants was scored out of 10 points.

Participants were gathered into groups of four for each session and randomly allocated into a condition. There were a total number of forty participants in each group. At the start of the experimental session, participants were first given a practice trial consisting of two blocks of five tries to put. Following which, they were given the CSAI-2R questionnaire to complete, to obtain a baseline level of their anxiety levels. Thereafter, participants in the performance-inducing condition were told that the aim of the experiment was for them to score as many successful puts as possible and to win the competition trial, where they will be ranked with their peers according to their performance. Participants in the mastery-inducing condition were told to focus on learning the skill and having fun. Lastly, participants in the control group were told to complete two rounds of trials. Participants in both performance and mastery-inducing conditions then underwent a brief ten minutes relaxation training session, where they were taught various relaxation techniques and ways to apply them. The competition trial took place after the relaxation training session. Here, participants were again given two blocks of five consecutive tries to put.

At the end of the assessment trial, participants were given the CSAI-2R once again, together with the perceived competence scale from the Intrinsic Motivation Inventory (IMI). Participants were also asked what their goals for the experiment were and what strategies they used to aid them during the task. A five-minute post-session debrief was concurrently conducted by the principal investigator, who explained the climate being constructed, the use of the NeuroSky MindWave EEG headset as well as
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The questionnaire measures. Questions from participants were also encouraged and correspondingly answered. A diagrammatic representation of the flow of events is shown in Figure 11 below. Throughout the duration of both practice and assessment trials, participants were also required to put on a NeuroSky headset device.

Figure 11. The experimental design for Study 3. The figure illustrates the flow of events that participants underwent.

Due to the importance of using qualitative data to check quantitative data collected and its ability to give a more holistic picture, participants were verbally questioned on their achievement goals and usage of strategies after the task. Responses were recorded verbatim by the researcher on the spot and later collated onto an excel sheet.

6.1.3 Pilot Study.

As part of the refinement process, a pilot study was conducted with each of the three conditions, to test the experimental protocol of Study 3. From the pilot study,
feedback was given to only include the perceived competence scale in the second questionnaire and not the first.

**6.1.4 Relaxation Intervention.**

The relaxation intervention script can be found in Appendix J and comprises both muscle to mind as well as mind to muscle relaxation techniques. In a study by Kudlackova and colleagues (2013), athletes perceived relaxation as relevant to their performance with professional athletes engaging in more counts of relaxation. Specifically, athletes reported greater use of physical relaxation (e.g., PMR) when coping with competition anxiety but greater use of mental relaxation (e.g., meditation) when coping with everyday anxiety (Kudlackova et al., 2013). Hence, both forms of relaxation exercises were deliberately included due to their positive influence in athletes. Muscle to mind relaxation techniques used in the intervention involved sighing with exhalation, rhythmic breathing and progressive muscular relaxation. On the other hand, meditation was included as a mind to muscle relaxation technique. These relaxation techniques were also included due to their popularity and success in literature (Garza & Ford, 2009; Kudlackova et al.; Thelwell & Greenlees, 2001).

**6.1.5 Measures**

Similar to previous questionnaires, the first part of the questionnaire asked participants for some background information regarding their participation in sport. The information included participants’ demographical information like gender, type of sport played, number of years playing sport, and highest level of sport participation achieved. In the subsequent paragraphs, the following validated instruments were used to look at achievement goals and perceived competence in participants.
Achievement Goal. The 2 X 2 Achievement Goal Questionnaire for Sport (AGQ-S; Conroy et al., 2003) was used to measure athletes’ achievement goals. The AGQ-S was developed by modifying items from Elliot and McGregor’s (2001) 12-item 2 X 2 AGQ; which was originally intended for use in an education domain, to make the items more applicable to sport. The AGQ-S consists of 12 items as well, and each of the items describes different ways in which participants can strive for competence or avoid incompetence. The AGQ-S measures four different achievement goal dimensions in sport: Mastery-approach (e.g. “It is important to me to perform as well as I possibly can”; α = .72), Mastery-avoidance (e.g. “I’m often concerned that I may not perform as well as I’d like”; α = .85), Performance-approach (e.g. “It is important to me to do well compared to others”; α = .82), and Performance-avoidance (e.g. “My goal is to avoid performing worse than everyone else”; α = .89). The internal consistencies of all subscales were found to be adequate. Participants responded on a seven-point Likert scale, where they rated how consistent each way of evaluating competence was with their own achievement goals (1= “not at all like me”, to 7 = “completely like me”).

Perceived Competence. The items from the perceived competence scale of the IMI (Ryan, 1982) was adopted. The scale consists of six items and was used to assess participants’ perceived competence in the golf-putting task (e.g., “I think I’m pretty good at the activity”; α = .90). The scale was found to have good internal consistency. Responses were rated on a seven-point Likert scale (1= “strongly disagree”, to 7= “strongly agree”).

Anxiety. The CSAI-2R (Cox et al., 2003) was adapted to measure participants’ state anxiety levels after both practice and assessment trials. The CSAI-2R was revised from the CSAI-2, as limitations were found in the development of the CSAI-2, one of
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which is a failure to confirm the factor structure with a follow-up CFA (Cox et al., 2003). The scale divides anxiety into three components – cognitive anxiety (e.g., “I feel jittery; α = .91”), somatic anxiety (e.g., “I am concerned I may not do as well in this task as I can”; α = .94) and a related scale of self-confidence (e.g., “I feel self-confident”; α = .91). Self-confidence was included in the scale as researchers argued it is the opposite of anxiety, and indicative of stress management. The questions in the original scale are worded for competitions and thus for this study, questions were rephrased to relate to the task at hand. The internal consistencies of all subscales were found to be adequate. Once again for uniformity’s sake, a seven-point Likert scale was used (1 = “Not at all” to 7 = “Very much so”).

Attention and Meditation. A neurophysiological device known as the NeuroSky MindWave EEG headset (NeuroSky, 2011) was used to measure both attention and meditation levels in participants during trials. The NeuroSky headset is a portable EEG device developed by NeuroSky to measure brainwave signals and attention levels of individuals as they engage in various tasks (Chang et al., 2013). It has previously been used in the health and wellness aspect as well as in education settings. A third-party application named “EEG Recorder” was used to record data on a revised scale of one to 100, where higher scores reflect higher attention and meditation levels.

6.2 Data Analysis

Preliminary data analysis was conducted by observing the means and standard deviations of all constructs. Skewness and kurtosis were also checked and found to be appropriate (+2 or -2; George & Mallery, 2010).

To test Hypothesis 3b on the effectiveness of a brief relaxation intervention, a Within Subject Repeated Measures multivariate analysis of variance (MANOVA) was
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conducted with pre- and post-test scores for both the task and brainwave device as dependent variables, and the three different conditions as the independent variable to test if there is a significant within subject effect across all participants. Hypothesis 3c was tested next when dispositional achievement goals were subsequently included as covariates. Depending on whether the MANOVA showed any significant effect, follow-up tests were conducted using the ANOVA test on each dependent variable. Post hoc analyses using Tukey’s test was used to test pairwise comparisons at the .05 level of significance for the ANOVA. These pairwise comparisons among groups were conducted to investigate Hypothesis 3d.

To supplement Hypothesis 3c, participants were asked about their goals and use of coping strategies during the task. All responses were written down, with permission from participants, and thereafter keyed into an online excel sheet by the principal investigator. Participants were coded to preserve their anonymity. The principal investigator read and re-read the responses to ensure familiarity with the data. Following which, these themes were coded and organised into more comprehensive categories by grouping similar themes. This process of grouping also ensured that the categories were distinct from one another. This technique was repeated until saturation of data was reached and no new themes or codes could be formed from the raw data. Causal-chains were also drawn on to look at the plausible sequence between the goal of the participants, and the resultant strategy participants took to deal with these stressors (Miles et al., 2014). Using investigator triangulation (Carter, Bryant-Lukosius, DiCenso, Blythe, & Neville, 2014), the themes that emerged from the coding were then verified by a Masters graduate from Loughborough University who is currently pursuing research in the National Institute of Education. The definitions of both achievement goals and strategies used were explained to the secondary coder and Cohen’s Kappa
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6.3 Results

6.3.1 Descriptives.

The means and standard deviations of the dispositional goal orientations across the three groups are presented in Table 22 below. The baseline dispositional achievement goals of participants indicate higher mastery approach followed by performance-avoidance goal tendencies. Mean brainwave and task scores of the three groups are similarly presented in Table 22. Additionally, pre and post scores for somatic anxiety, cognitive anxiety and self-confidence can be found in Table 22. Due to the small sample size in each group, gender and age effects were not examined. Looking at the descriptive statistics for brainwave data scores and actual task scores across all three conditions there appears to be a consistent increase in both Meditation and Attention scores from pre-test to post-test. Task scores also increased from pre-test to the actual score, with participants in both Performance and Mastery conditions seemingly performing better than those in the Control condition.

Table 22

Means and Standard Deviations (in Parenthesis) for Dispositional Goal Orientations, Mean brainwave results and task scores by Condition

<table>
<thead>
<tr>
<th>Construct</th>
<th>Performance-inducing</th>
<th>Mastery-inducing</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N= 40</td>
<td>N= 40</td>
<td>N=40</td>
</tr>
<tr>
<td>Performance-approach</td>
<td>13.95 (2.98)</td>
<td>14.40 (3.22)</td>
<td>15.65 (2.89)</td>
</tr>
<tr>
<td>Performance-avoidance</td>
<td>16.55 (2.62)</td>
<td>16.70 (3.31)</td>
<td>17.28 (3.10)</td>
</tr>
<tr>
<td>Mastery-approach</td>
<td>18.00 (2.26)</td>
<td>17.80 (2.19)</td>
<td>17.95 (2.60)</td>
</tr>
<tr>
<td>Mastery-avoidance</td>
<td>11.83 (3.73)</td>
<td>13.18 (4.66)</td>
<td>13.63 (4.66)</td>
</tr>
</tbody>
</table>
6.3.2 Manipulation Check

Manipulation checks were conducted using anxiety scores to assess the appropriateness of the task and resultant condition in the experiment. First, a paired samples t-test was conducted to compare the anxiety scores pre- and post- experiment across the three different conditions. In the performance condition, there was no significant difference for both somatic; $t(39) = 1.45, p > .05$, and cognitive anxiety; $t(39) = 1.80, p > .05$. However, there was a significant difference in the level of self-confidence participants experienced between the start and end of the experiment; $t(39) = -2.65, p = .01$. In the mastery condition, participants had significantly lower cognitive; $t(39) = 6.03, p < .001$, and somatic anxiety; $t(39) = 4.16, p < .001$, at the end of the experiment. However participants in this climate became significantly more self-confident as the experiment progressed; $t(39) = -2.75, p < .05$. In the control condition, participants had significantly lower somatic anxiety at the end of the experiment; $t(39) = 2.67, p < .05$. Nevertheless participants had no significant difference in both cognitive anxiety; $t(39) = 1.21, p > .05$, or self-confidence scores; $t(39) = -2.00, p > .05$. Therefore, it appears that the construction of the mastery condition was able to allow participants...
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to feel less anxious and more self-confident. Next, a one-way ANOVA was conducted using post-experiment anxiety scores as the dependent variable and condition as the independent variable to determine if there was a significant difference in anxiety levels based on the constructed conditions. There was no statistically significant difference across all three conditions for somatic anxiety ($F(2,117) = 2.44, p = .09$), cognitive anxiety ($F(2,117) = 1.89, p = .16$) or self-confidence ($F(2,117) = .13, p = .88$). Therefore, the construction of the different conditions was insufficient to examine the research hypotheses as evidenced by the anxiety scores.

