# An Exploration of the Psychometric Properties of the Test of Attentional and Interpersonal Style 2 and its Ability to Predict Athletic Injury

A thesis submitted in (partial) fulfilment of the requirements for the degree of Doctor of Psychology

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# DECLARATION

I, Maria V. Vassos, certify that, except where due acknowledgement has been made; the work is that of the author alone. The work has not been submitted previously, in whole or in part, to qualify for any other academic award. The content of the thesis is the result of work which has been carried out since the official commencement date of the approved research program. Any editorial work, paid or unpaid, carried out by a third party is acknowledged and, ethics procedures and guidelines have been followed.

Signed: _____

Name: _____

Date: _____

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## ABSTRACT

This thesis presents two studies that are concerned with evaluating the psychometric properties of the revised version of the Test of Attentional and Interpersonal Style (TAIS; Nideffer, 1976) - the TAIS2 (Nideffer, n.d.). The original TAIS has many psychometric weaknesses but the revised version was developed in an attempt to rectify the problems of the original. The aim of Study One of this thesis was to explore the internal consistency and construct validity of the TAIS2 with particular focus on the attention subscales. These psychometric properties were evaluated on a sample of 119 undergraduate students who completed the TAIS2 along with measures of anxiety and the “Big Five” personality traits.

Eight hypotheses were proposed with the general theme being that the TAIS2 would show improved psychometric properties compared with the original TAIS. Results generally support these hypotheses. The TAIS2 showed improved internal consistency (three scales were below the acceptable .70 level only) and reduced measurement redundancy compared with the original TAIS. The TAIS2 also showed improved construct validity with the OIT and RED attention subscale scores significantly correlating with anxiety as predicted and the attention plus interpersonal subscale scores relating to the “Big Five” personality traits as predicted. However, the factor analysis results do not lend support to the construct validity of the TAIS2 attention subscales. The attention scores reduced to two higher order factors that measure only the bandwidth dimension of Nideffer’s (1976) theory of attentional style and not both the bandwidth and direction dimensions of attention as claimed. Combined, these findings imply that the TAIS2 displays improved psychometric properties compared with the original TAIS measure however these results do not display that the TAIS2 is a psychometrically sound measure.

The second study presented in this thesis attempted to explore the predictive validity of the TAIS2 by investigating whether the attention subscale scores predict athletic injury in accordance with the stress and injury model (Andersen & Williams, 1988). It was hypothesised that maladaptive attention styles and perceived risk of injury would separately mediate the relationships between five psychosocial factors (life events stress, coping, social support, anxiety and previous injury) with subsequent injury. The interaction between maladaptive attention style and perceived risk of injury would also mediate these relationships was another hypothesis proposed. A total of 41 recreational athletes participated in this study by completing a questionnaire containing the measures of perceived risk of injury, life events stress, coping, social support, anxiety and previous injury. The TAIS2 attention subscales were also included in the questionnaire. Each participant was contacted two months later to check on their injury status in the 2 months since completing the questionnaire.

Mediation results indicated that the TAIS2 scales measuring external distractibility (the OET subscale) and internal distractibility (OIT subscale) were the only significant single mediators. Perceived risk of injury was not a significant mediator of any relationships on its own however it interacted with reduced focus (the RED subscale) to mediate some of the psychosocial and athletic injury relationships. These results partially support the hypotheses further demonstrating only partial support to the predictive validity of the TAIS2. These results further imply that the stress and injury model in its entirety has some support but this statement cannot be said with much confidence as results may be due to the poor psychometric properties of the TAIS2. Explored in the final chapter of this thesis are theoretical and practical implications, limitations to the research and directions for future research.

# CHAPTER ONE

## Literature Review

Participation in physical activity, exercise and sporting activities is recommended by health professionals as being integral to ensuring future health – the reason being because physical activity has been implicated as an important aid in the prevention of chronic diseases. Research indicates that the risk of developing diseases such a cardiovascular disease, cancer, diabetes, depression and osteoporosis can diminish by incorporating physical activity into one's lifestyle (Warburton, Nicol, & Bredin, 2006; Caltabiano & Sarafino, 2002). Although participation in sporting activities may be a good strategy to help guarantee future physical health, it can also lead to physical injuries. In an Australian Government report, Flood and Harrison (2006) reported that in the 2002-2003 financial year, 45,452 sports-related hospitalisations occurred in Australia with the highest incidence of hospitalisations occurring for Australian Rules footballers (8.68%) followed by soccer players (7.19%) then water sports athletes (6.16%). These figures are quite alarming. If sports participation is being recommended as an activity that will help minimise the risk of serious illness in the future, the incidence of associated injuries must also be addressed.

The high incidence of injury Flood and Harrison (2006) reported also highlights the need for researchers to investigate the factors that contribute to individuals becoming injured during physical activities and how these injuries can be prevented. In an Australian Government report, National Public Health Partnership (2004) stated that general injuries in the population can be prevented by safer environments being created and safer behaviours being promoted. For the sporting sector of the community, these recommendations could entail creating safer sporting environments such as ensuring that playing surfaces are adequate or encouraging

safer behaviours in the sporting arena such as the wearing of helmets and other protective gear.

### *The Stress and Injury Model*

The recommendations of the National Public Health Partnership (2004), as mentioned above, are physical ways of preventing injury, which implies that injuries are occurring due to physical and environmental factors. But can sporting-related injuries be caused by psychological factors? Andersen and Williams (1988) argued that psychological factors are relevant and developed a theoretical model, the stress and injury model that provided an explanation for the relationship between stress and athletic injury. This model is depicted in Figure 1[1]. The model states that athletic injuries may occur due to an interplay between various psychosocial factors such as an athlete's history of stressors (e.g., major life events, daily problems, previous injuries), their personality characteristics (e.g., locus of control, competitive trait anxiety, sensation seeking, psychological hardiness), their coping resources (e.g., social support, general coping behaviours, stress management and medication) and the athlete's stress response in a potentially stressful athletic situation. These factors will directly or indirectly influence the athlete's stress response in a stressful athletic situation. Andersen and Williams propose that the athlete's history of stressors will contribute directly to the athlete's stress response (depicted by the arrow labelled 1 in Figure 1) whereas personality characteristics and coping resources will exert their influence either directly or through the effects of the athlete's history of stressors (depicted by arrows labelled as 2 in Figure 1).

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[1] The model depicted in Figure 1 is the revised model published in Williams and Andersen (1998), not the original model published in Andersen and Williams (1988)

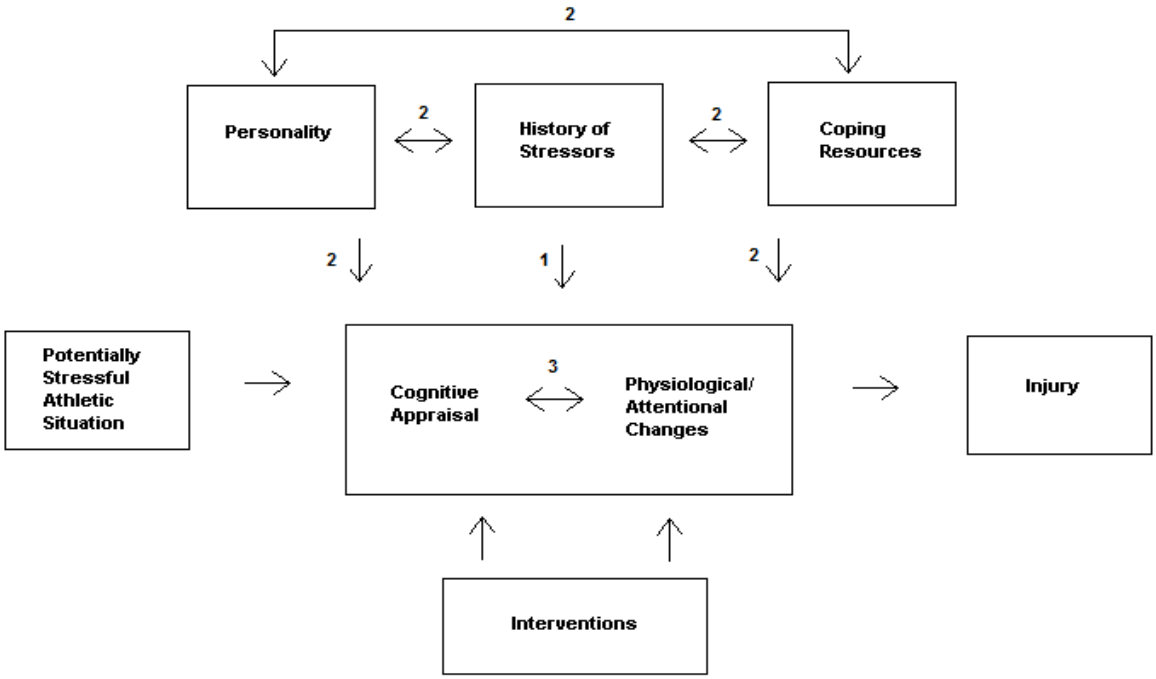


*Figure 1.* The Stress and Injury Model (Williams & Andersen, 1998)

Andersen and Williams (1988) proposed that the stress response of the athlete is made up of a bidirectional relationship between the athlete's cognitive appraisals of the stressful athletic situation and the physiological/attentional changes that occur in the situation (depicted by the arrow labelled 3 in Figure 1). Cognitive appraisals can influence physiological/attentional changes and vice versa. Andersen and Williams argued that, in an athlete who has a history of stressors, personality characteristics that exacerbate the stress response, and low coping resources, will be more likely in stressful situations to appraise the situation as stressful, show greater muscle tension (physiological aspect) and have disruptions in their attentional processes such as the narrowing of their visual field or scattered attention. These changes then place the athlete at a greater risk of getting injured.

### *Research Investigating the History of Stressors, Personality, and Coping Resources Component of the Stress and Injury Model*

Since being proposed in 1988, researchers have attempted to test the stress and injury model's capacity to predict athletic injuries. Williams and Andersen (1998) comprehensively reviewed the research conducted between 1988 and 1998. This review is summarised in Table 1. Williams and Andersen's review highlighted that the most investigated aspects of the stress and injury model are life events stress, in particular negative life events stress (part of the history of stressors component), locus of control and anxiety (part of the personality component) and social support and psychological coping (part of the coping component). The review also indicated that life events stress, trait anxiety, locus of control, sensation seeking, social support, coping, and peripheral narrowing have been found to be associated with or predictive of athletic injury occurrence, therefore supporting their inclusion in the stress and injury model. The research literature did not support the inclusion of previous injury and muscle tension in the stress and injury model. The two methodologically sound studies that investigated daily hassles demonstrated that this variable does predict athletic injuries.

Seventeen studies investigating the stress and injury model have been conducted since 1998. A summary of these studies and their findings are provided in Table 2 (brief summary) and Appendix A (more comprehensive summary). The history of stressors component (mainly life events stress and previous injury) continued to be widely researched after 1998 and the results continued to indicate that life stress is related to injury.

Research found that negative life events (NLE) stress was significantly associated with injury and time lost to injury (Maddison & Prapavessis, 2005; Patterson, Smith, Everett, & Ptacek, 1998). High levels of NLE stress also predicted

Table 1

*A summary of Williams and Andersen's (1998) review of the Stress and Injury Model*

| Component investigated | Variables investigated | Summary of the reviewed research for this component |
|---|---|---|
| History of stressors | Life events stress (positive, negative and total) | Life events stress has a significant relationship with injury: Seven studies found evidence of negative life events increasing the risk of injury (Byrd, 1993; Meyer, 1995; Passer & Seese, 1983; Petrie, 1992, 1993; Smith, Ptacek, & Smoll, 1992; Smith, Smoll, & Ptacek, 1990); three studies found that positive and total life stress contribute to injury occurrence and frequency (Blackwell & McCullagh, 1990; Hanson, McCullagh, & Tonymon, 1992; Petrie, 1993). Total and negative life events stress has been found to predict injury separately across different sports e.g. total life events stress predicts injury in track athletes but not in athletes from other sports (Hardy & Riehl, 1988) |
| History of stressors | Daily hassles | Six studies have investigated daily hassles: Four of them found that it did not contribute to injury risk but these studies had methodological problems (Blackwell & McCullagh, 1990; Hanson et al., 1992; Meyer, 1995; Smith et al., 1990). The two methodologically sound studies found moderate support for daily hassles as a factor that predicts injury (Fawkner, 1995*; Byrd, 1993). |
| History of stressors | Previous injury | One study has investigated previous injury and that study pointed to a non-significant relationship with injury frequency and severity (Hanson et al., 1992). |
| Personality | Locus of control<br>Trait anxiety | Locus of control and trait anxiety were found to be significantly related to injury severity and frequency when sports related measures were used not general measures of these constructs (e.g. Blackwell & McCullagh, 1990; Hanson et al., 1992; Kerr & Minden, 1988; McLeod & Kirkby, 1995; Lysens, Vanden Auweele, & Ostyn, 1986; Passer & Seese, 1983; Dalhauser & Thomas, 1979; Petrie, 1993). |
| Personality | Sensation seeking | One study investigated this and found that only low sensation seekers had a significant positive relationship between sport-specific negative life events and time loss due to injury (Smith et al., 1992). |
| Coping resources | Social support<br>Psychological coping | Social support and psychological coping moderate the life events stress and injury relationship; having high levels of either of these will decrease the vulnerability of injury for an athlete (Smith et al., 1990) |
| Stress Response | Muscle tension<br>Peripheral narrowing | Only one study (Andersen, 1988) investigated muscle tension and found that it was not greater for athletes at risk of injury according to the model in high stress situations. Three studies investigated peripheral narrowing and found that it occurs in athletes under high stress conditions but the level of peripheral narrowing experienced by athletes was moderated by the athletes levels of coping, social support and negative life events (Williams, Tonymon, & Andersen, 1990, 1991; Andersen & Williams, 1997 – later published in 1999). One study (Thompson & Morris, 1994) found that recent life events and low vigilant attention lead to increased injury risk. This study also found that as focused attention increased, risk of injury decreased. |

Note. Please refer to the original Williams and Andersen (1998) paper for the complete reference for each study mentioned in this table.
* This is an unpublished masters thesis which was later published in 1999

Table 2

*A summary of the post 1998 literature concerning the Stress and Injury Model*

| Component of the model investigated | Variables investigated regarding the component of the model | Summary of the reviewed research for this component |
|---|---|---|
| History of stressors | Life events stress (positive, negative and total) | Life events stress continued to have a significant relationship with injury occurrence. Seven studies found evidence of negative life events stress increasing the risk of injury and predicting time lost to injury. Four studies investigated total life events and found that it was able to classify injured athletes and predict injury likelihood and time lost to injury. One study investigated positive life events stress and found that it did not predict injury occurrence. |
| History of stressors | Daily hassles | Only one study was published that found daily hassles predicted injury |
| History of stressors | Previous injury | Two studies investigated previous injury. Results are conflicting; one found that previous injury correlated with subsequent injury whereas the other did not. |
| Personality | Locus of control<br>Trait anxiety | No studies investigated locus of control. Anxiety was positively related to injury frequency but studies investigating its moderating potential of the negative life events-injury relationship were conflicting; one found evidence to support its moderating potential, one did not. |
| Personality | Sensation seeking<br>Hardiness<br>Optimism | No studies investigated sensation seeking. One study found that optimism and hardiness was associated with decreased time lost to injury when positive life changes occurred in an athlete's life. |
| Coping resources | Social support<br>Psychological coping | Results generally continued to support the notion that social support and psychological coping moderate the negative life events stress - injury relationship. However some conflicting results were found; avoidance and problem focused coping moderated the relationship with high levels associated with injury whereas another study found that high levels of psychological coping was associated with decreased levels of injury. Studies also found that coping and social support interact together to moderate the negative life events stress – injury relationship. |
| Stress Response | Cognitive Appraisal<br>Peripheral narrowing | Three studies investigated cognitive appraisal in the form of perceived risk of injury. All three studies found that previous injury was positively related to perceived risk of injury. One study found that peripheral vision narrowing was associated with higher levels of injury in those with low social support. Another study found that peripheral vision narrowing mediated the relationship between negative life events stress and injury occurrence. |

injury ($R^2$ = .18) (Andersen & Williams, 1999); time lost to injury (Falkstein, 1999) and increased the likelihood of injury occurrence (Gunnoe, Horodyski, Tennant, & Murphey, 2001; Rogers & Landers, 2005). NLE stress was also found to be significantly different in injured and non-injured athletes with higher levels found in injured athletes (Laws-Gallien, 2001). Total life events (TLE) stress was found to increase the likelihood of injury (Gunnoe et al., 2001; Rogers & Landers, 2005), predicted time lost to injury ($R^2$ = .07) (Dunn, Smith, & Smoll, 2001) and could correctly classify injured, recently healed, and non-injured athletes with 39% accuracy (Galambos, Terry, Moyle, & Locke, 2005). This level of classification is not impressive though; by chance, 33% would be classified as injured therefore TLE is not a variable that is classifying with great accuracy. Positive life events (PLE) stress, another form of life stress did not predict injury occurrence either (Falkstein, 1999). In summary, the life events stress results are consistent with what Williams and Andersen (1998) indicated in their review, except for PLE stress; Williams and Andersen found three studies that indicated that PLE stress does contribute to injury frequency and occurrence.

In their review, Williams and Andersen (1998) found one study investigating previous injury which indicated a non-significant relationship with subsequent injury frequency and severity. Since 1998, two studies investigated this variable. Kontos (2004) found that previous injury did not correlate with subsequent injury. In contrast Quarrie, Alsop, Waller, Bird, Marshall, and Chalmers (2001) found that rugby players who had injuries in preseason ended up missing a greater proportion of the season to injury compared with those who were uninjured in preseason. Inconsistent findings highlights that more research investigating previous injury is needed.

With regards to the personality component of the stress and injury model, Williams and Andersen (1998) indicated that trait anxiety, sensation seeking, and

locus of control were the only personality variables researched that appeared to be antecedent to athletic injury. Research since 1998 has centred mainly on trait anxiety, with one study specifically investigating hardiness and optimism. Anxiety on its own was positively related to injury frequency in athletes (Hazzard, 2004). The results regarding anxiety as a moderator of the relationship between history of stressors and injury are mixed at best. Falkstein (1999) found anxiety to be a moderating factor in conjunction with coping and social support for the relationship between NLE stress and time lost to injury, but Maddison and Prapavessis (2005) did not. This discrepancy could have occurred because of methodological issues, specifically the method for conducting moderator analyses. Both Falkstein and Maddison and Prapavessis used conjunctive moderation techniques, which involves demonstrating that a specific combination of two or more variables acts as a moderator for the relationship between the predictor variable and the criterion variable. For a more in depth discussion on this type of moderation, see Smith, Smoll, and Ptacek (1990). Large samples are recommended for conjunctive moderation techniques; the sample size Maddison and Prapavessis used was 470 whereas Falkstein used two small samples of 79 and 98. The moderating effect Falkstein found may be a reflection of sampling error.

Regarding psychological hardiness, Ford, Eklund, and Gordon (2000) found that high levels of optimism and hardiness were related to a decreased amount of time lost to injury when positive life changes (and the stress that goes with it) occur in an athlete’s life. This finding, plus the findings mentioned previously for trait anxiety, provide evidence that variables in the personality component of the stress and injury model may interact with other components (such as the history of stressors and coping components) in order to influence the occurrence of injury.

With regards to the coping resources component of the stress and injury model, Williams and Andersen (1998) indicated in their review that evidence exists to support the notion that social support and general coping or psychological coping are associated with injury occurrence and also act as moderators of the relationship between history of stressors and injury. Generally, the literature after 1998 supports these patterns also.

Patterson et al. (1998) found that NLE stress predicted injury in those athletes who had low levels of social support ($R^2$ = .22 for total NLE and $R^2$ = .21 for minor NLE). Noh, Morris, and Andersen (2005) found that freedom from worry, which is a psychological coping skill, significantly predicted injury frequency ($R^2$ = .21) and freedom from worry in conjunction with negative dance stress predicted injury duration ($R^2$ = .17). With regards to moderation, Rogers and Landers (2005) found that increased levels of psychological coping skills decreased an athlete's likelihood of injury and also acted as a moderator of the NLE and injury occurrence relationship. Maddison and Prapavessis (2005) found that that NLE predicted injury occurrence in athletes who had high levels of avoidance coping and NLE also predicted time lost to injury for athletes who had high levels of either avoidance coping and problem-focused coping. These results seem conflicting because Rogers and Landers indicated that high levels of coping are associated with decreased injury levels, whereas Maddison and Prapavessis indicated that they are associated with increased injury levels. This discrepancy may be a reflection of the coping measurements used. Maddison and Prapavessis used the Ways of Coping Scale (Folkman & Lazarus, 1988) which measures coping from a traditional perspective, which are the strategies people actually use to cope with stressful situations that occur in their lives. On the other hand, Rogers and Landers used the Coping Skills Inventory (Smith, Schultz, Smoll & Ptacek, 1995) which measures coping from a

sports perspective, which is the athlete's perceived ability to use psychological skills they possess in order to cope with their lives. Therefore, the conflicting results may indicate that using coping strategies, such as problem focusing or avoidance may indeed lead to more injury in athletes but having the perception of possessing many psychological coping skills may decrease injury risk. These conflicting results highlights that more research in this area is needed as well.

Two studies, however, found that coping and social support on their own did not moderate the relationship between NLE stress and injury. Laws-Gallien (2001) found that non-injured athletes possessed higher levels of psychological coping behaviours compared with injured athletes but her results did not demonstrate statistical moderation of the relationship between NLE stress and injury. Falkstein (1999) also found that coping and social support on their own were not moderators, but he found that social support and coping interacted together when influencing the NLE stress and injury relationship. He found that there was a stronger relationship between NLE stress and time lost to injury in athletes with low levels of social support and low levels of problem- or emotion-focused coping. Maddison and Prapavessis (2005) also found an interaction between coping and social support, but the interaction found worked differently; they found that high avoidance coping and low social support strengthened the relationship between NLE stress and injury frequency and time lost. They also found that high problem-focused coping and low social support strengthened the relationship between NLE stress and time lost to injury only. This inconsistency could be due to the methodological issues that were stated previously with regards to these two studies. Research needs to focus on the role that coping strategies play in the stress and injury model as conflicting evidence is present with regards to whether lower levels or higher levels is associated with injury occurrence.

*Research Concerning the Stress Response of the Stress and Injury Model*

In their review, Williams and Andersen (1998) highlighted that the stress response had not been investigated by many studies (only five studies, one that was an unpublished manuscript and was later published in 1999). Why the stress response has not been more researched is quite puzzling because it is one of the key components of the stress and injury model - the stress response mediates the relationship between the history of stressors, personality, and coping components and injury.

One reason why the stress component may have not been studied to a great extent is because it is a difficult construct to investigate, especially outside the laboratory setting. The four published studies that Williams and Andersen (1998) reviewed were all conducted in laboratory settings, and all of them investigated the attentional/physiological change portion of the stress component; cognitive appraisals were not investigated. Andersen (1988) found that muscle tension was not greater for individuals at risk of injury in high stress situations (which is contrary to the predictions of the stress and injury model). Williams, Tonymon, and Andersen (1990, 1991) measured peripheral vision in a sample of recreational athletes and found that narrowing and higher levels of state anxiety occurred for athletes in the high stress condition [simultaneously doing the Stroop Color Word Test (Golden, 1978) and a peripheral vision task while listening to distracting phrases]. They also found that NLE stress moderated these levels. Williams et al. (1991) found that coping resources did not moderate the relationship between negative life events stress and peripheral vision narrowing. Thompson and Morris (1994) found that adolescent football players who had recent life event stress and low vigilant attention [as measured by the Symbol Digit Modalities Test (Smith, 1982)] were at a higher risk of getting injured.