6.3.3 Multivariate Analyses.

Multivariate tests revealed a significant between-subjects effect based on condition ($F(10,218) = 2.008, p < .005; \text{Wilk's } \Lambda = .004$). There was also a significant effect found for the Time variable ($F(5,108) = 11.654, p < .005; \text{Wilk's } \Lambda = .650$). Univariate tests revealed that the significant effect for time and condition occurred in task scores between pre- and post-test ($p < .005$). However, there was no significant interaction effect between time and condition ($p > .05$). When comparing attention and meditation scores from the NeuroSky MindWave EEG Headset, there was a slight within subject improvement from pre- to post-meditation scores when comparing the highest scores across all participants ($p=.075$).

In terms of measuring effectiveness of the relaxation intervention according to Hypothesis 3b, pairwise comparisons among groups further revealed that pre- and post-test scores were significantly higher in the Mastery ($p = .011$) and Performance ($p = .026$) groups when compared with the Control group. However, contrary to Hypothesis 3d, there was no significant difference between both Mastery and Performance groups ($p = .913$). No significant difference was found with regards to the
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achievement goals used to test for covariate effect (p > .05). In general, the participants who underwent the relaxation treatment scored significantly better in the task as compared to those in the Control group who did not undergo the brief relaxation training. However, contrary to past research showing that a Mastery climate is linked to more adaptive learning behaviours than a Performance climate (Bortoli et al., 2010), there was no significant difference between the scores of participants in both groups. Moreover, researchers have reported that a mastery climate leads to increased intrinsic motivation, specifically in the presence of a low perceived performance climate (Buch, Nerstad, & Säfvenbom, 2017). Instead of observing significantly better scores for participants in the Mastery-inducing climate as opposed to the Performance-inducing climate in a novel golf-putting task, participants in both climates were able to display similar task scores.

Contrary to expected, there was no significant difference in brainwave scores across the three conditions before and after the intervention. There was only a slight improvement in pre- and post-meditation scores when comparing the highest meditation scores recorded across all conditions.

6.3.4 Qualitative Analyses.

As a follow-up, participants’ perceptions of achievement goals and strategies used were obtained to see if any insight could be gained from these results. Thereafter, both the state goals and strategies used by participants were read through multiple times and thematically analysed. Goals were grouped into five sub-categories comprising “Mastery-approach”, “Mastery-avoidance”, “Performance-approach”, “Performance-avoidance” and “Others”. Strategies used were grouped into six sub-categories namely, “Mental skills (without relaxation)”, “Relaxation techniques”, “Learning from others”,

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“Learning from self”, “Technical” and “Others”. As two different coders (principal investigator and secondary coder) were involved in the analysis of this data, Cohen’s Kappa was run to test for inter-rater reliability. The closer the Cohen’s Kappa statistic is to 1, the stronger the agreement. There was good agreement between both coders with regards to goals for the study, K = .800 (p < .005). Table 21 below shows a breakdown of the different state achievement goals participants had over the course of the task.

Table 23
Breakdown of Participants’ State Achievement Goals

<table>
<thead>
<tr>
<th>Mastery Approach</th>
<th>Mastery Avoidance</th>
<th>Performance Approach</th>
<th>Performance Avoidance</th>
<th>Others</th>
</tr>
</thead>
<tbody>
<tr>
<td>94</td>
<td>3</td>
<td>2</td>
<td>0</td>
<td>21</td>
</tr>
</tbody>
</table>

Contrary to Hypothesis 3c, regardless of the condition they were placed in, participants indicated a preference for mastery goals, specifically mastery-approach goals, with many of them stating a desire to improve from the previous round or to complete the task to the best of their ability. This could have contributed to the lack of difference found in post-test task scores between mastery and performance conditions.

In fact, the three participants who mentioned having a mastery-avoidance and performance-approach goal all came from the Control group. “Other” goals included those not in related to winning self or peers but wanting to master either the task or aspects of the task such as ‘align putt to the white line’.

There was also good agreement between both coders with regards to strategies used during the study, K = .750 (p < .005). Table 22 below shows a breakdown of the different state achievement goals participants had over the course of the task.

Table 24
Breakdown of Participants’ Use of Strategies

<table>
<thead>
<tr>
<th>Mental skills</th>
<th>Relaxation techniques</th>
<th>Learning from self</th>
<th>Learning from others</th>
<th>Technical</th>
<th>Others</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>
Of the 120 participants, about ten percent (n = 10) of them continued with the use of relaxation techniques to aid their performance. Out of these 10 participants who used relaxation techniques, four of them were from the Performance climate, three of them were from the Mastery climate, and three of them were from the Control group. Despite not being pre-conditioned to relaxation techniques, participants from the Control group were found to automatically use relaxation techniques to aid their performance in a novel golf-putting task. This shows the prevalence of relaxation techniques in aiding performance.

To have a deeper understanding of the role perceived competence plays in performance, a Pearson correlation was run to determine the relationship between perceived competence and post-test task scores. There was a strong, positive correlation between perceived competence and post-test task scores due to statistical significance (r = .608, n = 120, p < .001). Therefore, individuals who thought that they were competent in the task also scored higher during the post-intervention trial. However, when perceived competence was measured against achievement goals, no correlation was found between perceived competence and any of the four achievement goals. This is surprising as past literature in the field of achievement goals have established perceived competence as the core of achievement goals (Elliot & McGregor, 2001) and even being able to moderate the relationship between performance-approach and performance-avoidance goals (Law, Elliot, & Murayama, 2012).
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6.4 Discussion

Study 3 was designed as a follow-up application study with two aims. Firstly, it was to see the efficacy of a brief relaxation technique in a golf-putting task under three different conditions. In agreement with Hypothesis 3a, the portable NeuroSky device was used as an objective measure to determine the efficacy of a relaxation intervention. Similar to clinical grade devices, which were previously used extensively in brainwave studies, the NeuroSky device served its purpose as a measure although no significant difference in Meditation and Attention scores were found. However, equipment and technological limitations were evident as several data sets were lost due to technological glitches caused by the third-party application “EEG Recorder”. A previous study conducted on the NeuroSky headset also saw data loss due to students manually interfering with the device itself (Sezer, İnel, Seçkin, & Uluçınar, 2017). However, data loss in this study from the third-party application was also due to the version of the application itself. The application could only be used on Apple iPhones, with an IOS version of 10 and earlier. The application did not support later versions of IOS. Moreover, numerous other studies have found the NeuroSky MindSet and MindWave headsets as reliable and adequate for measuring attention in education settings as well as categorization of human emotions (Crowley et al., 2010; Rogers, Johnstone, Aminov, Donnelly, & Wilson, 2016; Sittiprapaporn, & Chang, 2018; Yoon, Park, Lee, & Jang, 2013). Therefore, on the premise of being able to measure Meditation and Attention scores for the purpose of research, the NeuroSky device was adequate.

Accordingly, Hypothesis 3b looked at the efficacy of the intervention and the brief relaxation intervention was found to result in significantly better post-intervention golf-putting scores for both the Mastery and Performance conditions as compared to the
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Control condition. However, care has to be taken in the interpretation of this result as the manipulation checks revealed little difference in anxiety levels across all three condition. Nevertheless, the significantly better post-intervention golf-putting scores add on to literature on the effectiveness of relaxation techniques. Relaxation techniques have previously been found to reduce test anxiety in third-grade students (Larson, Ramahi, Conn, Estes, & Ghibellini, 2010) and activation levels in patients awaiting a diagnostic scan (Aiger, Palacín, Pifarré, Llopart, & Simó, 2016). In the context of sport, relaxation techniques such as rhythmic breathing were found to lead to benefits such as improved performance and physiological states (Pelka et al., 2017). Consequently, rhythmic breathing was a part of the intervention procedure used in this present study, which was in turn found to lead to improved golf-putting performance. However, a literature review done on the effect of various relaxation techniques in sport found biofeedback and hypnosis to be the most effective methods over a range of performance measures, whilst PMR was found to be ineffective especially in performance-oriented settings (Pelka et al., 2016). In a separate research study, PMR was found to effectively reduce cognitive and somatic anxiety in football players (Rashidi, Atash-Poor, & Badami, 2013). These findings shed new light in looking at relaxation techniques from a more individualised angle. Researchers have highlighted the possibility of the individualistic characteristics of relaxation techniques (Pelka et al., 2017). Pelka et al. (2017) suggested that relaxation techniques are highly individualised and need to be adjusted in order to suit each athlete. Moreover, despite the relaxation intervention in this study being found to be effective, there could be one technique which is more if not most effective. Future research can look into the efficacy of individual relaxation techniques as well as consider how these techniques apply to different individuals.
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With regards to Hypothesis 3c, the adoption of mastery goals was scrutinised. Participants placed in the mastery climate were found to be more liable to adopt mastery goals, indicating that the climate is able to influence the subsequent adoption of achievement goals. Results from this study confirm previous research conducted on motivational climate and achievement goals. A previous study examining the influence of perceived motivational climate on achievement goals found that a mastery climate predicted the adoption of mastery-approach and mastery-avoidance goals whilst a performance climate predicted the adoption of performance-approach and performance-avoidance goals (Wang et al., 2010). Therefore, when coaches or people in authority construct a mastery climate for athletes, athletes are more likely to adopt mastery goals, which in turn have been found to lead to adaptive outcomes such as greater enjoyment and intrinsic motivation (Jaakkola, Ntoumanis, & Liukkonen, 2016; Wang et al., 2010). However, there was a lack of performance goals adoption, with participants generally choosing to adopt mastery-approach and other goals. Regardless of the condition participants were placed in, majority of participants showed a preference for mastery approach goals. This is surprising, considering how researchers usually examine both motivational climate and achievement goal together. In particular, a mastery classroom goal structure was found to predict mastery approach and avoidance goals, whereas a performance classroom goal structure was found to predict performance approach and avoidance goals as well as mastery avoidance goals (Luo, Hogan, & Paris, 2011).

Nonetheless, these findings could be because many of the outcomes of a mastery climate take time to nurture, such as self-esteem, discipline and perseverance, leading to continued participation in sport and resulting in enjoyment as well as achievement (Eccles & Barber, 1999; Prichard & Deutsch, 2015). As the design of this study constructed a climate according to Epstein’s (1989) TARGET framework in a space of
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an hour, the short amount of time that participants were in this climate may not have been sufficient for the climate to make much of a difference. This could also be an influence of culture as Singaporean athletes were found to be more inclined to mastery goals. Wang et al. (2016) found that when compared to Korean athletes, Singaporean athletes scored higher in both mastery approach and mastery avoidance goals, signifying a greater preference for the adoption of these goals as compared to Asian counterparts.

Contrary to Hypothesis 3d, there was no significant difference in scores between both the mastery and performance climates. This can help contribute to applied work by showing that a relaxation intervention is effective no matter the environment one is placed in. Therefore, it does not matter as much if one athlete trains under a controlling coach whereas another athlete trains under an autonomy-supportive one; having a relaxation intervention to target performance anxiety can help both athletes improve their performance equally.

Therefore, the findings from this study extend current literature in showing that Singaporean athletes prefer mastery-approach goal adoption regardless of motivational climate. To better determine the effectiveness of climate construction, participants were also verbally questioned on their goals for the experiment.

6.5 Conclusion

In this third and final study, the efficacy of a brief relaxation intervention was observed through an improvement in pre- and post-test task scores, across both intervention groups. From previous studies, the use of relaxation techniques in local athletes was found to be minimal and limited to just breathing. Therefore, this brief relaxation intervention that encompasses breathing techniques, PMR and meditation
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helps to pave the way for future studies in relaxation and competition stress. Athletes who only have a short span of time can use relaxation techniques to self-regulate and relax in the face of competition anxiety. Moving forward, this study contributes to applied research in showing that athletes are able to enhance their task performance through brief but basic relaxation techniques, even in the face of a possible time constraint.

The use of the NeuroSky device in the study also contributes to the literature on how commercial-grade portable headsets are able to be utilised in the field of research. To date, the NeuroSky MindWave device has mainly been used in the fields of learning and measuring emotions (Crowley et al., 2010; Mostow et al., 2011; Yoon et al., 2013). This study extends the possibilities of utilising the NeuroSky MindWave EEG headset in the field of sport by measuring attention and meditation levels, which may result in better coping mechanisms in athletes. These headsets are not as bulky as clinical-grade EEG measurement devices and open up possibilities for future neuroscience research. This also implies that the measurement of brainwaves is no longer restricted to a laboratory setting, together with a tedious set-up. Instead, future brainwave research can utilise portable EEG devices in the field, in the face of stationary tasks.
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Chapter 7: Conclusion

Riding on the increasing emphasis on the local sports scene, this thesis aimed to understand the coping strategies used by athletes in Singapore, and also to determine the efficacy of a brief relaxation intervention in helping athletes cope with task-related anxiety. The reviewed literature revealed gaps in the usefulness of singular mental skills. Specifically, relaxation techniques and research conducted were all largely based in a Western sporting culture. Moreover, it is with caution that these findings are applied to our local context as researchers have found that culture indeed plays a role in the use of coping strategies (Laborde et al., 2012). Singapore as a multi-cultural nation also experiences the amalgamation of culture between East and West, especially in sport. For instance, Singapore is heavily influenced by Chinese coaches and athletes in the sport of table-tennis. At the same time, the swimming culture is diverse with strong influence from Australian, Chinese and local coaches as well as administrators. Therefore, despite extensive research being done on coping and the factors that affect it, less was committed to the impact of such factors from a cultural and contextual (e.g., sport) standpoint.

This present thesis began with an introduction of the need for effective coping in sports and went on to cover a literature review on the various constructs of stress, coping, achievement goals, motivational climate, relaxation interventions, as well as portable EEG measures. As an overview, this thesis consists of three related studies with the following objectives:

a) Study 1 – to explore the psychometric properties of the four-factor COPE inventory on tertiary athletes’ coping strategies in the face of sport-related stress.
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b) Study 2a – to investigate the interactions among dispositional goal orientations, motivational climate, use of coping strategies and use of performance strategies. Cluster analysis was used to obtain an in-depth understanding of how disposition and situation can influence the use of coping and performance strategies in tertiary athletes.

c) Study 2b – to attain richer and more holistic perspectives of athletes on both stressors and coping strategies through the use of semi-structured interviews.

d) Study 3 – to determine the efficacy of a brief relaxation intervention, in two different climates. Brief relaxation techniques used in the intervention involved deep breathing, progressive muscular relaxation and meditation. The effectiveness of the intervention was evaluated by examining the significant effects between pre and post-test tasks, as well as brainwave scores.

The following sections of this final chapter will first summarise key findings mentioned in the earlier chapters. Secondly, limitations of the present study will be identified and discussed. Next, some practical implications from the study will be highlighted for sport personnel to consider when planning and implementing sports programmes. Finally, future research directions will be proposed. A summary of the main findings from each individual study is presented in Table 24.

7.1 Key Findings

In Chapter 2, it was revealed that studies employing the COPE inventory were varied and may not have catered for differences in gender, ethnicity and/or age. Therefore, it was not clear if the factor structure of the COPE inventory could hold across multiple samples (Nicholls & Polman, 2007). The first study of this thesis was hence designed to address this issue. In Study 1, the psychometric properties of the
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original 60-item COPE inventory were tested in a sample of 301 tertiary athletes. Initial analyses revealed inadequate scales and three items were subsequently deleted to form the 57-item COPE inventory, which was used in later analysis. This 57-item COPE inventory was later fitted into a four-factor model and two other models, with the four-factor model being favoured due to parsimony of findings. These four factors are “problem-focused coping”, “emotion-focused coping”, “avoidance” and “social support”. In addition, the statistical concerns with some of the COPE constructs were highlighted and supported by literature. This eventual four-factor COPE inventory was subsequently used in Study 2.

In Study 2 the relationship among achievement goals, motivational climate, coping as well as performance strategies were observed using cluster analysis. Four distinct clusters were found and the cluster that used the most adaptive coping and performance strategies displayed high mastery but low performance goals in the presence of a mastery climate. Conversely, a mixture of high mastery and high performance goals in a mastery climate resulted in moderate use of adaptive coping and performance strategies, but also showed the least use of maladaptive coping and performance strategies such as negative thoughts and denial. These findings extend previous research in the field of achievement goals and shows the need to adopt both mastery-approach and performance-approach goals, where having both these goals could lead to adaptive coping strategies in athletes. Additionally, findings from the cluster analysis in Study 2a supported a more in-depth perspective of how dispositional and situational factors interact to affect how individuals cope. Specifically, the study revealed that on top of promoting adaptive coping strategies in individuals, maladaptive coping and performance strategies can be minimised through moderating the motivational climate.
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Study 2b comprised a follow-up qualitative interview session, which was conducted with twenty-two participants who participated in Study 2a. Common stressors and coping responses were collated to gain a more holistic picture of the coping process in athletes. Coping strategies noted by participants mostly fell in line with the subscales in both the COPE inventory and TOPS-2 with exceptions such as the extent of social support athletes garner from their team mates. Some examples include having team cheers or engaging in activities together. This finding shows the need for further work in refining questionnaires looking at coping responses to ensure that nothing gets left out and also extends the importance of externally validating questionnaires. Collectively, these findings are considered an important step forward in understanding the closely-knit relationship among achievement goals, motivational climate, coping and performance strategies.

In Study 3, the efficacy of a brief relaxation intervention was tested in a Performance, Mastery and neutral climate using the novel task of golf-putting. The results showed that the brief relaxation intervention was effective in improving golf-putting scores although no change was observed in Attention or Meditation brainwave scores. Interestingly, participants mentioned low usage of the relaxation technique taught to help them with the task. This could potentially be attributed to participants having just gone through the intervention and did not see a purpose in replicating it, or the retention of the relaxation techniques was low. Participants across the two constructed and neutral climates also showed a general preference for mastery goals. Therefore, mastery goal adoption occurred regardless of the climate participants were placed in, which illustrates the need for other factors to be considered when constructing a climate (Garcia, Tor, & Schiff, 2013). More studies should hence be conducted to examine how a brief relaxation intervention can influence task performance by also
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### Table 25
**Summary of Findings from Individual Studies**

<table>
<thead>
<tr>
<th>Study</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>To examine the psychometric properties of the COPE Inventory in a sample of Singaporean athletes</td>
</tr>
<tr>
<td></td>
<td>Cross Sectional Questionnaire</td>
</tr>
<tr>
<td>2a</td>
<td>To investigate the relationship among coping strategies, use of performance strategies, achievement goals and motivational climate</td>
</tr>
<tr>
<td></td>
<td>Cross Sectional Questionnaire</td>
</tr>
<tr>
<td>2b</td>
<td>To look at antecedents and responses to sport related stressors</td>
</tr>
<tr>
<td></td>
<td>Interviews</td>
</tr>
<tr>
<td>3</td>
<td>To determine the efficacy of a brief relaxation intervention for athletes with different achievement goals in different motivational climates</td>
</tr>
<tr>
<td></td>
<td>Experimental</td>
</tr>
</tbody>
</table>
7.2 Contributions of the Research

The key findings of this study have noteworthy contributions to sporting research. To understand the extent of these findings, the following four points are discussed.

(i) Refinement of the COPE inventory constructs

Previous research using CFA on the COPE inventory have produced many mixed results. Even the COPE inventory itself was first conceptualised to be 13 initial subscales, with another two added from observations (Carver et al., 1989). Over time, researchers argued that the 60-item COPE inventory could be best represented in fewer numbers of higher-order subscales (Cook & Heppner, 1997; Hasking & Oei, 2002). However, these researchers could not agree on the number of higher order subscales that should encompass the COPE inventory. Therefore, this study demonstrated that the four-factor higher-order subscale was adequate and possible for use in local athletic populations. This is in line with other researchers who have found the four-factor COPE inventory to be appropriate for use (Carver et al., 1989; Litman, 2006). Hence, the four-factor COPE inventory, which was validated in a local sample of tertiary athletes has been shown to be a viable model for future investigations on athletes’ coping processes. Specifically, the CFA conducted in this present study further refined the COPE inventory in the sample of athletes in Singapore.

(ii) Better understanding of the coping process

The cluster analysis data from Study 2a offered greater insight into the dispositional and situational characteristics of athletes. Results revealed four distinct achievement goal/motivational climate profiles, pointing to a diverse range of athletes in Singapore. Adding on to the cluster-analytic results, there are obvious differences in
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athletes’ achievement goals as well as perceived motivational climate. Specifically, the cluster patterns display interesting trends in the way achievement goals are closely linked to the motivational climate. These trends contribute to existing cluster profiles of Singaporean students in the physical education context (Wang et al., 2007) and extend these findings to the context of sport.