They also found that as focused attention increased [as measured by the MacQuarrie Test of Mechanical Ability (Lezak, 1983)], risk of injury decreased.

In the seventeen studies conducted since 1998, five of the studies investigated the stress response, three of these directly investigating the cognitive appraisal component of the model. In their original paper regarding the stress and injury model, Andersen and Williams (1988) indicated that previous injury may influence an athlete's cognitive appraisal of a potentially stressful athletic situation, in that fear of re-injury may lead to a large stress response that could, in turn, increase the likelihood of injury. Reuter and Short (2005) found that athletes who had a history of previous injury indicated that they had more fear of re-injury than those without previous injury. Short, Reuter, Brandt, Short, and Kontos (2004) found that previous injury was positively related to an athlete's perceived probability of re-injury and their concerns or worries regarding injury; it was also negatively related to confidence in avoiding injury. Deroche, Stephan, Brewer and Le Scanff (2007) found that previous injury predicted perceived susceptibility to injury after the influence of age and time since last injury was removed. These results support Andersen and Williams' idea regarding previous injury influencing cognitive appraisal (exhibited as a fear of re-injury). There is some evidence supporting the notion that the previous injury part of the history of stressors component influences the stress response. What these studies do not address is whether this cognitive appraisal (fear of re-injury) because of previous injury actually leads to re-injury. Investigating this relationship would test the model as a whole.

Two studies directly assessed the attentional/physiological change portion of the stress and injury model. Andersen and Williams (1999) used a similar stress condition as Williams et al. (1990, 1991) and found peripheral vision narrowing that occurred during the stressful condition of the experiment was associated with a

higher number of injuries in those who had lower levels of social support ($R^2$ = .08). Rogers and Landers (2005) found that peripheral vision narrowing provides a unique contribution to the prediction of injury occurrence over and above negative life events stress, coping, and social support. They also found that peripheral vision change that occurred in the stress condition (testing the athlete one hour before an important game) mediated the effect of negative life events stress on injury occurrence. These results support the general premise that components of the model, such as coping (in the form of social support) and history of stressors (in the form of negative life events stress), will influence the stress response of the athlete (in the form of peripheral vision narrowing), and that in turn can lead to injury or to an increase in the likelihood of injury.

That more research has investigated the stress response is positive trend in the area of athletic injury prediction, but the continued use of laboratory techniques to measure attentional/physiological change was also evident. It must be said that although the results found from the studies mentioned above are valuable in demonstrating the validity of the stress and injury model, the measures used may not be suitable for use by sporting clubs. Large professional sporting clubs may have the means to purchase laboratory machines that measure peripheral vision and attention change, however lower level clubs may not. Also, these measures are time consuming (as only one participant can be tested at a time) and they require skilled administrators. More cost and time effective measures are required to increase the appeal of psychological screening of athletes to pinpoint those at a higher risk of injury.

Brief, questionnaire measures of attention may offer an alternative to these laboratory measures. In their review of the methodological, statistical, and measurement issues that face injury prediction researchers, Petrie and Falkstein

(1998) recommend that more work should be done outside the laboratory setting to test the attentional/physiological component of the stress and injury model. They made this recommendation following promising results from two studies that utilised questionnaire measures of attentional change instead of laboratory measures. The first study was conducted by Williams, Hogan, and Andersen (1993). They used the Positive States of Mind (PSOM; Horowitz, Adler & Kegeles, 1988) instrument to predict injury occurrence in a sample of college athletes. This instrument measures a person's own perception of their abilities to enter different positive states of mind over the course of a certain period of time. Williams et al. found that the PSOM was a psychometrically reliable and valid measure to be used with athletes. They also found that the focused-on-task score of the PSOM was significantly correlated with injury occurrence in a sample of collegiate athletes. They also found that those individuals who could put themselves into more positive states of mind were at less risk of injury.

The second study Petrie and Falkstein (1998) cited in their review was a study by Bergandi and Witting (1988) who used the Test of Attentional and Interpersonal Style (TAIS; Nideffer, 1976) to predict injury occurrence in a sample of 335 athletes from 17 different sports. The TAIS measures the skills necessary for high level performance. These skills include attention skills (e.g., focused attention) and interpersonal skills (e.g., expression of ideas and thoughts). Bergandi and Witting found that three factor scores on the TAIS (attentionally effective, overload, and performance anxiety) significantly predicted injuries for one sport only (softball). Although this result does not appear promising, this study had many methodological faults, mainly due to the small samples from each sport represented. Bergandi and Witting recommended that more research be done using the TAIS in the domain of athletic injury prediction because the TAIS factor scores were able to explain high proportions of injury variance in some sports [$R^2$ = .56 in volleyball (non-significant),

$R^2$ = .49 in softball (significant), $R^2$ = .28 in men's basketball (non-significant) and $R^2$ = .29 in women's gymnastics (non-significant)].

### *The Test of Attentional and Interpersonal Style*

Even though the TAIS was recommended by Bergandi and Witting (1988), very few studies have utilised the measure to predict injury occurrence in athletes. Only two studies have investigated the link between injury and TAIS attention scores. Noun (1997) found no differences between injured and non-injured athletes on any of the TAIS attention subscales. Bond, Miller, and Chrisfield (1988) found, contrary to what was expected, that the more effective attentional profiles were associated with injury occurrence in a sample of swimmers. On face value, the attention subscales appear to be suitable measures of the attentional change portion of the stress and injury model. Also, the TAIS purports to measure mechanisms of attention that can be directly linked to the model's theoretical explanation as to why attentional change would be linked to athletic injury (narrowing of the visual field and having scattered attention) . So why are the TAIS attention scores not predicting athletic injuries? A more in-depth investigation into the TAIS is warranted at this point.

The TAIS was developed in 1976 by Nideffer, who created the measure for practitioners to use in their clinical work. It allows practitioners to measure a person's performance-related skill set, which can then be used to check that the individual matches the performance demands that a certain situation entails. The information gleaned from the scoring of the test can then be used to develop programs and interventions to improve performance and minimise mistakes for the individual in question.

The TAIS contains seventeen subscales that measure seventeen different behaviours that are important in predicting performance (six measuring attentional

processes, two measuring behavioural and cognitive control and nine measuring interpersonal style). Table 3 contains more detailed explanations of the subscales of the TAIS. Previous literature and theory was used to identify the skills and behaviours. A pool of unambiguous items believed to be measuring the seventeen behaviours was created. The pool of items was whittled down to 144 items using an item analysis procedure. Nideffer used a sample of college students to develop the TAIS.

The attention items of the TAIS were based on Nideffer's (1976) theory of attentional style. This conceptualisation of attention states that focus of attention shifts along two distinct dimensions: bandwidth (broad to narrow) and direction (internal to external). Four distinct attentional styles can be inferred when considering the dimensions together: (a) the broad-external attentional style is used when an individual has to be aware of what is happening in their environment, and they need to react to it; (b) the broad-internal attentional style is used when an individual needs to plan, create strategies, and analyse. They must be aware of all internal thoughts, ideas and emotions and must take information from their environment and compare it to their internal thoughts and ideas; (c) the narrow-internal attentional style is used when an individual needs to rehearse (in a systematic fashion) information, like the movement sequence of dive for a diver, or when an individual needs to be aware of and manipulate an internal state like breathing rate; and, (d) the narrow-external attentional style is used when an individual must have their attention focused on a narrow part of their external environment, e.g. a cricketer focusing on the ball being bowled to them.

The theory also states that individuals have preferred attentional styles but the average person can develop all four styles and can use all four styles when the

Table 3

*The TAIS subscales and their description (Nideffer, 1976)*

| Type | Subscale | Subscale description |
|---|---|---|
| Attentional | Broad external focus (BET) | High scores reflect an individual's ability to effectively integrate many external stimuli at the one time |
| | Overloaded by external stimuli (OET) | High scores reflect a tendency to make mistakes because the individual becomes overloaded and confused by external stimuli |
| | Broad internal focus (BIT) | High scores reflect an individual's ability to effectively integrate ideas and information from different areas. |
| | Overloaded by internal stimuli (OIT) | High scores reflect a tendency to make mistakes because the individual confuses themselves by thinking about too many things at the one time |
| | Narrow attentional focus (NAR) | High scores reflect an individual's ability to narrow their attention when needed |
| | Reduced attentional focus (RED) | High scores reflect an individual's tendency to make mistakes because they narrow their attention too much |
| Control | Behaviour control (BCON) | High scores reflect a tendency to be impulsive and engage in anti-social behaviour |
| | Control scale (CON) | High scores reflect an individual's ability to be in control of most situations (interpersonal or other) |
| Interpersonal | Self-esteem (SES) | High scores reflect a person who think high of themselves |
| | Information processing (INFP)* | High scores reflect a tendency to process large amounts of stimulus information |
| | Physical orientation (P/O) | High scores reflect an individual who enjoys competitive sports |
| | Obsessive (OBS) | High scores reflect a person who is has a tendency to ruminate and worry about one thing |
| | Extroversion (EXT) | High scores reflect a person who is outgoing, warm, the life of the party and enjoys being with other people |
| | Introversion (INT) | High scores reflect a person who likes enjoys quiet time, avoids being the centre of attention and like being alone |
| | Intellectual expression (IEX) | High scores reflect an individual who likes to express their ideas and thoughts to others |
| | Negative affective expression (NAE) | High scores reflect an individual who expresses their negative feelings to others |
| | Positive affective expression (PAE) | High scores reflect an individual who expresses (both verbally and physically) their feelings of affection to others |

* This scale is also considered an attentional scale.

performance situation demands it. Various situations will place different demands on the four attentional styles and will require different levels of shifting between the four styles. Nideffer also stated that as arousal increases, shifting from one style to another breaks down, and attention tends to narrow involuntarily and becomes more internally focused.

In his original paper, Nideffer (1976) presented psychometric data on the TAIS. Correlations between the 17 subscales ranged from .01 to .80 (median of .28). However, the high correlations were expected as Nideffer indicated that it is unreasonable to assume that these 17 subscales are independent of each other. The factor structure of the TAIS subscales was not presented in this paper. In order to demonstrate overlap in content being measured, Nideffer computed the correlations between each item and its corresponding total subscale score and then calculated the mean correlation for each subscale. He then computed the correlations between each item and each subscale other than the one that the item belongs to. He then determined the percentage of items in each scale that correlate better than the mean correlation for that scale with another subscale. This procedure found a 0 - 2.2% overlap for the six attention subscales and a 0 – 1.6% overlap for the control and interpersonal subscales indicating that the degree of overlap between scales is minimal, therefore most of the items are not redundant in the measure.

Nideffer (1976) found 2-week test-retest reliabilities ranging from .60 (OBS subscale) to .93 (P/O subscale) with a median correlation of .83. Heiman (2001) stated that test-retest correlations of .80 and larger are desirable. From Nideffer's result, it can be concluded that at least half of the subscales have adequate test-retest reliability. This is not a positive result though because at the same time, this demonstrates that half of the test is unreliable. No table of test-retest reliabilities was reported in the paper, only the range mentioned previously. This is quite strange as it

is common to report all test-retest reliabilities, not just a range. Different population groups were also found to score differently on the TAIS subscales supporting the construct validity of the TAIS. Males scored significantly higher than females on the BIT, NAR, P/O, IEX and PAE subscales; this was expected on the basis of social learning theory. Male police applicants produced significantly different scores on 15 of the 17 subscales compared with male college student (differences were not found on the BIT and OBS subscales). Nideffer also expected this finding as individuals who are being recruited to the police force should show greater control in attention and interpersonal skills than college students.

In order to further demonstrate the construct validity of the TAIS, Nideffer (1976) used his theory of attentional style to predict how the attention scales would be related to measures of anxiety. Since the theory states that as arousal (in the form of anxiety) increases, individuals will tend to narrow their attention to a level that is not useful, become internally focused and overloaded by their own feelings and thoughts, it was predicted that the attention subscales of RED and OIT will be positively correlated with anxiety scores. As predicted, Nideffer found significant positive correlations between the RED and OIT subscales with trait anxiety for a sample of introductory psychology students (RED: $r$ = .54; OIT: $r$ = .39) and a sample of college students (RED: $r$ = .53; OIT: $r$ = .43).

In another attempt to further demonstrate the construct validity of the TAIS, Nideffer compared the TAIS scales with other valid measures of personality that measure similar concepts to the TAIS. He found that the INT subscale was significantly positively correlated with the neuroticism scale of the Maudsley Personality Inventory ($r$ = .36). Also, the EXT subscale was significantly positively correlated with the extraversion scale of the Maudsley Personality Inventory (MPI; Eynsenck, 1959) ($r$ = .64) and significantly negatively correlated with the Minnesota

Multiphasic Personality Inventory (MMPI; Hathaway & McKinley, 1940, cited in Groth-Marnat, 2003) subscale of Social Introversion (*r* = -.46).

Nideffer (1976) also demonstrated that the TAIS scores can be linked to performance, therefore demonstrating the predictive validity of the test. Swimmers who scored high on the RED subscale were more likely to be rated by their coach as choking under pressure, falling apart if performance errors were made, having to work hard for everything they obtain, and being prone to rumination. Swimmers who were rated by their coach as being inconsistent scored higher on the OET, OIT, NAR and BIT scales. Students who were judged as contributing to class discussions, assumed leadership, expressed opinions, and sought out teachers to discuss material after class tended to score higher on the BIT, RED, INFP, CON, SES, EXT and IEX subscales. Students who were judged to be easily intimidated, withdrawn, unable to handle more than one topic at a time, and were rated as having poor behaviour tended to score lower on the SES, BCON, CON and INFP subscales and higher on INT subscale. Nideffer did not state in his paper whether these findings (for both the swimmers and students) were expected on the basis of previous research or theory.

Since the publication of Nideffer's (1976) original paper on the development of the TAIS, other researchers have attempted to investigate the psychometric properties of the TAIS. Most of the research has focused on the psychometric properties of the attention subscales and how reliable and valid these scales are. The next few subsections will discuss this research in more depth.

### *TAIS Test-Retest Reliability and Internal Consistency*

Cohen and Swerdlik (2002) defined reliability as "the attribute of consistency in measurement" (p.128). There are many ways to estimate the reliability of a test, one

way being to test a set of individuals at one time then retest them at a later time and then correlate the scores. This form of reliability is called test-retest reliability and is used to evaluate tests that claim to measure traits that are stable over time (Cohen & Swerdlik). This form of reliability is an appropriate way of evaluating the TAIS as the test claims to measure personality and attentional traits that are relatively stable.

Studies evaluating the test-retest reliability of the TAIS have found moderate to large positive correlations for the attention subscales. Using a variable test-retest period (between 10 – 101 days with a mean of 32 days), Van Schoyck and Grasha (1981) found that the attention subscales from their tennis-specific TAIS measure (T-TAIS) had better test-retest reliabilities than the original TAIS, ranging from $r$ = .68 to $r$ = .91 for the T-TAIS, and $r$ = .48 to $r$ = .84 for the TAIS. The NAR and RED subscales of the T-TAIS and the BET, OET, NAR and RED subscales of the TAIS exhibited test-retest correlations below .8. Albrecht and Feltz (1987) found that the two week test-retest reliabilities for both the TAIS and their baseball/softball-specific TAIS measure (B-TAIS) attention subscales were large, ranging from $r$ = .72 and $r$ = .92 for the TAIS, and $r$ = .72 and $r$ = .95 for the B-TAIS. The RED subscale of the TAIS and the RED and OIT subscales of the B-TAIS had test-retest correlations below .8. The TAIS test-retest reliabilities found by Albrecht and Feltz were higher than those Van Schoyck and Grasha found. Albrecht and Feltz attributed this to the longer test-retest period Van Schoyck and Grasha used compared with the two week test-retest period utilised in their study.

Using a 14 – 25 day test-retest period, Summers, Miller, and Ford (1991) found moderate to large test-retest reliabilities for the attention subscales for both their basketball-specific TAIS measure (BB-TAIS) and the original TAIS, ranging from $r$ = .69 to $r$ = .83 for the BB-TAIS with the OET, NAR and RED subscales being the only correlations below .8, and $r$ = .58 to $r$ = .91 for the TAIS with the OIT, BET, and

NAR subscales being the only correlations under .8. Using the .80 level of acceptable test-retest reliability recommended by Heiman (2001), these findings indicate that the reliability of the RED and NAR subscales needs to be questioned as it consistently produced test-retest correlations below .8.

Nideffer and Bond (1998) found that the 6-month test-retest reliabilities for all 17 subscales ranged from $r$ = .52 to $r$ = .81 and the 2-year test-retest reliabilities ranged from $r$ = .40 to $r$ = .70. While these figures are still positive and moderate, they do not meet the .8 acceptable reliability criteria. Only one subscale (NAE) displays adequate reliability after 6-months and no subscales display adequate reliability after two years. Nideffer and Bond indicate that the reduced magnitude of these correlations reflect that TAIS subscale scores change over time especially in certain age groups. As expected, they found that percentage change in scores decreases with increasing age; younger athletes (mean age between 16 and 20 years) show a greater increase in scores when tested two to four years after initial testing compared with older athletes. This reflects that with increased maturity and experience in their chosen sport, athletes develop better attentional and interpersonal skills but these skills plateau with increasing age.

Internal consistency is another form of reliability that has been used to evaluate the TAIS measure. This reliability estimate is calculated by comparing the items on the test with each other (Cohen & Swerdlik, 2002). The most reported internal consistency coefficient is Cronbach's alpha ($\alpha$). Studies have questioned the internal consistency of the TAIS attention subscales. Using a sample of amateur tennis players, Van Schoyck and Grasha (1981) found that the attention subscales of the T-TAIS had better internal consistency values compared with the TAIS [ranging from $\alpha$ = .16 (RED) to $\alpha$ = .83 (NAR, OET and OIT) for the T-TAIS and $\alpha$ = .44 (RED) to $\alpha$ = .77 (OET) for the TAIS]. For the TAIS, the RED, INFP, OIT and BET subscales

all showed internal consistency values below .70. Using a sample of college baseball/softball players, Albrecht and Feltz (1987) found alpha coefficients for the attention subscales of the TAIS ranged from $\alpha$ = .13 (RED) to $\alpha$ = .76 (OET) and $\alpha$ = .50 (RED) to $\alpha$ = .85 (OET) for the B-TAIS measure. All subscales but the OET subscale on the TAIS had α values below .70. None of the internal consistency coefficient differences between the TAIS and B-TAIS were significantly different. Using a sample of basketball players, Summers et al. (1991) found that the BB-TAIS had higher alpha coefficients than the original TAIS on every subscale [ranging from $\alpha$ = .66 (NAR) to $\alpha$ = .83 (OET) for the BB-TAIS and $\alpha$ = .24 (OIT) to $\alpha$ = .76 (OET) for the TAIS)]. For the TAIS, the OIT, BET, NAR and RED subscales had α coefficients less than .70. Using a sample of first year undergraduate psychology students, Ford and Summers (1992) found that all TAIS attention subscales except for OET had internal consistency coefficients lower than .70 [α = .58 (RED) to α = .72 (OET)].

Each of these studies used a Cronbach alpha value of .70 and above as a guide in evaluating adequacy of coefficients obtained. Using this guide, Summers et al's (1991) results indicate that one BB-TAIS attention subscale (NAR) and four of the TAIS attention subscales (OIT, BET, NAR and RED) do not show adequate internal consistency. Albrecht and Feltz's (1987) results indicate that only one TAIS attention subscale is acceptable (OET) and only three B-TAIS attention scales are acceptable (OET, OIT and NAR). Van Schoyck and Grasha's (1981) results indicate that the RED, INFP, OIT and BET subscales of the TAIS and the RED subscale of the T-TAIS display poor internal consistency. Ford and Summers' (1992) results show that all attention subscales except for the OET subscale show inadequate internal consistency.

In summary, the research presented in this section highlights that, while some of the TAIS attention subscales display adequate test-retest properties, the RED and

NAR subscales consistently did not. Therefore the stability of these subscale scores over time needs to be questioned. The internal consistency of many of the TAIS attention subscales also needs to be questioned. In a theoretical sense, internal consistency should always be higher than test-retest reliability for any test because internal consistency is evaluated from one sample that completed the test at one particular time whereas test-retest reliability is evaluated from the same sample who took the test on two particular occasions. Therefore another source of error is introduced into the test-retest sample compared with the internal consistency sample. This pattern is not evident for the TAIS attention subscales; its test-retest reliability is better than its internal consistency. This indicates that there is a considerable lack of internal consistency in some of the attention subscales. Poor internal consistency indicates that the items in the scale are not homogenous (i.e., they are not measuring a single trait only) therefore the poor internal consistency values found for the TAIS attention subscales may reflect that some of the items in the scales may not be measuring the attention trait that they should be measuring.

### *TAIS Construct Validity - Group Differences*

One way to display that a test has construct validity is to show that the test scores vary across distinct groups as predicted by theory or past research (Cohen & Swerdlik, 2002). Research has indicated that different groups score differently on the TAIS. DePalma and Nideffer (1977) found that psychiatric patients scored significantly higher compared with medical inpatients on the OET, OIT and RED attention subscales. Schizophrenic patients with good premorbid adjustment scored higher than schizophrenic patients with poor premorbid adjustment on the OET subscale and lower on the NAR subscale. These findings were predicted from theory

and previous research with regards to psychiatric patients and their attentional capabilities.

Further group differences were found by Albrecht and Feltz (1987). They compared scores on the TAIS attention subscales found by Nideffer (1976) for college students with those found in their sample of softball/baseball players. The profile was similar across the two populations except for the NAR subscale, with the baseball/softball players scoring higher on this scale. The profile for the B-TAIS attention scores for the baseball/softball players also show this pattern but the higher NAR score is even more pronounced. This was expected as it was assumed that baseball/softball players would need to use a narrow attentional style in order to hit a ball being pitched at them.

Athletes from different sports also score differently on the TAIS. Using discriminant function analysis, Nideffer (1990) found that the TAIS scores could discriminate certain groupings of athletes with 50.5% accuracy. If classification were to happen by chance, 33% accuracy would be expected therefore the TAIS scores are classifying better than chance. He found that closed skill athletes (e.g., divers) tended to be score higher on the INT and NAR subscales and less on the EXT and OET subscales. Open skill athletes (e.g., wrestlers) scored higher on the P/O and CON subscales and athletes from team sports (e.g., volleyballers) scored higher on the EXT and BET subscales and lower on the BIT subscales. The attention differences across the three categories were predicted from Nideffer's (1976) theory of attentional style. The personality differences were predicted from previous research that highlights that introversion and extroversion can discriminate athletes from different sports.

Nideffer, Bond, Cei, and Manili (2003) investigated whether TAIS scores for multiple Olympic/World Championship medal athletes were significantly different than

single medal winners. ANOVA procedures found that multiple winners tended to score significantly higher on NAR and significantly lower on the BIT and BET subscales compared with single medal winners. They also found that multiple medal winners tended to score higher on the RED subscale compared with single medal winners and single medal winners tended to score higher on the OIT subscale compared with multiple medal winners. They also found that multiple medal winners tend to score higher on the CON and INFP subscales and lower on the EXT subscale compared with single medal winners. All of these findings were expected on basis of previous literature that highlights the attentional and interpersonal characteristics of world class performers.