Further, the qualitative data of the follow-up study contribute to literature in sporting research by highlighting an in-depth understanding of athletes’ perspectives on stress and coping in their various sports as well as the importance of effective coping especially during competitions. How athletes perceived stress in sport was found to be influenced more by external factors (e.g. the type of sport they engaged in) rather than dispositional or situational factors (e.g., achievement goals and motivational climate). Subsequently, athletes’ use of coping strategies was also influenced by type of sport as well as perceived stressors. More importantly, the current research provides empirical evidence to emphasise the need for coaches and teachers – two key pillars in an athlete’s sporting journey, to actively guide athletes in coping effectively with sport-related stress. Parents were not frequently discussed although the reason may have been related to the age group of athletes being interviewed, where parents generally play more of a supporting role as athletes get older.

Overall, coaches were found to have a huge influence on the stress athletes face as well as how athletes cope with this stress. This shows that how athletes perceive stress and subsequently cope with this stress may be strongly influenced by the behaviours (or lack of behaviour) of their coaches. Taking all these together, the stress and coping process may depend less on dispositional and situational profiles but more on the sporting context as well as the unique experiences faced by athletes.
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(iii) Implementation of a relaxation intervention to cope with anxiety

The pinnacle of this study lies in the implementation of a relaxation intervention in two different motivational climates. Although research has established the effectiveness of relaxation techniques alone on sporting performance (Garza & Ford, 2009; Kudlackova et al., 2013), this present study extended these findings to include the impact of the motivational climate on the effectiveness of relaxation techniques. Surprisingly, the motivational climate was found to not have as great an impact on performance as the intervention itself and athletes in both mastery and performance climates had similar results. Also contrary to expectations, dispositional factors in the form of achievement goals did not seem to influence the effectiveness of relaxation techniques in athletes.

Nevertheless, the present study showed the need for effectively coping athletes and established the efficacy of a brief relaxation intervention. Findings also provided evidence for the education of brief relaxation techniques across athletes. This education session can be conducted by their coaches or through a sport psychologist.

(iv) Expansion to existing literature on stress and coping

All three studies contributed to the extensive literature on stress and coping in Singaporean athletes. In particular, the findings highlighted the impact of achievement goals and motivational climate on the use of resultant coping strategies by examining athletes from a cluster level. In relation to coping behaviours, the cluster analysis result revealed a greater use of performance and coping strategies in athletes high in mastery goals and low in performance goals in a mastery climate. However, athletes high in mastery goals and high in performance goals in a mastery climate were found to use the least amounts of maladaptive coping strategies.
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Other than being the most adaptive cluster profile, high mastery goals, low performance goals and a mastery climate were found to be precursors to optimal performance (Elliot & Conroy, 2005). This profile was also the most common profile of athletes in Singapore. The second most common profile was that of high mastery goals, high performance goals and a mastery climate, which as mentioned previously, was also the cluster with the least use of maladaptive strategies. However, although performance goals were high for this cluster, the performance-avoidance goal was still the lowest amongst all other goals. Once again, this extends achievement goal literature in Singapore as low performance-avoidance goals were found to be beneficial for Singaporean students (Luo et al., 2011). Nevertheless, both the aforementioned cluster profiles have their own advantages and there is no one perfect cluster. In contrast, a study on Portuguese football players found four different achievement goal clusters with one cluster high in mastery (or task) goals but low in performance (or ego) goals, one cluster low in mastery (or task) goals but high in performance (or ego) goals, and two clusters low in both goals where one cluster is much lower in mastery goals (Sarmento et al., 2018). Unlike the Portuguese athletes, Singaporean athletes did not display high performance but low mastery goals, a cluster found to exhibit negative characteristics such as high amotivation and extrinsic motivation (Sarmento et al., 2018). Taken together, these findings suggest the prevalence of adaptive achievement goal and motivational climate profiles in Singapore whilst reinforcing the importance of performance-approach goals in avoiding use of maladaptive performance and coping strategies.
7.3 Practical Implications

The three studies in this thesis have evidenced the key findings and their contributions to research. However, policy and practical considerations should not be overlooked as well. The implications of this study to Singapore’s sporting ecosystem and practice are discussed in the following three main points.

(i) For policymakers

Through Studies 2a and 2b in the present research study, stress and coping in athletes was established to be influenced by their achievement goals as well as motivational climate. In relation to the types of achievement goals and motivational climate, diverse profiles were uncovered, extending from the most adaptive to the least adaptive (or maladaptive) clusters. The cluster profiles may be rationalised by varying types of achievement goals and motivational climate in athletes. In the 2008 Sporting Culture Committee Report (MCYS, 2008), the government released a set of targets for sports in Singapore, including being a top-10 sporting nation in Asia, as well as nurturing a steady stream of world class athletes, amongst others.

Therefore, the cluster profiles from this study offer practical insights to achievement goals and motivational climates, highlighting the impact of adaptive profiles on stress and coping in athletes. Previous research in the field found having both high-mastery approach and high-performance approach goals to lead to the most adaptive behaviours (Luo et al., 2011). However, the present studies challenge these findings and show that there are four dominant clusters of achievement goals and motivational climates in sport, with the most adaptive ones being high mastery goals with a mastery climate. These empirical findings also provide information for policymakers to consider fostering more adaptive motivational climate in the sport
Despite Singapore’s sporting aspirations, Singapore came in 18th position at the recent 2018 Asian Games eight positions short of the target set for the nation a decade ago. Nevertheless, the government is in a key position to influence the sporting ecosystem and are paying close attention to what they have achieved and what more they can achieve. After Joseph Schooling won Singapore’s first Olympic gold medal at the 2016 Rio Olympic Games, Minister for Culture, Community and Youth, Grace Fu said that the government is pumping an additional $100 million to ensure the nation continues producing champions (Tan, 2017). Therefore, there is a call for progression in our sports ecosystem to produce champions. However, sport competitions often bring with them stressful situations, which are further accompanied by changes in psychological functioning like impaired concentration, a loss of attention focus, a heightening of the anxiety state or even an increase in muscle tension (Hanton, Neil, & Mellalieu, 2008). Moreover, a failure to make an adequate response to stress frequently leads to a reduced capacity for performance or even withdrawal from sports. Therefore, it is evident that athletes participating in competitive sports need to use psychological abilities and effective coping strategies in order to meet their expectations and improve their performance (Márquez, 2006; Nicholls & Polman, 2007). It is insufficient for Singapore to merely pump in more money in the bid to produce champs, investments in the support system surrounding athletes have to be considered as well.

According to the most adaptive cluster, athletes who have high mastery goals in a mastery climate tend to cope more readily with stress. For athletes to have high mastery goals, a mastery climate is essential and can influence the subsequent adoption
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of mastery goals (Granero-Gallegos et al., 2017). In turn, a mastery climate is constructed by the coach but can also be driven by policymakers such as the National Sports Associations (NSAs) as well as sporting organisations like Sport Singapore and the National Youth Sports Institute. Hence, such empirical findings guide the need for a paradigm shift in the sport ecosystem advancing from focusing only on bringing home medals to an optimal and progressive future in sporting achievements.

To achieve the national vision for Singapore sports, the government may consider implementing educational workshops for coaches nation-wide. Specifically, these educational workshops will highlight how the motivational climate constructed by the coach is able to influence athletes’ achievement goals, which can in turn enable athletes to cope effectively with stress in their sport. Following this, policymakers can enforce the implementation of such climates through guidelines and best practices.

(ii) For Coaches

Coaches play an extremely influential role in the sporting experience of athletes. The coach-athlete relationship has been found to affect athletes’ motivation in sport where athletes who feel higher levels of closeness, commitment and complementarity with their coach also perceived higher role sharing and cooperation with teammates as well as sport related improvement (Avci, Çepikkurt, & Kale, 2018). Additionally, from the qualitative portion of this research study, athletes emphasised the impact of their coaches’ behaviours on both their stress appraisal and coping process. This is due to the close interaction between coaches and athletes. Coaches should be more mindful of the climate they create for athletes so that athletes can in turn cope effectively with stress in sport and perform optimally.
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From the evidence of adaptive cluster profiles, coaches should help to promote both high-mastery and high-performance approach goals, instead of valuing one over the other. This can be done by constructing a training climate that helps promote the adoption of approach goals. Another way could be to guide athletes in setting both mastery-approach and performance-approach goals throughout the season, placing more emphasis on performance-approach goals at the start of the season and focusing more on mastery-approach goals nearer to competitions.

In a similar vein, coaches can also guide athletes in setting realistic and achievable goals. The qualitative portion in Study 2b revealed that a huge source of stress for athletes occurred when they placed overly high expectations on themselves. This, in turn, affected their eventual performance. Therefore, coaches can set pre-season goals together with athletes (if not already doing so), and ensure the eventual goals set are high but not overwhelming. These goals can also be set with the help of a sport psychologist, which will be elaborated in the section below. Another common source of stress for athletes was also in their mind, and took the form of negative thoughts. The fact that many athletes’ first response to a stressor is a negative thought, shows the extent of negativity in Singapore’s sporting culture, which could be influenced by the general culture here. Therefore, there is a need for a long-term process where coaches especially, change the coaching climate into a more positive one that allows for mistakes to be made and for athletes to know that they can learn from these mistakes. Coaches can instil a more positive training climate for athletes by shifting the focus away from the need to perform well and instead on the processes required to perform well.

(iii) For Sport Psychologist
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The findings of the present study can guide strategies for planning intervention programmes in the field of sport psychology. Competition anxiety is a very common scenario across sports and the findings from this study extend previous research in the field of mental skills proving the effectiveness of relaxation techniques in enhancing sports performance (Thelwell & Greenlees, 2001; Williams & Harris, 2006).

Study 2b provided evidence that athletes in Singapore tend to cause themselves stress by placing high expectations on themselves. Findings also revealed the extent of negativity in athletes where negative thoughts were commonly experienced as threat appraisals. Negative thoughts have been found to play a pivotal role in predicting an athlete’s stress-burnout relationship and it is hence imperative for practitioners to take steps in ensuring athletes’ motivation as well as psychological well-being (Chang et al., 2017). Taking these together, a long-term MST can be structured, where sport psychologists, with the help of coaches, can help athletes to manage their expectations or restructure their thoughts. MST is commonly used by athletes and the advantages of MST in enabling athletes to deal with anxiety or concentration issues by developing mental skills have long been established in literature (Weinberg & Williams, 2006). Hence, an eight week-long MST can be implemented with the first week focusing on goal-setting. These goals being set in conjunction with the coach are to be achievable and help provide athletes with a direction as well as a destination. Athletes can also manage their expectations through this goal setting process. The next three weeks will focus on managing stress using the relaxation techniques taught in Study 3. Subsequently, the next three weeks can focus on restructuring the thought process. This would involve getting athletes to be more aware of their thoughts and differentiating them into positive and negative ones. Upon appraisal of stress, athletes’ self-talk tend to be negative and being aware of their negative self-talk is the first step for athletes to
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reframe their thinking into something more positive. Finally, the last week can be used to review the MST programme and its impact on athletes’ performance.