Significant gender differences have also been found on the TAIS. Nideffer and Bond (2003) found that males score significantly higher on the BIT subscale compared with females. Females also had significantly higher scores on the OIT and OET subscales compared with males. These finding were found across different sporting types and across several cultures (including Australia, United States, Canada and Spain). These differences were expected on the basis of previous research and theory. In a literature review, Nideffer (2007) concluded that the perceptual skills of males tend to be more analytical and they process information in a logical manner (hence the need for broad internal attention), whereas women tend to detect their own thoughts and feelings, they try to read people and try to absorb contextual cues (hence the likely overload).

In summary, the research presented here indicates that the TAIS measure is able to discriminate between different subgroups and different athletic subgroups in accordance with previous research and theory. These findings lend support to the construct validity of the TAIS.

*TAIS Construct Validity – Factorial Validity*

One way to show that a particular measure displays construct validity is demonstrate that the test items band together into predicted factors - which is known as factorial validity (Cohen & Swerdlik, 2002). Nideffer's (1976) theory of attentional style was used as a basis for creating the attention items of the TAIS. Therefore when reducing the attention subscale scores into factors, two distinct factors should appear, one that represents bandwidth (broad to narrow) and another that represents direction (internal to external). Van Schoyck and Grasha (1981) found two factors to be evident when conducting a factor analysis on the attention subscale scores for the TAIS and the tennis specific T-TAIS. The BET, BIT and INFP subscales linked into one factor which they interpreted as the "broad" or "scan" factor. The OIT, OET and NAR subscales linked into the other factor which they interpreted as "overload or narrow" or "focus". The scan and focus names come from Wachtel's (1967) theoretical conceptualisation of attention. Van Schoyck and Grasha also found that that the RED subscale loaded on a factor of its own, but the eigenvalue for this factor indicated that it should not be considered as a factor on its own. An appropriate follow up analysis that Van Schoyck and Grasha could have done would have been to force a two factor solution to check on which factor the RED scale would have loaded onto in a two factor solution. There was no indication in their paper that this was done.

Van Schoyck and Grasha (1981) concluded that their results highlight that the TAIS seems to measure the bandwidth dimension (narrow to broad), but fails to measure the direction dimension (internal to external). Van Schoyck and Grasha believe this occurs because the items (on both the TAIS and T-TAIS) that assess the direction dimension do not measure just direction, they also measure bandwidth. Positive correlations presented between the BET and BIT subscales and the OET

and OIT subscales indicate that the direction dimension is not the common factor between the scores, the bandwidth dimension is. If the direction dimension was the common factor between the scales, the correlations for these pairs would be negative. Van Schoyck and Grasha concluded that the bandwidth dimension probably dominates a person's interpretation of these items.

Summers and Ford (1990) found a similar two factor structure to Van Schoyck and Grasha (1981) when factor analysing the attention subscale scores across three different sporting populations (cricketers, fencers and basketball players). The first one contained BET, BIT and INFP plus a negative loading for RED indicating an interpretation of scanning ability. The second contained OET, OIT and RED indicating poor focus. The third factor had different subscales loading depending upon type of population, although NAR was in each solution in the third factor indicating ability to effectively narrow attention. Summers et al. (1991) also replicated the factor structure found by Summers and Ford on a sample of basketball players. These factors again appear to be supporting the notion that the bandwidth dimension is being measured by the TAIS to a greater degree, compared with the direction dimension.

The TAIS proposed that six attention subscales are being measured, therefore, six factors would be expected when the attentional items are reduced into factors using techniques such as principle components analysis and factor analysis. Ford and Summers (1992) used multidimensional confirmatory factor analysis to verify this. The first model tested was that the items would load into the six attention subscales and the subscales would be uncorrelated with each other. This model directly tests if the items that make up the six subscales actually fit into their proposed subscales and tests if the subscales are independent from each other. Goodness of fit measures indicated that this model did not fit the data. They also

found that the factor loadings on each subscale were generally low and in some cases, below the recommended .3 cut-off indicating that some items do not have a meaningful relationship with their corresponding subscale. These results do not support the six factor structure for the attention items of the TAIS. These findings along with the findings of Summers and Ford (1990), Summers et al. (1991) and Van Schoyck and Grasha (1981) indicate that the factorial validity of the TAIS attention subscales should be questioned.

In Nideffer's (1976) original paper on the TAIS, it was concluded that while the subscales may be correlated, the degree of overlap between scales was minimal therefore most of the items were not redundant in the measure. Research conducted since disagrees with this conclusion. Albrecht and Feltz (1987) found that 48% of the attention items on the TAIS correlated better with attentional subscales other than the one it was proposed to be a part of. This figure is higher than the figure found by Nideffer (1976) but two different methods were used to arrive at these figures. The method used by Nideffer was explained previously. Ford and Summers (1992) found that 44% of the attention items on the TAIS correlated better with attentional subscales other than the one it is proposed to be a part of. These figures indicate considerable item-scale overlap indicating that the scales and items have some major inadequacies with regards to measuring what it purports to measure.

Nideffer (1990) indicated that some of the subscales would be correlated because they are measuring conceptual components of the same natural attentional phenomenon. In order to demonstrate this, Ford and Summers (1992) stated that differential validity was needed. Differential validity is achieved by showing that items are placed only on a scale if they correlate less with scales other than the one it is proposed to belong to. If moderate to large correlations continue to exist, it can be inferred that the correlation is due to natural phenomena, not measurement error.

Ford and Summers indicated that this could not be concluded for the TAIS attention subscales for many reasons, one being that many of the items seem to be placed in the wrong subscale or confuse the direction dimension which lends credence to why this dimension is not adequately measured, e.g., Item 51 reads “In games, I make mistakes because I am watching what one person does and forget about the others”. Ford and Summers highlight that this item appears to be measuring an external attention process (vision) indicating that it should be scored on the BET subscale; however this item is scored on the BIT subscale.

Another reason why differential validity cannot be inferred for the TAIS attention subscales is because some items are scored in the same direction on two different scales indicating that diametrically opposed concepts are being measured by the same item (Ford & Summers, 1992), e.g., Item 69 reads “I have a tendency to get involved in a conversation and forget important things like a pot on the stove, or like leaving the motor car running”. Ford and Summers indicated that this item is scored on the OIT and RED scale in the same direction implying that an individual is forgetting things because they are overloaded, with too many cues to pay attention to (OIT), but at the same time, they are also paying attention to too few. These measurement errors mentioned above can lead to inflated item-scale correlations implying measurement redundancy. These findings along with the findings of Albrecht and Feltz (1987) indicate that measurement redundancy is present in the TAIS attention subscales which may be hindering their factorial validity properties. Item-scale and inter-scale correlations found for the TAIS attention items and scales may not be an accurate reflection of the true relationship properties, therefore hindering any analysis that tries to summarise the relationships between items and scales (e.g. factor analysis). This redundancy could also be the reason why the internal consistency of many of the attention subscales is below acceptable levels.

*TAIS Construct Validity – Relationships with Other Test Scores*

Another way to demonstrate the construct validity of a measure is to show that the scores correlate with scores from another test in accordance with the predictions of theory (Cohen & Swerdlik, 2002). Nideffer's (1976) theory of attentional style predicts that as arousal (in the form of anxiety) increases, individuals will tend to narrow their attention too much and will become overloaded by their own feelings and thoughts. Extrapolating from this theory, the attention subscale of RED and OIT should be positively correlated with anxiety scores. Nideffer found evidence to support this in his 1976 study but evidence to support this was also found in a previously unpublished study. Nideffer, Wolfe, and Wiens (1975, cited in Nideffer & Pratt, 1982) compared TAIS subscale scores with the state and trait anxiety scores of the State-Trait Anxiety Inventory (STAI; Spielberger, Forsuch, & Lushene, 1970) and found that high state and trait anxiety score were significantly associated with high OIT subscale scores ($r$ = .31 for trait anxiety and $r$ = .36 for state anxiety) and RED subscale scores ($r$ = .49 for trait anxiety and $r$ =.48 for state anxiety).

However, studies done by Albrecht and Feltz (1987) and Summers et al. (1991) since have not been so supportive of the TAIS attentional scores' theoretical link with anxiety scores. Albrecht and Feltz found that the RED subscale score for both the TAIS ($r$ = .39) and the baseball/softball-specific B-TAIS ($r$ = .45) were significantly correlated with the overall score on the Sports Competition Anxiety Test (SCAT; Martens, 1977). A significant relationship was also found between the OIT subscale score on the B-TAIS ($r$ = .37) and overall SCAT. However, this was not found for the OIT subscale score of the TAIS ($r$ = .16). Significant positive correlations were found for the OIT subscale score of the B-TAIS and both the cognitive anxiety ($r$ = .42) and somatic anxiety ($r$ = .38) scores on a trait version of the Competitive State Anxiety Inventory (CSAI-2; Martens, Burton, Vealey, Bump, &

Smith, 1982). The OIT subscale score of the TAIS did not show these relationships (for somatic anxiety, *r* = .13; for cognitive anxiety, *r* = .06) neither did the RED subscale score (for somatic anxiety, *r* = -.11; for cognitive anxiety, *r* = -.01).

Summers et al. (1991) found similar findings to Albrecht and Feltz (1987); the RED subscale score of the TAIS (*r* = .24) and the RED (*r* = .31) and OIT (*r* = .41) subscale scores of the basketball-specific BB-TAIS significantly correlated with the overall score on the SCAT. They also found significant positive correlations for the OIT and RED subscale scores on the BB-TAIS with both the somatic anxiety (for OIT, *r* = .34; for RED, *r* = .49) and cognitive anxiety scores (for OIT, *r* = .49; for RED, *r* = .55) of the trait version of the CSAI-2. However, the RED and OIT subscale scores of the TAIS failed to significantly correlate in the predicted directions (for somatic anxiety: OIT, *r* = .15; RED, *r* = .06; for cognitive anxiety: OIT, *r* = -.11; RED, *r* = .07). These findings do not entirely support the construct validity of the TAIS attention subscales as attention scores do not correlate with anxiety scores as the Nideffer's (1976) theory of attentional style would predict.

Another way to show that a test has construct validity is to show that the test scores are related to scores from another test that measures a similar construct (Cohen & Swerdlik, 2002). Since some of the subscales of the TAIS measure personality characteristics, correlating its scores with a well known personality measure would demonstrate the construct validity of the TAIS. Nideffer (2003a) reported correlations between the TAIS scores and the Myers Briggs Type Indicator (MBTI; Myers, 1962) which support the construct validity of the TAIS. It was found that the higher individuals scored on the Extroversion direction of the MBTI, the higher they scored on EXT (*r* = .59) and PAE (*r* = .63) subscales, and the lower they scored on the INT (*r* = -.64) subscale. These associations fit with the MBTI's description of the extravert personality type. The higher individuals scored on the

Intuitive direction, the higher they scored on the BIT (*r* = .52), IEX (*r* = .39), CON (*r* = .34), and INT (*r* = .34) subscales which again fits well with the MBTI's description of the intuitive personality type. The higher an individual scored on the Thinking direction of the MBTI, the higher they scored on the INFP (*r* = .52), CON (*r* = .46), SES (*r* = .43) and IEX (*r* = .34) subscales. Individuals scoring high on this direction also scored lower on the RED subscale (*r* = -.52). These associations again fit well with the MBTI's description of the thinking personality type. But one cannot be too excited about these results because research has demonstrated on many occasions that the MBTI is a psychometrically poor test (e.g. Boyle, 1995). Comparing one's measure with a psychometrically poor test is not an ideal way to validate one's measure.

Since the TAIS measures attentional processes, it seems logical that the attention scores should be related to performance measures of attention. Turner and Gilliland (1977) compared the six attention subscale scores of the TAIS with scores on the Block Design and Digit Span subtests from the Wechsler Adult Intelligence Scale (WAIS; Wechsler, 1955). These measures were chosen because Digit Span requires a person to narrow their attention in order to complete the task and Block Design requires an individual to both broaden and narrow their attention. They found only one significant correlation (*r* = .29) between the BIT subscale score and Block Design. Turner and Gilliland concluded that performance measures of attention are not related to self-rated measures of attention therefore displaying a lack of construct validity. Since the TAIS attention scores had a sizeable relationship with anxiety scores (as displayed by Nideffer, 1976), Turner and Gilliland concluded that TAIS attentional subscales may have little construct validity independent of their association with anxiety.