However, there is also value in having a brief MST programme. Findings from the third study provide evidence that a short session of relaxation can be used by practitioners to guide athletes in enhancing their competition performance. A similar study looking at the effectiveness of a brief 30 minutes mindfulness intervention, which also used golf-putting as an objective task, found the intervention group to display more successful performance over time (Perry, Ross, Weinstock, & Weaver, 2017).

Therefore, there appears to be performance-related benefits in the use of brief relaxation interventions. As there is little time in-between sets or before competition, athletes often do not have the luxury of going through an entire relaxation session of progressive muscular relaxation, meditation or deep breathing. Therefore, it is possible that sport psychologists can now prescribe a brief 15 minutes relaxation session for athletes to quickly go through before their competitions, to help alleviate their competition anxiety.

It is worth noting that dispositional achievement goals did not contribute to significant improvements in task scores. Hence, the brief relaxation intervention can be applied across athletes and sports. One drawback of a brief MST over a longer MST programme is the inability of reviewing the intervention or being unable to have more than one focus. However, there appears to be an appropriate time for each form of MST in sport. During pre-season, a longer MST programme might be more appropriate due to the luxury of time to introduce a skill, apply it and review the whole process. However, leading up to competitions, brief MST programmes can be implemented to prepare athletes for the brief use of mental skills in-between sets or right before competition.

In light of the aforementioned key findings, contributions and implications, the present study offered a more in depth understanding of athletes in Singapore by
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exploring their stressors and resultant coping strategies. It is evident that a lot of stress athletes face in their sport today arise from within themselves, as well as those close to them in their sport such as their coaches. However, there are still some limitations in this study, which will now be discussed briefly.

7.4 Limitations and Direction for Future Research

Although the present study displayed some noteworthy findings, there are still limitations. These shall be discussed from the viewpoint of each study and are followed by recommendations for future research.

First, from Study 1, fit statistics for the four-factor COPE inventory were adequate but not the best when compared to other studies. However, different studies have had diverse findings for the COPE inventory and researchers have yet to reach a conclusive viewpoint on this instrument (Lyne & Roger, 2000; Zuckerman & Gagne, 2003). Researchers have also argued for a higher-order factor version of the COPE inventory (Cook & Heppner, 1997), which is not surprising given that the original COPE inventory consists of 15 factors. Given that there is no perfect measure, the lower internal reliability measures of the revised four-factor COPE inventory indicate potential for further improving the measure. Since culture may shape the environment athletes are nurtured in, which would in turn influence the way they perceive and respond to stressors, there is a need to examine the way athletes cope in different societies to ensure it is applicable in the current context. Moreover, validated coping scales such as the COPE inventory were proven to have weak internal validity across samples (Donoghue, 2004). Nevertheless, despite the COPE inventory being seemingly problematic, it is widely used in empirical studies to look at how athletes cope with stress in sports (Ntoumanis & Biddle, 2000; Pensgaard, Roberts, & Ursin, 1999). Future
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Research could involve refining the wording of items or deleting certain subscales from the inventory due to inapplicability. The revised COPE inventory could also be administered across different age groups, beyond just the tertiary level, to ensure generalisability of the measure.

Secondly, Study 2a involved just the use of self-reported questionnaires, which limited data to that of athletes’ perceptions. However, factorial validity of these self-report instruments was not examined as part of the preliminary analyses in Study 2a. Future research should examine factorial validity of all self-report instruments to determine their suitability with the sample.

The methodology used in conducting the cluster analysis in Study 2a can be improved in future research. The present study conducted a cluster analysis on both achievement goals and motivational climate before running a MANOVA with the four resultant clusters on the dependent variables. However, this is not ideal as the interaction effect of achievement goal orientation and perceived motivational climate on dependant variables could not be examined. Future studies should assess the interaction effects of independent variables on dependent variables by conducting a cluster analysis on all variables together.

Qualitative interviews in Study 2b uncovered additional coping mechanisms not covered in the coping scales used. In terms of future direction, researchers have agreed that the coping process as well as factors affecting it should be studied in greater detail (Nicholls et al., 2010; Nicholls, Taylor, Carroll, & Perry, 2016). This reinforces the limitation of self-reported data and highlights the need for triangulation of data to verify accuracy of data collected.
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From Study 2, we have observed how dispositional and situational factors are able to affect an athlete’s use of coping and performance strategies. We have also established how culture can influence the use of coping and performance strategies. However, other factors have been found to be able to affect coping strategies in athletes. Two of these factors are gender and sport, where Polish women shooters were found to engage in more behavioural and cognitive forms of coping mechanisms than men (Litwic-Kaminska, 2010). It would be interesting for future research to look deeper into how sport and gender effects may possibly affect the use of coping strategies in local athletes.

Finally, in the third study, the construction of the mastery and performance climates could be improved in future research. As participants were randomly grouped into the three conditions of mastery-inducing, performance-inducing and control, some of the groups were made up of friends whilst others comprised entirely of strangers. Throughout the course of the experiment, it was observed that some participants in the mastery-inducing climate held strong performance goals, which could be due to them being grouped together with their friends. On the other hand, certain participants in the performance-inducing climate became less competitive early on as they were losing, possible because they did not know anyone else in the group and felt they had nothing to lose. These findings parallel previous research, which has found that individuals tend to be more competitive when targets are interpersonally close as in the case of friends (Garcia, et al., 2013). Therefore, not controlling the social aspect of competitions could have led to a slight shift in achievement goals, which affected the experimental design. Future studies should also take into consideration social aspects when designing a competition environment.
In fact, the construction of all three conditions were found to have room for improvement based on anxiety scores. Only the mastery condition showed a significant decrease in anxiety levels at the end of the experiment, but there was no significant difference in anxiety scores across all three conditions. This could be due to a lack of sufficient measures of anxiety through the experiment. Anxiety levels of participants should have been measured up to four times (after practice trials, after condition allocation, after intervention and after the actual trial) but was instead only measured twice in this experiment. Future studies would need to take into closer scrutiny the number of measures required to determine the appropriateness of the study design.

Another limitation was the inability of the motivational climate to influence the adoption of corresponding achievement goals. Despite literature finding that a mastery climate is able to influence the adoption of mastery goals whilst a performance climate is able to influence the adoption of performance goals (Duda, 2005), that was not found to be so in the present study. However, the design of this study constructed a climate according to Epstein’s (1989) TARGET framework in a space of an hour. Hence, the short amount of time that participants were in this climate may not have been sufficient for the climate to make much of a difference. Future studies could consider having a longer intervention period to allow sufficient time for climate creation. Another limitation was in the study design, where four participants were required to be present in each group. There were times that just two or three participants were present and a fourth participant had to be sought. Nevertheless, as the study took place in the Physical Education and Sport Science department of the National Institute of Education, Singapore, it was not difficult to find a willing fourth participant who fit the inclusion criteria.
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Some of the brainwave data collected during the third study was lost due to technical glitches from the third-party application used. This affected the results obtained as missing data is able to reduce the statistical power of a study, and can produce biased estimates, hence affecting the conclusion drawn (Kang, 2013). Nevertheless, missing data is common across all forms of research. Data lost through an equipment failure or samples lost in transit are classified as Missing Completely at Random (MCAR; Kang, 2013). Such data has a loss in power, but estimated parameters remain unbiased by the absence of the data. Moreover, sometimes it might be difficult to pair a headset with a phone for data recording as the signal might be lost. This resulted in a lot of time being wasted on trying to reconnect the various devices. Future research using the NeuroSky device should hence proceed with caution especially in extracting the necessary data, due to a slight tendency for data loss and inability to detect signal whilst using outdated and unreliable applications.

In summary, the findings from this study suggest that athletes’ stress and coping behaviours can be influenced by their achievement goals and motivational climate. In addition, a brief relaxation intervention can enable athletes to cope effectively with sport-related stress and improve their performance. Nevertheless, there are still some limitations present in the study. To overcome these limitations, it is imperative for future research to consider the recommendations above to further assess the efficacy of intervention and determine the generalization of these findings.

7.5 Conclusion

The three integrative studies from this thesis have provided a greater insight into the coping process of athletes in Singapore. This research study has extended present literature in the field of coping to examine the intra-individual differences in goals and
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the motivational climate athletes are in. How these differences affect athletes’ in their use of coping and performance strategies were also investigated. In addition, common stressors and coping strategies of tertiary athletes in Singapore were identified and categorised. By identifying stressors and coping strategies of Singaporean athletes, coaches and sport scientists can help to navigate the coping process whilst ensuring that these athletes utilise effective coping strategies. Finally, the efficacy of a brief relaxation intervention paves the way for future research looking at the effectiveness and applicability of brief intervention programs. These findings can help sport psychologists and practitioners in designing psychological intervention programmes to enhance athletes’ performance especially in the face of competition stress and anxiety.

This study also specifically examined the coping processes of athletes in Singapore. It does not claim to be a comprehensive study in terms of stress and coping in athletes, without considering the athlete demographic, sport ecosystem and culture. Therefore, the findings from this study should not be generalized to different age bands of athletes with different experiences. Nevertheless, the findings from the present study offer useful insight to those involved in the sport ecosystem. Researchers may consider the issues and limitations above to improve future interventions and enhance sporting performance whereas practitioners such as sport psychologists maybe gain some practical insight into the use of the skill of relaxation in order to better develop their repertoire of skills to help athletes. As the sporting scene in Singapore receives greater scrutiny and attention, especially after Singapore’s first Olympic gold medal in the sport of swimming at the 2016 Rio Olympic Games, greater expectations are increasingly being placed on individual athletes and the local sports performance on the whole. Therefore, to enhance local sporting standards, it is imperative to continue studies evaluating the coping process of athletes, which is arguably just as important as the
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technical training process for each sport. In this way, we can cultivate a more holistic and dynamic environment that will hopefully help Singapore hit her decade-old goal of being a top-10 sporting nation in Asia with a steady stream of champions.
References


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Appendix A

IRB Approval for PhD Study

Research Support Office

IRB-2016-03-015

03 May 2016

Professor Wang Chee Keng, John
National Institute of Education

NTU INSTITUTIONAL REVIEW BOARD APPROVAL
Project Title: Examining Coping Strategies, and the Effectiveness of a Coping Intervention on Athletes

I refer to your application for ethics approval with respect to the above project.

The Board has deliberated on your application and noted from your application that your research involves collecting behavioral data from participants using interview and questionnaires.

You have also confirmed that informed consent will be obtained from the participants and you have guaranteed the confidentiality of your participants' biodata obtained from them.

The documents reviewed are:

a) NTU IRB application form dated 10 March 2016
b) Participant information sheet and consent form: version 1 dated 10 March 2016
c) Data collection form: version 1 dated 10 March 2016

The Board is therefore satisfied with the bioethiclal consideration for the project and approves the ethics application under Expedited review. The approval period is from 03 May 2016 to 15 December 2017. The NTU IRB reference number for this study is IRB-2016-03-015. Please use this reference number for all future correspondence.