Nideffer (1977) disputed Turner and Gilliland's (1977) findings for two reasons; one reason being that the Digit Span subtest is not a robust measure of attention. For the normal adult and college population, the distribution of Digit Span scores is skewed therefore less variation in scores is seen. Variation in Digit Span scores is apparent only in individuals who have lower intelligence scores. Because of this skewed distribution in the normal/college population, any correlation between Digit Span scores and TAIS attention subscale scores is likely to be weak at best (which is what Tuner and Gilliland found).

The second reason Nideffer (1977) highlighted for disputing the findings of Turner and Gilliland (1977) was on the basis of the population that was used to test the construct validity of the TAIS attention scores. Turner and Gilliland used a sample of college students; this population tends to produce skewed scores on a test like Block Design (which Nideffer acknowledged is a more robust measure of attention than Digit Span). Nideffer used a sample of Vietnam veterans with attentional, learning and behavioural problems unrelated to intelligence and police academy applicants with no reported attentional, learning and behavioural problems to test the construct validity of the TAIS. He combined these populations in order to limit the skewness of Block Design scores. Nideffer found significant correlations between five out of the six TAIS attention scores in the predicted directions (the BIT and NAR subscale scores positively correlated, the BET subscale score was in the right direction but not significant and the OET, OIT and RED subscale scores negatively correlated). Nideffer concluded that these results support the construct validity of the TAIS attention subscales.

In summary, inconsistent findings discussed in this section indicate that the TAIS attention subscales may not relate to other test scores as theory would predict therefore questioning the construct validity of the TAIS attention scales. When

considering all evidence on the construct validity of the TAIS attention subscales (as discussed in previous subsections), the evidence generally threatens the validity of these scales. While the scales may discriminate different groups on the basis of theory and past research, they don't correlate with other test scores as theory would predict. Furthermore, poor factorial validity is also evident in the TAIS attention subscales.

### *TAIS Criterion-Related Validity (Predictive)*

Predictive validity is demonstrated by scores on a test being able to predict (on the basis on theory and past research) some criterion measure obtained at a future time (Cohen & Swerdlik, 2002). Many of the studies looking at the predictive validity of the TAIS have attempted to demonstrate if scores on the TAIS can predict various performance skills (as the TAIS claims to measure the skills necessary for performance) or different skill levels in a particular sport.

Four studies have investigated the predictive validity of the TAIS attention subscales. Vallerand (1983) created a French version of the TAIS attention subscales in order to test if attentional style can predict whether a basketball player can be classified as being a good, average or poor decision maker when on the field. Based on previous research and theory, good decision makers (relative to average and poor decision makers) would score higher on the BET, BIT, NAR and INFP subscales and lower on the OET, OET and RED subscales. Results indicated that none of the TAIS attention subscales were able to differentiate between the three decision making groups. Vallerand highlighted that these null findings are not because the TAIS items were translated into French; in the same study, Vallerand evaluated the French TAIS and found that it had a similar factor structure (with the exception of NAR loading onto the "scan" factor and not the "focus" factor) and inter-

scale correlation patterns as Van Schoyck and Grasha (1981). Vallerand concluded that these results do not support the predictive validity of the TAIS attention subscales.

Albrecht and Feltz (1987) investigated whether the baseball/softball-specific B-TAIS and the original TAIS were related to batting performance statistics. The authors hypothesised that batting performance would be related to NAR subscale scores because the ability to narrow attention and focus on the ball is a skill softball and baseball players should have. A positive correlation was found for the NAR subscale score of the B-TAIS and batting performance; however this correlation did not reach significance. Contrary to prediction, a negative correlation was found for the NAR subscale score of the TAIS and batting performance. They also found that the effective attention subscales on the B-TAIS (NAR, BIT and BET) were all positively related to batting performance as predicted (the BIT and BET subscale scores were the only correlations that reached significance). The NAR, BIT and BET subscale scores of the TAIS were negatively correlated with these scales. As predicted, the ineffective attention subscales (RED, OET and OIT) were all negatively correlated with batting performance for both the TAIS and B-TAIS. Albrecht and Feltz concluded that the psychometric properties of the sports specific B-TAIS measure displayed better predictive validity properties than the original TAIS. However, the predictive validity properties of the B-TAIS are not great either.

Summers et al. (1991) indicated that all attention subscales would be relevant to basketball players because the sport demands different attentional requirements during different parts of the game. Therefore, the subscales should be able to discriminate individuals at different skill levels in the sport. Summers et al. found that their basketball-specific BB-TAIS was superior to the original TAIS at differentiating different basketball skill levels. Factor scores (the SCAN factor score which consisted

of the BET, BIT and INFP subscale scores and the FOCUS factor score which consisted of the OET, OIT, NAR and RED subscale scores) were calculated and it was found that different basketball skill levels scored differently on the BB-TAIS SCAN score only. The difference was that advanced players scored higher than both beginner and intermediate players. Van Schoyck and Grasha (1981) also found that their tennis-specific T-TAIS attention subscales were able to differentiate among different skill levels better than the TAIS subscales. The T-TAIS subscale scores that make up the “broad” factor (BET, BIT and INFP) increased with increasing skill level whereas the T-TAIS subscale scores that make up the “narrow or focus” factor (OIT, OET and NAR) did not differentiate the groups. The TAIS subscale scores did not differentiate the different skill levels. These results further highlight that sport specific TAIS measures may have better predictive validity compared with the original version.

Nideffer (1987) believes that sports-specific tests have better predictive validity compared with general tests because of response sets. In tests that have more structure to them, like the sports-specific TAIS tests, response sets are less likely utilised by the respondent therefore minimising the error variance in the scores. Nideffer tested this by giving the TAIS to a group of elite divers on two occasions, once using the traditional instructions used by the test and the other time, using a specific sports related reference in the instructions. Participants were asked to relate the items to diving and compare themselves on each item to the average diver. If they thought they were average, they would rate themselves as ‘sometimes’ on that item. The hypothesis that correlations between performance and the TAIS subscales when using the sports-specific instructions would be higher was partially supported; only five significant correlations (three using the sport-specific instructions and two using the original TAIS) were found. While Nideffer claims that these results imply

that the predictive validity of a general measure like the TAIS increases when giving it a more structured sport-specific instruction set, three significant correlations out of a possible 17 doesn't sound like solid evidence to support such a claim therefore making his claim quite unconvincing.

In summary, the findings in this subsection indicate that the predictive validity of the TAIS may also need to be questioned. Sports-specific TAIS measures tend to show better predictive validity compared with the original TAIS. Ford and Summers (1992) indicate that while the sports-specific TAIS measures may have superior validity compared with the original, they are not an improved measurement of attentional style. This is because the sports-specific TAIS measures are made from the original TAIS measure which has been shown to have inadequacies in measuring its underlying measurement model (as discussed in the construct validity section).

### *Conclusion*

In summary, this literature review summarised the research evaluating the stress and injury model (Andersen & Williams, 1988). What was evident from the literature was that, while the history of stressors, coping resources and personality component of the model have been widely researched and supported by findings, relatively few studies have addressed the stress response component. These studies used laboratory techniques such as measuring peripheral vision narrowing which led to relevant findings but these types of measures are not cost and time effective, especially for the athletic population. Questionnaire measures such as the Positive States of Mind (PSOM) and the Test of Attentional and Interpersonal Style (TAIS) have been used as measures of the stress response and have provided promising findings with regards to predicting injury occurrence (more so for the PSOM than the

TAIS). Petrie and Falkstein (1998) also recommend questionnaire use in future research evaluating the stress component of the stress and injury model.

Why the TAIS attention scores are not predicting athletic injuries is puzzling because on face value, the TAIS attention scales measure mechanisms of attention that can be linked to the stress and injury model's theoretical explanations as to why attentional change is associated with injury (i.e. due to the narrowing of the visual field and having scattered attention). This warranted a thorough review of the psychometric properties of the TAIS. With regards to test-retest reliability, some of the TAIS attention subscales displayed adequate test-retest properties; however the RED and NAR subscales consistently did not. The internal consistency of many of the TAIS attention subscales were also below acceptable levels highlighting that some of the items may not be testing what they claim to measure. The construct validity findings were mixed. The TAIS scores discriminate different populations but the proposed factor structure (especially for the attention scales) was not validated by the research. Plus, mixed findings were found with regards to the TAIS attention scores link to anxiety scores as predicted by Nideffer's (1976) theory of attentional style. However, when comparing the TAIS with other instruments measuring similar constructs, results were positive. Findings also highlight that the predictive validity of the TAIS may also need to be questioned as sports-specific TAIS measures show better predictive validity properties compared with the original TAIS.

In conclusion, while the TAIS may have been recommended for use in injury prediction research (by Bergandi and Witting, 1988), the psychometric properties highlighted above are not optimal and at a standard that would be acceptable to the scientific community. The poor psychometric properties displayed by the TAIS are the likely reason why the scores on this test are not associating with athletic injury even though theoretically, it links very well with the stress and injury model. These

properties do not make the TAIS a good candidate for use in research. The injury prediction community agree also because the TAIS has not been used since Noun (1997) and was used once before that (by Bond, Miller & Chrisfield, 1988). The test needs major revisions before it can be considered for use in athletic injury prediction research again.

# CHAPTER TWO

## Introduction and Method for Study One – Psychometric Evaluation

### *Introduction*

In Chapter One, the psychometric properties of the Test of Attentional and Interpersonal Style (TAIS; Nideffer, 1976) were reviewed and it was concluded that the TAIS attention subscales may not be an appropriate measure to be used in research due to their poor internal consistency, construct validity and predictive validity. Nideffer himself has conceded, in many of his writings (e.g. Nideffer, 2007), that the psychometric properties of the TAIS may not be at a standard expected of a research measurement.

However, in recent years, Nideffer has been working on a revised TAIS measure, the Test of Attentional and Interpersonal Style 2 (TAIS2; Nideffer, n.d.). This measure has 124 items compared with the 144-item original TAIS and many of the items have been rephrased. The measure is still based on Nideffer's (1976) theory of attentional style; therefore the six attention subscales are still present in the TAIS2 measure as are the other nine interpersonal subscales and the two control subscales. The TAIS2 measures four additional interpersonal performance skills: self criticism, focus over time, performance under pressure and immersion. Table 4 contains a description of these four additional subscales. Nideffer (personal communication, March 15, 2007) indicated that the measure has not been evaluated in terms of its psychometric properties, but he expects that the scales will have better psychometric properties than the original TAIS scales.

The aim of the present study was to explore the psychometric properties, mainly the internal consistency and construct validity, of the TAIS2 using an undergraduate student sample. An undergraduate student sample was chosen for

Table 4

*Descriptions of the additional four subscales of the TAIS 2 (Nideffer, n.d.)*

| Subscale type | Subscale | Subscale description |
|---|---|---|
| Interpersonal | Self critical (DEP) | High scores reflect an individual who is more negative and self-critical |
| | Focus over time (FOT) | High scores reflect a an individual who is likely to set intermediate and long term goals, and is likely to then make the personal sacrifices needed in order to accomplish them |
| | Performance under pressure (PUP) | High scores reflect an individual is more comfortable when performing in situations that are high pressure. They also like to be in "the driver's seat" when the going gets tough |
| | Immersion (IMM) | High scores reflect a person who becomes completely absorbed in the activity that they are performing |

two reasons: (1) the undergraduate student population is readily available to any researcher therefore initial validation of any instrument can be done with more ease using this population, and (2) the TAIS2 is a measure of the skills that are needed for high level performance and can be used on various populations; students are expected to perform to a particular standard at university therefore the skills being measured by the TAIS2 are relevant to a student sample.

This study focused on the attention subscales (including the INFP subscale). Studies in the past have utilised Cronbach's alpha (α) as a way of evaluating the internal consistency of the attention subscales (e.g. Van Schoyck & Grasha, 1981) and this was the method of choice in this study. These studies have used an α level of .70 and above as indicating acceptable internal consistency and this value was also used as a guide in this study. In order to check the construct validity of the TAIS attention subscales, studies in the past have utilised factor analytic techniques to assess the factorial validity of the attention subscales (e.g., Ford & Summers, 1992) and have compared the subscales scores to measures of anxiety and personality that measure similar constructs (e.g., Albrecht & Feltz, 1987; Nideffer, 2003a). This study utilised similar methods except that the anxiety and personality measures used as a

comparison were different from that of previous research. Because the research sample in this study involved students, a general measure of anxiety (not a sport-specific measure) was utilised.

The personality measure of choice in this study was a scale measuring the "Big Five" personality traits. The reason a measure of these personality traits was used was because the five traits have theoretical links to the TAIS/TAIS2 subscales according to Nideffer (2003b). The surgency/extroversion trait (behaviours such as dominance, social presence, assertiveness, and a need for power) is expected to be associated with the CON, SES, P/O and IEX subscales. The emotional stability trait (behaviours such as calm, cool, steady, self confident, the opposite of anxious and insecure behaviour) is expected to be associated with the NAR, OET, BCON and NAE subscales. The agreeableness trait (behaviours such as cooperative, warm, good natured as opposed to aloof, distant, and cold) is expected to be associated with the EXT, PAE and INT subscales. The intellectance/openness trait (imaginative, cultured, curious, and broad minded) is expected to be associated with the BIT, BET, OBS and INFP subscales. Lastly, the conscientiousness trait (hard working, focused, and persevering as opposed to impulsive and not dependable) is expected to be associated with the FOT and PUP subscales.

Eight hypotheses were made. Since previous research indicates that the internal consistency and construct validity properties of the original TAIS are not at an acceptable level, it would be expected that the revised version of this measure (the TAIS2), which has been modified to rectify some of its weaknesses, would show better psychometric properties than its predecessor. But it is not enough to say that the TAIS2 is better than the original TAIS, one needs to demonstrate that it is a psychometrically sound measure. The hypotheses below present trends that would

need to be supported in order to show that the TAIS2 is a psychometrically sound instrument. The hypotheses are:

1. All seven attention subscales should show acceptable levels of internal consistency ($\alpha$ coefficient at .70 and above);
2. The seven attention subscales should reduce down to two higher-order factors reflecting the two attention dimensions reflected in Nideffer's (1976) theory of attentional style (bandwidth and direction);
3. The OIT and RED attention scores should correlate positively with scores from tests that measure increased arousal (e.g., anxiety);
4. The extroversion score measured by the "Big Five" personality measure will correlate positively with CON, SES, P/O and IEX scores from the TAIS2;
5. The emotional stability score measured by the "Big Five" personality measure will correlate positively with the NAR score from the TAIS2, and negatively with OET, BCON and NAE scores from the TAIS2;
6. The agreeableness score measured by the "Big Five" personality measure will correlate positively with the EXT and PAE scores from the TAIS2 and negatively with INT score from the TAIS2;
7. The intellectance score measured by the "Big Five" personality measure will correlate positively with the BIT, BET and INFP scores from the TAIS2 and negatively with OBS score from the TAIS2; and,
8. The conscientiousness score measured by the "Big Five" personality measure will correlate positively with the FOT and PUP scores from the TAIS2.

## *Method*

### *Participants*

One hundred and nineteen undergraduate students participated in this research study. Participants were approached during their tutorial classes and lectures by the investigator. The students were not rewarded for their participation. This research study was approved by the RMIT University Human Research Ethics Committee (Reference Number: BSETAPP 05 – 08 VASSOS).

The demographic characteristics of the sample are described in Tables 5, 6 and 7. The most represented cultural background is Anglo-Australian (*n* = 77) followed by European (*n* = 19). The least represented cultural background is African (*n* = 3). The West Asian participants had the lowest mean age (18.50 years) and the African participants had the highest mean age (24.67). The African participants also had the lowest mean education level (9.67 years) with Anglo-Australian participants having the highest mean education level (14.99 years). There were more females in the sample compared with males however the average male participant was two years older than the average female participant (24.38 years compared with 22.24 years). Males and females had very similar levels of education (14.60 and 14.62 years respectively). The research sample contains no male participants from the African or Middle Eastern cultures.

### *Materials*

The first measure utilised was the Test of Attentional and Interpersonal Style 2 (TAIS2; Nideffer, n.d.) which is the measure under psychometric evaluation in this research study. The TAIS2 contains 124 self-report items that measure 21 skills that are deemed important for high level performance in any domain. These skills include:

Table 5

*Frequency distribution table of gender and cultural background*

| Cultural background | Males | Females | Total |
|---|---|---|---|
| Anglo-Australian | 13 | 64 | *n* = 77 |
| Asian (East) | 2 | 7 | *n* = 9 |
| Asian (West) | 1 | 3 | *n* = 4 |
| European | 5 | 14 | *n* = 19 |
| African | 0 | 3 | *n* = 3 |
| Middle Eastern | 0 | 7 | *n* = 7 |
| Total | *n* = 21 | *n* = 98 | N = 119 |

Table 6

*Mean (SD) age by gender and cultural background*

| Cultural background | Males | Females | Total |
|---|---|---|---|
| Anglo-Australian | 26.62 (9.85) | 22.50 (5.81) | 23.19 (6.76) |
| Asian (East) | 20.50 (0.71) | 21.14 (1.57) | 21.00 (1.41) |
| Asian (West) | 19.00 (-) | 18.33 (0.58) | 18.50 (0.58) |
| European | 21.20 (2.49) | 22.07 (4.71) | 21.84 (4.19) |
| African | - | 24.67 (4.62) | 24.67 (4.62) |
| Middle Eastern | - | 22.00 (5.48) | 22.00 (5.48) |
| Total | 24.38 (8.26) | 22.24 (5.31) | 22.62 (5.95) |

*Note.* First number represents the mean, standard deviation in the bracket, (-) represents no value able to be calculated.

Table 7

*Mean (SD) education level (in years) by gender and cultural background*

| Cultural background | Males | Females | Total |
|---|---|---|---|
| Anglo-Australian | 14.35 (3.50) | 15.09 (2.53) | 14.99 (2.70) |
| Asian (East) | 14.00 (1.41) | 14.29 (1.80) | 14.22 (1.64) |
| Asian (West) | 13.00 (-) | 13.33 (0.58) | 13.25 (0.50) |
| European | 15.30 (3.23) | 14.39 (1.98) | 14.63 (2.31) |
| African | - | 9.67 (4.62) | 9.67 (4.62) |
| Middle Eastern | - | 13.86 (1.95) | 13.86 (1.95) |
| Total | 14.60 (3.14) | 14.62 (2.56) | 14.62 (2.66) |

*Note.* First number represents the mean, standard deviation in brackets, (-) represents no value able to be calculated.

attentional skills (broad external awareness, external distractibility, broad internal awareness, internal distractibility, narrow-focused attention, reduced attentional flexibility), behaviour control skills (control, impulsive/non-conforming), interpersonal skills (information processing, self esteem, physical competitiveness, speed of decision, extroversion, introversion, expression of thought/ideas, expressions of criticism/anger, expression of support/affection, self criticism, focus over time, performance under pressure) and immersion. The information processing subscale is also considered an attention subscale. Each item is rated on a 5-point Likert scale ranging from 1 (Never) to 5 (Always). Scoring is completed by Enhanced Performance Systems, which is owned and run by Robert Nideffer (the author of the TAIS2). Subscale scores are reported in the form of percentiles. The TAIS2 is a revised version of the original 144-item Test of Attentional and Interpersonal Style (TAIS; Nideffer, 1976). The psychometric properties of the original TAIS have been discussed in detail in Chapter One of this thesis.

In order to demonstrate the construct validity of the TAIS2, scores on the TAIS2 need to be compared with test scores from instruments that measure similar constructs or that are theoretically linked to the scores. Two instruments were used as comparison measures. The first was the shortened version of the Depression, Anxiety, and Stress Scale (DASS-21; Lovibond & Lovibond, 1995). This scale assesses depression, anxiety and stress symptoms reported by the respondent over the past week. The DASS-21 contains 21 self-report items that are rated on a 4-point Likert scale ranging 0 (Did not apply to me at all) to 3 (Applied to me very much, or most of the time). Three subscale scores are calculated: depression, anxiety, and stress. The subscales of depression, anxiety, and stress have acceptable reliability properties with Cronbach α values of .94, .87 and .91 respectively (Antony, Bieling, Cox, Enns, & Swinson, 1998). Also, it has been reported by Antony et al. that the

shortened 21-item version has better psychometric properties than the original 42-item version.

The second instrument used to demonstrate the construct validity of the TAIS2 was a self report personality inventory. The inventory was created by Goldberg (2001b) using 50 items chosen from his International Personality Item Pool. The 50 items are divided into five subscales that measure the “Big Five” personality traits of extroversion, agreeableness, emotional stability (the polar opposite of neuroticism), conscientiousness, and intellectance/imagination (more commonly known as openness). Individuals rate each item on a 5-point Likert scale ranging from 1 (very inaccurate) to 5 (very accurate) according to how much the item accurately reflects the person they are. Goldberg (2001a) reports that for the 50-item inventory, the five subscales and the overall total score have adequate internal consistencies with Cronbach α values of .87 (extraversion), .82 (agreeableness), .86 (emotional stability), .79 (conscientiousness), .84 (intellect/imagination) and .84 (total score). Goldberg (1999) demonstrated that the scores on all IPIP subscales (not just the five used in this study) correlate highly (mean *r* = .73) with subscale scores on the NEO Personality Inventory (NEO-PI-R; Costa & McCrae, 1992). These results demonstrate the acceptable construct validity properties for the IPIP subscales.

*Procedure*

The three measures utilised in this research study were collated into a questionnaire booklet (Appendix B). Students who were approached and volunteered to be part of the research were given a questionnaire booklet and a Plain Language Statement (PLS) (Appendix C). Students were instructed to read the PLS before completing the questionnaire and to keep this statement for their future reference. No consent form was used in this study; return of the questionnaire was taken as

consent to be part of the research. Students were given as much time as needed during their lecture or tutorial to complete the questionnaire booklet. Students returned questionnaire booklets to the investigator by handing them to their lecturer or tutor directly or by placing them in a box or envelope located near the administration office of the Discipline of Psychology, RMIT University.

*Statistical Analysis*

Cronbach alpha coefficients (*α*) were used to evaluate the internal consistency of the attention subscales of the TAIS2. According to Cohen and Swerdlik (2002), this coefficient is appropriate for use on test items that are scored along a range of values bigger than two; the TAIS2 items are scored on a 5-point Likert scale making this coefficient appropriate for use in this study. No statistical assumptions are in place for calculating this coefficient. Cohen and Swerdlik describe this coefficient as the mean of all possible split half correlations. The formula for calculating coefficient α is:

$$r_\alpha = \left(\frac{k}{k-1}\right)\left(1 - \frac{\sum \sigma_i^2}{\sigma^2}\right)$$

where $r_\alpha$ is the alpha coefficient, $k$ is the number of items, $\sigma_i^2$ is the variance of one item, $\sum \sigma_i^2$ is the sum of the variances of each item and $\sigma^2$ is the variance of the total test scores.