The following protocol and compliances are to be observed upon NTU IRB approval

1. All research involving procedures greater than minimal risk on minors (individuals who are less than the legal age of 21 years old) requires IRB approved written Parental Consent and assent from the participant to be obtained before any research protocols can be administered. Minimal risk refers to an anticipated level of harm and discomfort that is no greater than that ordinarily encountered in daily life, or during the performance of routine educational, physical, or psychological examination.

2. Only the approved Participants Information Sheet and Consent Form should be used. It must be signed by each subject prior to initiation of any protocol procedures. In addition, each subject should be given a copy of the signed consent form.
COPING STRATEGIES OF TERTIARY ATHLETES IN SINGAPORE: THE INFLUENCE OF ACHIEVEMENT GOALS, MOTIVATIONAL CLIMATE AND A BRIEF RELAXATION INTERVENTION

Research Support Office

3. Consent forms are important documents therefore they should be stored in the strictest arrangement. Loss of consent form would result in disciplinary action.

4. No deviation from, or changes of, the protocol should be initiated without prior written NTU IRB approval of an appropriate amendment.

5. The Principal Investigator should report promptly to NTU IRB regarding:
   a. Deviation from, or changes to the protocol.
   b. Changes increasing the risk to the subjects and/or affecting significantly the conduct of the trial.
   c. All serious adverse events (SAEs) which are both serious and unexpected.
   d. New information that may affect adversely the safety of the subjects of the conduct of the trial.
   e. Completion of the study.

6. Continuing Review Request/ Notice of Study completion form should be submitted to NTU IRB for the following:
   a. Annual review: Status of the study should be reported to the NTU IRB at least annually using the Continuing Review Request/ Notice of Study completion form.
   b. Study completion or termination: Continuing Review Request/ Notice of Study completion form is to be submitted within 4 to 6 weeks of study completion or termination.

7. All Principal Investigators should comply with existing legislation that would have an impact on the domain of their research.

Professor Lee Sing Kong,
Chair, NTU Institutional Review Board
encl.

cc Director, National Institute of Education
Members, NTU Institutional Review Board
Appendix B

Informed Consent for Study 1

PHYSICAL EDUCATION AND SPORTS SCIENCE
NATIONAL INSTITUTE OF EDUCATION
NANYANG TECHNOLOGICAL UNIVERSITY

Participant Information and Informed Consent

Study Title: Examining Coping Strategies, and the Effectiveness of a Brief Intervention on Athletes

Introduction:
As the significance of sport in Singapore increases, a greater emphasis is correspondingly placed on sporting performance, as well as the different aspects of performance. One of these aspects—coping has been relatively under-looked over the years. Therefore, the present study aims to 1) identify and observe trends in the coping strategies of athletes in Singapore, and also 2) investigate the effectiveness of a brief intervention tailored to athletes’ goal and motivational profiles. The findings from this study can help advance the field of coping research in Singapore, and also contribute to the design of future coping interventions for more effective coping in athletes. A comprehensive coping profile of athletes who participate in this study will also be obtained and shared.

Your Involvement:
You will be required to complete a questionnaire on your use of coping strategies in sport. The estimated duration to complete the questionnaire is 10 minutes.

There are no right or wrong answers to the questions in the questionnaire. You are to read the questions carefully and select the extent to which you agree with it.

Risks and Discomforts:
None.
COPING STRATEGIES OF TERTIARY ATHLETES IN SINGAPORE: THE INFLUENCE OF ACHIEVEMENT GOALS, MOTIVATIONAL CLIMATE AND A BRIEF RELAXATION INTERVENTION

Medical Clearance:

Not applicable.

Expected Value of Results:

The findings from this study will provide athletes and coaches with a better perspective of athletes’ use of coping strategies in sport. By identifying the use of effective/ineffective coping strategies, coaches and athletes can now work towards the utilisation of more effective coping strategies to achieve better sporting performance.

Further Information:

If you would like to discuss any details of this study further, please contact my supervisor, Prof John Wang at 6790 3687.

Member/s of the Study:

1. Ms Shermaine Lou
Study Title: Examining Coping Strategies, and the Effectiveness of a Brief Intervention on Athletes

1. I have read and understood the details of the study and give my voluntary consent to participate in this study, the particulars of which have been explained to me and are attached.

2. I understand that I may withdraw from the study at any time without reason or fear of redress.

3. I have been informed that the information obtained from me in this study is confidential and that participants’ names will not be identified at any point of time.

Name of participant: __________________________________________
Signature of participant: _______________________________________
Date: __________________________________

For participants below the age of 18

Name of parent/guardian*: _______________________________________
Signature of parent/guardian*: __________________________________
Date: __________________________________

(* Please delete accordingly)
Appendix C
Interview Guide

a) Introduction (3 minutes)
   - Introduction of Interviewer
   - Introduction to research study and study aims

b) Explaining Study Procedures (3 minutes)
   - Assurance of confidentiality on data obtained
   - Rights to withdraw from study
   - Informed consent on videotaping interview sessions

c) Building Rapport (5 minutes)
   - Starter questions to help participants feel more at ease

d) Main Areas of Inquiry (20 minutes)
   - Identify antecedents of stress
   - In depth exploration of coping strategies used in various stressful situations
   - Identify reasons behind the use of these coping strategies
   - Any other relevant insights
a) Introduction

Good morning/ afternoon (name of participant), my name is Shermaine and I will be the one conducting the interview with you today.

First of all, I would like to thank you for taking the time to participate in this interview.

The purpose of this interview is to better understand the coping process of athletes in Singapore. My purpose today will be to find out from you what triggers the use of coping strategies, and how do you cope with these triggers.

b) Explaining Study Procedures

Before we begin, I would like to inform you that there are no right or wrong responses for this interview, and I do seek your honest opinion. If you have any questions at any point of time, feel free to stop me and clarify your question.

I would also like to assure you that all the information we collect from this session will be kept confidential. You are allowed to withdraw from this interview at any point of time, without reason and there will be no repercussions whatsoever. Lastly, I would need to record this interview so that I am able to transcribe it later for analysis purposes. Is that alright with you?

Do you have any questions before we proceed? (pause)

c) Building Rapport

I would like to start off with some questions related to your sport involvement:

What made you decide to try out (your sport)?

What are some of the things you enjoy about (your sport)?

d) Main Areas of Inquiry

Alright, we have now come to the main segment of this interview session. Here, we will explore some of the factors, which lead to impaired performance in sport, and
COPING STRATEGIES OF TERTIARY ATHLETES IN SINGAPORE: THE INFLUENCE OF ACHIEVEMENT GOALS, MOTIVATIONAL CLIMATE AND A BRIEF RELAXATION INTERVENTION

also your use of coping strategies in response to these factors. Do you have any questions so far? Let’s begin.

Antecedents of stress:

- Can you describe some instances in your sport where you felt stressed or anxious, and it affected your subsequent performance? You don’t have to describe all of them, just some of the instances that affected you more.

Probe:

- *It could be during a competition, where you missed a shot, and you kept thinking about it afterwards.*
- *How was your performance affected?*
  - How did you feel during these situations? Can you describe your thought process?

Use of coping strategies:

- Now, can you think of what you did in response to these stressful situations?

Reasons behind use of coping strategies:

- Why did you do (coping strategies used)?

Further Insights:

- How did your response make you feel?

- Do you think your coping strategies were effective/ineffective?

- Why/why not?
COPING STRATEGIES OF TERTIARY ATHLETES IN SINGAPORE: THE INFLUENCE OF ACHIEVEMENT GOALS, MOTIVATIONAL CLIMATE AND A BRIEF RELAXATION INTERVENTION

Appendix D
COPE Inventory

PHYSICAL EDUCATION AND SPORTS SCIENCE
NATIONAL INSTITUTE OF EDUCATION
NANYANG TECHNOLOGICAL UNIVERSITY

This questionnaire asks you to indicate what you generally do and feel, when you experience stressful events. Think about what you usually do when you are under a lot of stress in your sport. Then respond to each of the following items by circling one number, which best represents your opinions. Please try to respond to each item separately in your mind. Please answer every item. There are no "right" or "wrong" answers, so choose the most accurate answer for YOU--not what you think "most people" would say or do. Indicate what YOU usually would do.

<table>
<thead>
<tr>
<th>Coping Strategies</th>
<th>I usually don’t do this at all</th>
<th>I usually do this a lot</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I try to grow as a person as a result of the experience.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>2. I turn to work or other substitute activities to take my mind off things.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>3. I get upset and let my emotions out.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>4. I try to get advice from someone about what to do.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>5. I concentrate my efforts on doing something about it.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>6. I say to myself, “this isn’t real.”</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>7. I put my trust in God.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>8. I laugh about the situation.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
</tbody>
</table>

Name: ____________________________  School: ____________________________
Gender: * Male/ Female  Number of years playing sport: ______
Race: ____________________________  Highest level achieved:______________

*Please circle where appropriate
<table>
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<tr>
<th>COPING STRATEGIES OF TERTIARY ATHLETES IN SINGAPORE: THE INFLUENCE OF ACHIEVEMENT GOALS, MOTIVATIONAL CLIMATE AND A BRIEF RELAXATION INTERVENTION</th>
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<tbody>
<tr>
<td>9. I admit to myself that I can’t deal with it and quit trying.</td>
</tr>
<tr>
<td>10. I restrain myself from doing anything too quickly.</td>
</tr>
<tr>
<td>11. I discuss my feelings with someone.</td>
</tr>
<tr>
<td>12. I use alcohol or drugs to make myself feel better.</td>
</tr>
<tr>
<td>13. I get used to the idea that it happened.</td>
</tr>
<tr>
<td>14. I talk to someone to find out more about the situation.</td>
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<tr>
<td>15. I keep myself from getting distracted by other thoughts and activities.</td>
</tr>
<tr>
<td>16. I daydream about things other than this.</td>
</tr>
<tr>
<td>17. I get upset and am really aware of it.</td>
</tr>
<tr>
<td>18. I seek God’s help.</td>
</tr>
<tr>
<td>19. I make a plan of action.</td>
</tr>
<tr>
<td>20. I make jokes about it.</td>
</tr>
<tr>
<td>21. I accept that this has happened and that it can’t be changed.</td>
</tr>
<tr>
<td>22. I hold off doing anything about it until the situation permits.</td>
</tr>
<tr>
<td>23. I try to get emotional support from friends or relatives.</td>
</tr>
<tr>
<td>24. I just give up trying to reach my goal.</td>
</tr>
<tr>
<td>25. I take additional action to try to get rid of the problem.</td>
</tr>
<tr>
<td>26. I try to lose myself for a while by drinking alcohol or taking drugs.</td>
</tr>
<tr>
<td>27. I refuse to believe that it has happened.</td>
</tr>
<tr>
<td>28. I let my feelings out.</td>
</tr>
</tbody>
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COPING STRATEGIES OF TERTIARY ATHLETES IN SINGAPORE: THE INFLUENCE OF ACHIEVEMENT GOALS, MOTIVATIONAL CLIMATE AND A BRIEF RELAXATION INTERVENTION

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<tbody>
<tr>
<td>29.</td>
<td>I try to see if in a different light, to make it seem more positive.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>30.</td>
<td>I talk to someone who could do something more concrete about the problem.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>31.</td>
<td>I sleep more than usual.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>32.</td>
<td>I try to come up with a strategy about what to do.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>33.</td>
<td>I focus on dealing with this problem, and if necessary let other things slide a little.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>34.</td>
<td>I get sympathy and understanding from someone.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>35.</td>
<td>I drink alcohol and take drugs, in order to think about it less.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>36.</td>
<td>I kid around about it.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>37.</td>
<td>I give up the attempt to get what I want.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>38.</td>
<td>I look for something good in what is happening.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>39.</td>
<td>I think about how I might best handle the problem.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
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<tr>
<td>40.</td>
<td>I pretend that it hasn’t really happened.</td>
<td>1</td>
<td>2</td>
<td>3</td>
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</tr>
<tr>
<td>41.</td>
<td>I make sure not to make matters worse by acting too soon.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>42.</td>
<td>I try hard to prevent other things from interfering with my efforts at dealing with this.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
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<td>43.</td>
<td>I go to movies or watch TV, to think about it less.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
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<tr>
<td>44.</td>
<td>I accept the reality of the fact that it happened.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
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<tr>
<td>45.</td>
<td>I ask people who have had similar experiences what they did.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>46.</td>
<td>I feel a lot of emotional distress and I find myself expressing those feelings a lot.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
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<tr>
<td>47.</td>
<td>I take direct action to get around the problem.</td>
<td>1</td>
<td>2</td>
<td>3</td>
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<tr>
<td>48.</td>
<td>I try to find comfort in my religion.</td>
<td>1</td>
<td>2</td>
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<td>49.</td>
<td>I force myself to wait for the right time to do something.</td>
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<td>50.</td>
<td>I make fun of the situation.</td>
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<td>51.</td>
<td>I reduce the amount of effort I’m putting into solving the problem.</td>
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<td>52.</td>
<td>I talk to someone about how I feel.</td>
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<tr>
<td>53.</td>
<td>I use alcohol or drugs to help me get through it.</td>
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<td>54.</td>
<td>I learn to live with it.</td>
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<td>55.</td>
<td>I put aside other activities in order to concentrate on this.</td>
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<td>56.</td>
<td>I think hard about what steps to take.</td>
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<td>57.</td>
<td>I act as though it hasn’t even happened.</td>
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<tr>
<td>58.</td>
<td>I do what has to be done, one step at a time.</td>
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<td>59.</td>
<td>I learn something from the experience.</td>
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<tr>
<td>60.</td>
<td>I pray more than usual.</td>
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</table>
COPING STRATEGIES OF TERTIARY ATHLETES IN SINGAPORE: THE INFLUENCE OF ACHIEVEMENT GOALS, MOTIVATIONAL CLIMATE AND A BRIEF RELAXATION INTERVENTION

Appendix E

Test of Performance Strategies-2 Scale

PHYSICAL EDUCATION AND SPORTS SCIENCE
NATIONAL INSTITUTE OF EDUCATION
NANYANG TECHNOLOGICAL UNIVERSITY

| Name: ______________________________ | Sport: ______________________________ |
| School: ___________________________ | Number of years playing sport: ______ |
| Gender: * Male/ Female | Highest level achieved:______________ |
| Race: _____________________________ | |

*Please circle where appropriate

Please answer the following questions. There is no right or wrong answer, and we are just seeking your honest opinion. Please circle the number, which corresponds best to how you feel.

**Performance Strategies**

<table>
<thead>
<tr>
<th></th>
<th>Never</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
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<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>I set very specific goals for competition.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>2.</td>
<td>During competition, I don’t think about performing much- I just let it happen.</td>
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<tr>
<td>3.</td>
<td>My emotions get out of control under the pressure of competition.</td>
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<tr>
<td>4.</td>
<td>I rehearse my performance in my mind at competitions.</td>
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<tr>
<td>5.</td>
<td>I do what needs to be done to get psyched up for competitions.</td>
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<tr>
<td>6.</td>
<td>I say things to myself to help my competitive performance.</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>7.</td>
<td>I am able to relax if I get too nervous at a competition.</td>
<td></td>
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<td></td>
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<tr>
<td>8.</td>
<td>My self-talk during competition is negative.</td>
<td></td>
<td></td>
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<tr>
<td>9.</td>
<td>I set personal performance goal for a competition.</td>
<td></td>
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</tr>
</tbody>
</table>

262
## COPING STRATEGIES OF TERTIARY ATHLETES IN SINGAPORE: THE INFLUENCE OF ACHIEVEMENT GOALS, MOTIVATIONAL CLIMATE AND A BRIEF RELAXATION INTERVENTION

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
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<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.</td>
<td>During competition, I perform on ‘automatic pilot’.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>11.</td>
<td>When something upsets me during a competition, my performance suffers.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
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<tr>
<td>12.</td>
<td>I imagine my competitive routine before I do it at a competition.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>13.</td>
<td>I psych myself up at competitions to get ready to perform.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>14.</td>
<td>I manage my self-talk effectively during competition.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>15.</td>
<td>When I need to, I can relax myself at competitions to get ready to perform.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>16.</td>
<td>I keep my thoughts positive during competitions.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>17.</td>
<td>During competition I set specific result goals for myself.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>18.</td>
<td>During competition, I play instinctively with little conscious effort.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>19.</td>
<td>When I make a mistake in competition, I have trouble getting my concentration back on track.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>20.</td>
<td>At competitions, I rehearse the feel of my performance in my imagination.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>21.</td>
<td>I can increase my energy to just the right level for competitions.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>22.</td>
<td>I have specific cue words or phrases that I say to myself to help my performance during competition.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>23.</td>
<td>When pressure is on at competitions, I know how to relax.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>24.</td>
<td>During competition I have thoughts of failure.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>25.</td>
<td>I evaluate whether I achieve my competition goals.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
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<td>6</td>
<td>7</td>
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<tr>
<td>26.</td>
<td>I perform at competitions without consciously thinking about it.</td>
<td>1</td>
<td>2</td>
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<td>5</td>
<td>6</td>
<td>7</td>
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<td></td>
<td>Question</td>
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</tr>
<tr>
<td>27.</td>
<td>I visualize my competition going exactly the way I want.</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>28.</td>
<td>I can raise my energy level at competitions when necessary.</td>
<td></td>
<td></td>
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<tr>
<td>29.</td>
<td>I talk positively to myself to get the most out of competitions.</td>
<td></td>
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<tr>
<td>30.</td>
<td>I find it difficult to relax when I am too tense at competitions.</td>
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<tr>
<td>31.</td>
<td>I imagine screwing up during a competition.</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>32.</td>
<td>My emotions keep me from performing my best at competitions.</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>
Appendix F

Achievement Goal in Sport Scale

PHYSICAL EDUCATION AND SPORTS SCIENCE
NATIONAL INSTITUTE OF EDUCATION
NANYANG TECHNOLOGICAL UNIVERSITY

Name: ____________________________  Sport: ____________________________
School: ____________________________  Number of years playing sport: ______
Gender: * Male/ Female  Highest level achieved: _____________
Race: ____________________________
*Please circle where appropriate

Please answer the following questions. There is no right or wrong answer, and we are just seeking your honest opinion. Please circle the number, which corresponds best to how you feel.

<table>
<thead>
<tr>
<th>Achievement Goals</th>
<th>Strongly Disagree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. It is important for me to perform better than others.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>2. I worry that I may not perform as well as I possibly can.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>3. It is important to me to perform as well as I possibly can.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>4. I just want to avoid performing worse than others.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>5. It is important for me to do well compared to others.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>6. Sometimes I’m afraid that I may not perform as well as I’d like.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>7. I want to perform as well as it is possible for me to perform.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>8. My goal is to avoid performing worse than everyone else.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>9. My goal is to do better than most other players.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>10. I’m often concerned that I may not perform as well as I can.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>11. It is important for me to master all aspects of my performance.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>12. It is important for me to avoid being one of the worst performers in the group.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
</tbody>
</table>
COPING STRATEGIES OF TERTIARY ATHLETES IN SINGAPORE: THE INFLUENCE OF ACHIEVEMENT GOALS, MOTIVATIONAL CLIMATE AND A BRIEF RELAXATION INTERVENTION

Appendix G
Motivational Climate in Youth Sport Scale

PHYSICAL EDUCATION AND SPORTS SCIENCE
NATIONAL INSTITUTE OF EDUCATION
NANYANG TECHNOLOGICAL UNIVERSITY

| Name: __________________________ | Sport: __________________________ |
| School: __________________________ | Number of years playing sport: ______ |
| Gender: * Male/ Female | Highest level achieved:_____________ |
| Race: __________________________ | |

*Please circle where appropriate

This questionnaire provides some statements describing a sports team. Please read each one and circle the number, which best represents how you feel about your team. If there is more than one coach on your team, the questions are about the coach you spend the most time with. Please answer every item. There are no "right" or "wrong" answers, so choose the most accurate answer for YOU—not what you think "most people" would say or do. Indicate what YOU usually would do.

<table>
<thead>
<tr>
<th>Motivational Climate</th>
<th>Not at all true</th>
<th>Very True</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Winning games was the most important thing for the coach.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>2. The coach made players feel good when they improved a skill.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>3. The coach spent less time with the players who weren’t as good.</td>
<td>1 2 3 4 5 6 7</td>
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</tr>
<tr>
<td>4. The coach encouraged us to learn new skills.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>5. The coach told us which players on the team were the best.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>6. The coach told players to help each other get better.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>7. The coach told us that trying our best was the most important thing.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>8. The coach paid most attention to the best players.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>9. Coach said that teammates should help each other improve their skills.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>10. Players were taken out of games if they made a mistake.</td>
<td>1 2 3 4 5 6 7</td>
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</table>
COPING STRATEGIES OF TERTIARY ATHLETES IN SINGAPORE: THE INFLUENCE OF ACHIEVEMENT GOALS, MOTIVATIONAL CLIMATE AND A BRIEF RELAXATION INTERVENTION

11. The coach said that all of us were important to the team’s success.

12. Coach told us to try to be better than our teammates.
Appendix H

Competitive State Anxiety Inventory-2 and Perceived Competence Scales

Name: ___________________________  Sport: ___________________________
School: ___________________________  Number of years playing sport: ______
Gender: * Male/ Female  Highest level achieved: ___________
Race: ___________________________
*Please circle where appropriate

Please answer the following questions. There is no right or wrong answer, and we are just seeking your honest opinion. Please circle the number, which corresponds best to how you feel.

**State Anxiety**

1. I feel jittery.  
<table>
<thead>
<tr>
<th>Strongly Disagree</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>Strongly Agree</th>
</tr>
</thead>
</table>
2. I am concerned I may not do as well in this task as I can.  
   | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
3. I feel self-confident.  
   | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
4. My body feels tense.  
   | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
5. I am concerned about losing.  
   | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
6. I feel tense in my stomach.  
   | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
7. I’m confident I can meet the challenge.  
   | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
8. I am concerned about choking under pressure.  
   | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
9. My heart is racing.  
   | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
10. I am confident about performing well.  
   | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
11. I am concerned about performing poorly.  
   | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
**COPING STRATEGIES OF TERTIARY ATHLETES IN SINGAPORE: THE INFLUENCE OF ACHIEVEMENT GOALS, MOTIVATIONAL CLIMATE AND A BRIEF RELAXATION INTERVENTION**

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<tr>
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<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>12.</td>
<td>I feel my stomach sinking.</td>
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</tr>
<tr>
<td>13.</td>
<td>I’m confident because I mentally picture myself reaching my goal.</td>
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<td>7</td>
</tr>
<tr>
<td>14.</td>
<td>I’m concerned that others will be disappointed with my performance.</td>
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<td>7</td>
</tr>
<tr>
<td>15.</td>
<td>My hands are clammy.</td>
<td></td>
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<td>7</td>
</tr>
<tr>
<td>16.</td>
<td>I’m confident about coming through under pressure.</td>
<td></td>
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<td>7</td>
</tr>
<tr>
<td>17.</td>
<td>My body feels tight.</td>
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<td>7</td>
</tr>
</tbody>
</table>

**Perceived Competence**

|   |                                                                 | Strongly Disagree | Strongly Agree |   |
|---|-----------------------------------------------------------------|-------------------|----------------|
|28.| I think I am pretty good at this activity.                      | 1                 | 2              |   |
|29.| I think I did pretty well at this activity, compared to other students.| 1                 | 2              |   |
|30.| After working at this activity for a while, I felt pretty competent.| 1                 | 2              |   |
|31.| I am satisfied with my performance at this task.               | 1                 | 2              |   |
|32.| I was pretty skilled at this activity.                         | 1                 | 2              |   |
|33.| This was an activity that I couldn’t do very well.             | 1                 | 2              |   |
Appendix I

Experimental Protocol for Study 3

Condition A (Performance-inducing Climate)

Informed consent

Instructions:
The task today is to see how well you are able to perform in a task of golf putting. We would also like to see how good you are in relation to your peers. For this task, you are required to score the most successful puts. At the end of the session, you will also be ranked according to your performance. We will be recording your scores on the whiteboard as well, so you can see how well you are doing in relation to your peers.

You will be given 1 practice session, followed by the competition session. During each session, you will be given 2 blocks of 5 consecutive tries to put. So that’s 10 tries for the practice session, and 10 tries for the competition session. You will all play one at a time, and as one person plays, the rest of you are to observe. Now, the order of play has already been decided. We will begin the practice session now. Before we begin, I would like all of you to put on a NeuroSky headset. This is how you wear it. Also, for those of you who are new to golf-putting, this is how you hold the golf club, and proceed to put. You have 5 tries.

- Teach how to put on NeuroSky and put

Right now, I will need you to complete a questionnaire. (place questionnaires at a table each)

- Questionnaire 1

During this session, you will be taught the mental skill of relaxation. Use the skill to help you as you engage in the competition later.

- Relaxation Training

Right now, we will need to take your heart rate. Can all of you sit at one table each. At each table, there is a heart rate monitor. I will need you to wear that. If you do not know how to wear a HR monitor, the person at the table can help to guide you.

- HR

Start of trials:
Coping Strategies of Tertiary Athletes in Singapore: The Influence of Achievement Goals, Motivational Climate and A Brief Relaxation Intervention

Once again, I would like to remind you that this experiment is to observe how well you are able to perform in golf putting. You will also be ranked alongside the other participants, based on your performance. You will be given two blocks of five tries. Before we begin I would need all of you to put on the NeuroSky headsets again. Are you ready? Let’s begin.

Trials:
- 2 x 5 puts

During trials:
- Focus on the need to win
- Remind participants that they will be ranked among each other
- Have an existing scoreboard with scores from previous trials

End of experiment:
- HR
- Questionnaire 2

Final Question:
1. Throughout the experiment, what was your goal? What were you trying to achieve?
2. Did you use any mental skills during the task? If so, what?
COPING STRATEGIES OF TERTIARY ATHLETES IN SINGAPORE: THE INFLUENCE OF ACHIEVEMENT GOALS, MOTIVATIONAL CLIMATE AND A BRIEF RELAXATION INTERVENTION

**Condition B (Mastery-inducing Climate)**

Informed Consent

**Instructions:**
The task today is to see how much you can master and improve in golf putting. This activity is able to train your hand-eye coordination and is also able to help train your ball control. You will have two trial sessions, where in each block, you are given two times of five consecutive chances to put. The session will be conducted in a fairly flexible manner, and if you have any feedback, feel free to share and discuss it with us (T). We encourage you to also help each other along the way so that you can all improve together (G). Who would like to start first? May be as one person plays, the rest of you can observe and give suggestions on how to improve. We will first begin with the first block of trial. Before you begin to play, I would need all of you to put on a NeuroSky headset. This is how you wear it. Also, for those of you who are new to golf-putting, this is how you put the golf ball. When the first person is ready, you may begin.

- Teach how to put on NeuroSky and put

Okay, right now, I would need all of you to complete a questionnaire.

- Questionnaire 1 (place questionnaires together at the same table)

We will now have a session of training in the skills of relaxation together. Feel free to use the skill to help you as you engage in the activity later.

- Relaxation Training

Right now, we will need to take your heart rate. Can all of you sit at one table each. At each table, there is a heart rate monitor. I will need you to wear that. If you do not know how to wear a HR monitor, the person at the table can help to guide you.

- HR

**Start of trials:**
Once again I would like to remind you that this experiment is just to see how you may improve and master golf putting. It is okay to make mistakes, as you may learn from them. Just focus on improving from your previous trials and have fun. Before we begin, I would need you to wear the NeuroSky headsets again. Are you ready? Let’s begin.

**Trials:**
- 2 x 5 Trials
COPING STRATEGIES OF TERTIARY ATHLETES IN SINGAPORE: THE INFLUENCE OF ACHIEVEMENT GOALS, MOTIVATIONAL CLIMATE AND A BRIEF RELAXATION INTERVENTION

During trials:
- Provide individual recognition/ encouragement (R)
- Guide participants towards problem solving and giving them choice (A)
- Evaluate individual progress, personal improvement and participation (E)

End of experiment:
- HR
- Questionnaire 2

Final Question:
1. Throughout the experiment, what was your goal? What were you trying to achieve?
2. Did you use any mental skills during the task? If so, what?
Condition C (Control)

Informed Consent

Instructions:
The task today is to just engage in a session of golf putting. All you have to do is to play a game. You will be given a practice trial for warm-up before you proceed to begin the actual trial. During each trial, you will be given two blocks of five chances to put the golf ball. Before you begin to play, I would need all of you to put on a NeuroSky headset. This is how you wear it. Also, for those of you who are new to golf-putting, this is how you put the golf ball. The order of play will be according to your order of arrival.

When the first person is ready, you may begin.

  o Teach how to put on NeuroSky and put

Okay, right now, I would need all of you to complete a questionnaire.
   Questionnaire 1

Right now, we will need to take your heart rate. Can all of you sit at one table each. At each table, there is a heart rate monitor. I will need you to wear that. If you do not know how to wear a HR monitor, the person at the table can help to guide you.
   HR

Start of trials:
Once again I would like to remind you that for this experiment, all you are required to do is to complete one trial of golf putting. Before the start, I will need you to wear the NeuroSky headset again. Are you ready? Let’s begin.

Trials:
  • 2 x 5 Trials

End of experiment:
   HR
   Questionnaire 2

Final Question:
1. Throughout the experiment, what was your goal? What were you trying to achieve?
2. Did you use any mental skills during the task? If so, what?
Relaxation Training Session (15 mins)

During this session, you will be taught several relaxation techniques that can help you to be less anxious, especially during competitions. We will first cover physical relaxation techniques, followed by mental ones. Throughout the session, as we cover the various relaxation techniques, you will also be taught how to use them.

1) Muscle-to-mind relaxation techniques

Sighing with exhalation

Inhale slowly and then hold your breath for ten seconds, feeling the tension build up in your chest. Exhale through the mouth, sighing as you do so. Let out the tension in the ribcage. Do not focus on inhaling, just let that happen naturally. Now, hold your breath and exhale once again with a sigh as you force the air out of your lungs.

Rhythmic breathing

Take a deep breath, and then exhale fully and completely. Now, take another deep breath, but inhale to the count of 4 and exhale to the count of 8. (If participants run out of breath before reaching 8, suggest that next time they take a deeper breath and exhale more slowly). Again, inhale to the count of 4, and exhale slowly to the count of 8. Focus on your inhalation and exhalation.

Progressive Muscular Relaxation

Sit down in a comfortable position and try to put yourself in a relaxed state. Close your eyes and take a long, slow deep breath through your nose, inhaling as much as you can. Then exhale slowly and fully, feel the tension leave your body as you exhale. Take another deep break and let all the tension and problems you feel leave your body as you exhale. Relax as much as possible and listen to what I say. Do not strain to relax, just let it happen naturally. During this period, try not to move unnecessarily. We will progress through a few muscle groups and for each muscle group; you will tense it for approximately 5 to 7 seconds and relax it for 20-30 seconds. Do not start tensing until I
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say, “Now”. Continue to tense until I say, “Okay, relax” upon which you can release the tension.

We will begin. Tense the muscles in the dominant hand and lower arm by making a tight fist and bending your hand back at the wrist. NOW. Feel the tension in the hand and along the lower arm. Okay, relax and let go of the tension. Feel the difference between tension and relaxation. Make another fist NOW. (After 5 to 7 seconds) Now, relax and feel the release of tension in your lower arm.
[Repeat for upper arm of dominant hand].

2) Mind-to-muscle relaxation techniques

Meditation

Ensure that you are sitting comfortably. Now, close your eyes and relax your muscles. Start by relaxing the muscles from the bottom of your feet, all the way to the top of your head. Keep them relaxed. Okay, now, focus on your breathing. Breath through your nose. As you breath out, say the word “calm” silently to yourself. For example, breathe in…. out…. “calm”; in…. out…. “calm”. Breathe slowly, naturally, easily. (After about 30 seconds). Okay you may open your eyes now. Do not stand up for a few minutes.