Factor analysis is the statistical procedure of choice to evaluate the factor structure of the TAIS2 and hence demonstrate the construct (factorial) validity of the measure. Factor analysis procedures utilise correlations calculated between a set of variables (in this case, the attention subscale scores of the TAIS2) and the patterns seen in the correlations calculated are then summarised into a set of factors (Tabachnick & Fidell, 2007). Factor analysis requires large sample sizes, however a

minimum of five participants per variable analysed is sufficient to run factor analysis (Coakes, Steed, & Price, 2008). Since seven variables will be entered into the factor analysis, a minimum of 35 participants is needed; this study has 119 participants which is more than the minimum reported by Coakes et al. In a simulation study, Costello and Osborne (2005) found that 60% of samples that contained a participant to item ratio of 10 participants for every item entered into the factor analysis (10:1) uncovered correct factor structures. Seventy percent of samples with participant-item ratio of 20:1 uncovered the correct factor structure. The participant to item ratio in this study is 17:1 indicating that the obtained sample has a good chance of uncovering a valid factor structure. The other statistical assumptions of factor analysis are linear relationships between the variables, minimal outliers, minimal multicollinearity and a correlation matrix that contains many correlations in excess of .3 (Coakes et al., 2008).

Many factor extraction methods are available; one such method is the maximum likelihood extraction method. This method estimates population factor loadings values by calculating loadings that maximise the likelihood of sampling the observed correlation matrix obtained from a sample of the population (Tabachnick & Fidell, 2007). This method is theoretically desirable and supported by the literature as being superior to other methods. Olsson, Troye, and Howell (1999) found in a simulation study that the maximum likelihood extraction was more likely to produce ‘true factor loadings’ compared with the generalised least squares extraction. Different rotation methods can also be used when conducting factor analysis; these are orthogonal rotations which do not allow factors to be correlated and oblique rotations which allow factors to be correlated (Tabachnick & Fidell, 2007). As Nideffer’s (1976) theory of attention style indicates that the attentional dimensions are independent of each other (therefore not correlated), an orthogonal rotation is

appropriate for use. The most commonly-used orthogonal rotation is the varimax rotation. For the reasons stated above, factor analysis using a maximum likelihood extraction and orthogonal rotation (varimax) was chosen to confirm if the TAIS2 attention subscale scores fall into two factors as predicted.

Pearson product-moment correlation coefficients between the TAIS2 subscale scores and the DASS-21 and IPIP personality scores are the statistic of choice to evaluate the hypothesised relationships between the TAIS2 subscale scores and anxiety and personality scores. These coefficients were chosen because they are the most frequently used measures of association between variables and they are independent of scale measurement and sample size (Tabachnick & Fidell, 2007). The statistical assumptions in place for Pearson coefficients are normally distributed scores on each variable, linear relationships occurring between the variables and homoscedasticity in variance between variables (Coakes et al., 2008). The formula for calculating a Pearson correlation coefficient is:

$$r = \frac{N\sum XY - (\sum X)(\sum Y)}{\sqrt{[N\sum X^2 - (\sum X)^2][N\sum Y^2 - (\sum Y)^2]}}$$

where $r$ is the Pearson correlation coefficient, $N$ is the total sample size, $X$ is a score on variable X, and $Y$ is a score on variable Y.

The data obtained from the 119 participants were analysed using SPSS for Windows, Version 17. Data obtained from the participants were screened prior to running the factor analysis procedure and calculating Pearson coefficients. This was done in order to confirm that the data did not violate the statistical assumptions of these procedures. None of the assumptions of factor analysis were violated by the attention subscale scores, therefore the full data set was used when running the factor analysis procedure. Scatter plots and correlation matrices indicated that no

outliers were present, the relationships between the variables were linear, multicollinearity was not an issue and many correlations above .3 were present.

Scores from six participants were removed from the data set prior to calculating the Pearson correlation coefficients because their scores on some of the variables of interest (e.g., the personality variables) were deemed to be outliers. All assumptions required for calculating Pearson correlation coefficients were met. Normality plots indicated that all variables, except for anxiety as measured by the DASS-21, did not violate the assumption of normality. A square root transformation was applied to the anxiety scores which reduced the positive skew and made the distribution appear normally distributed. After inspecting the scatter plots between the variables of interest, it was deemed that the assumptions of linearity and homoscedasticity were also satisfied.

The scoring on both the original TAIS and TAIS2 are copyright protected by their author. Therefore, in order to gain access to the items that make up the attention subscales of the TAIS2 (in order to conduct internal consistency analyses), the author of the TAIS2 placed certain restrictions on the investigator with regards to the reporting of TAIS2 items and what subscale they correspond to. This condition mainly influences how the internal consistency results are reported. Items will be talked about in very general terms with no item being identified either by item number or content type.

# CHAPTER THREE

## Results and Discussion for Study One – Psychometric Evaluation

### *Hypothesis One*

In order to test the first hypothesis of the study - which stated that all attention subscales of the TAIS2 will show acceptable internal consistency - Cronbach α coefficients were calculated for each attention subscale of the TAIS2. Table 8 contains these coefficients. This table also presents, for each subscale, the number of items which if deleted would increase α plus the range of α coefficients that would be obtained if α were calculated for the scale with one item left out at a time. All subscales apart from the BET, OET and NAR scales achieved an α coefficient above the acceptable level of .70. It should be noted that for the BET, OET and NAR subscales, removing any of the current items from the scale still does not allow the α to reach the .70 acceptable level. These results only partially support the first hypothesis of the study.

Table 8

*Cronbach α coefficients for the TAIS2 attention subscales plus the range of α coefficients if α were to be calculated for the scale with one item left out at a time*

| Scale | Standardised Cronbach α level | α range if α was calculated with one item left out at a time | Number of items that would increase α if the item were to be deleted |
|---|---|---|---|
| BET | .604 | [.528 , .627] | 1 |
| BIT | .768 | [.731 , .772] | 1 |
| OET | .610 | [.495 , .649] | 2 |
| OIT | .760 | [.705 , .753] | 0 |
| NAR | .623 | [.557 , .637] | 1 |
| RED | .724 | [.632 , .726] | 1 |
| INFP | .712 | [.665 , .705] | 0 |

This result is somewhat consistent with previous internal consistency results for the original TAIS. Van Schoyck and Grasha (1981) found that the BET, OET and NAR scales of the TAIS were below the 0.7 acceptable level which is the exact result found in this study. However, Albrecht and Feltz (1987) and Summers and Ford (1992) found that all TAIS attention subscales apart from the OET scale were below the acceptable level, and Summers et al. (1991) found that the OIT, BET, NAR and RED subscales were below the acceptable level. What these inconsistencies highlight is that the revised TAIS2 attention subscales appear to have better internal consistency properties than the original TAIS.

Ranges highlighted in Table 8 indicate that, for the BET, BIT, OET, NAR and RED subscales, deleting one or two items from these subscales may result in a higher α coefficient compared with when no items are deleted. Analysing the items pinpointed as being a poor fit for its corresponding scale can provide insight into what types of issues may be hindering the internal consistency of some of the TAIS2 attention subscales.

For the BET subscale, the item that would increase α if it were to be deleted is also an item that is also part of the BIT subscale. Removing this item from the BIT subscale would also lead to an increase in α. The fact that the item takes part in two different scales is apparent in the wording of the item. The item is very long and discusses two types of behaviour and asks the respondent to compare themselves on the two behaviours. The behaviours mentioned also seem to be measuring internal attention processes and correlations support this; the item significantly correlated better with the OIT ($r$ = .259) and BIT subscales ($r$ = .274) compared with the BET scale ($r$ = .169) which measure external attention processes.

For the OET subscale, two items are indicated as increasing α if they were to be deleted from the subscale. The wording of these items indicates that the items

appear to be measuring external distractibility and correlations indicate that these items significantly correlate highest with the OET scale. But one item also significantly correlates with the OIT subscale (*r* = .363) and RED subscale (*r* = .355). Conceptually, the OET, OIT and RED subscales are related because they represent maladaptive attention styles. Therefore this particular item may be measuring broad maladaptive attention compared with just external distractibility.

For the NAR subscale, one item is pinpointed as increasing α if it were to be deleted from the subscale. It must be stated that minimal increase in α would occur if this item were to be deleted. The reason for this item being a poorer fit in this subscale is because it doesn't significantly correlate with the NAR subscale (*r* = -.103). However, the item significantly correlates with the BET (*r* = .322), BIT (*r* = .315) and INFP subscales (*r* = .225). This pattern of correlations becomes clear when analysing the wording of the item. The item discusses a behaviour of seeking out broad stimulation from a situation (hence larger correlations with the BIT, BET and INFP subscales) and not wanting to focus on a narrow part of the situation (therefore low negative correlation with the NAR subscale).

For the RED subscale, one item is indicated as increasing α if it were to be deleted from the subscale, but again a minimal increase in α would occur if the item were to be deleted. While this item correlates significantly with the RED subscale (*r* = .525), the item also significantly correlates with the OIT subscale (*r* = .473). The wording of the item indicates a specific behaviour of reducing focus and the reduced focus is because of becoming distracted by an internal process. This explains why this pattern of correlations was found. But going back to the definition of the RED subscale, it highlights that people have a reduced focus because they get stuck in either an internal or external focus. Therefore, the items on this scale would be expected to correlate with the OIT and OET subscales. This is evident from the

correlation matrix (which cannot be reported for reasons stated in the Method section of this study).

In summary, these results highlight that the internal consistency of the TAIS2 attention subscales are an improvement on the original TAIS' internal consistency. While improvement has been made, some subscales still exhibit internal consistency values below the acceptable .70 level. Item analysis highlights that this may be occurring because items appear to be measuring multiple concepts, not just a single concept. This is apparent from the wording of certain items and from item-attention subscale correlations. Future versions of the TAIS should rectify this issue by making sure that the content in each item is measuring only one specific behaviour or subscale, not multiple behaviours or subscales.

### *Hypothesis Two*

In order to test the second hypothesis of the study - which stated that the attention subscales of the TAIS2 will reduce into two factors, one reflecting bandwidth (narrow and broad) and the other reflecting direction (internal and external) – factor analysis was conducted on the seven attention subscale scores. The factorability of the attention subscale score correlation matrix was assessed by two statistics: the Kaiser-Meyer-Olkin measure of sampling adequacy and the Bartlett test of sphericity. For this analysis, the Kaiser-Meyer-Olkin was .665 which is above the .60 acceptable cut-off value (Coakes et al., 2008). In addition, the Bartlett test returned a significant chi-square value ($p < .001$) indicating that the correlation matrix is factorable.

Table 9 presents the results of the factor analysis conducted on the attention subscale scores using a maximum likelihood extraction and varimax rotation. Two factors with eigenvalues greater than 1.0 were extracted accounting for 58.53% of the variance in the TAIS2 attention subscale scores. The goodness-of-fit test

returned a non-significant result, $\chi^2$ (8) = 7.95, $p$ = .44, indicating that the correlation matrix reconstructed by the factor analysis procedure is not significantly different from the correlation matrix obtained from the data. Osborne and Costello (2005) state that variables with high communalities (loadings) and with no cross loadings on other factors, plus many variables loading strongly on each factor represent strong data for factor analysis. When strong data is present, smaller sample sizes (such as the sample used in this study) can produce accurate and valid results. The factor solution represented in Table 9 shows two factors that contain several attention subscale variables with moderate to high communalities. It also shows no attention subscale variable is loading onto multiple factors. This implies that the factor analysis result obtained is most likely valid and accurate.

Table 9

*Factor analysis results for the seven TAIS2 attention subscales*

| Scale | Factor 1 | Factor 2 |
|---|---|---|
| OIT | .13 | **.99** |
| RED | .04 | **.85** |
| OET | .02 | **.47** |
| INFP | **.92** | .02 |
| BIT | **.77** | .10 |
| BET | **.61** | .04 |
| NAR | **.58** | .05 |
| Eigenvalue | 2.71 | 1.99 |
| Percentage of variance accounted for | 28.88 | 29.65 |
| Cumulative variance accounted for | 28.88 | 58.53 |

*Note.* Loadings presented are from the rotated factor matrix. Loadings presented in bold indicate loadings above .30.

From Table 9, it is evident that the OIT, OET and RED subscales loaded together onto one factor (Factor 1) with the INFP, BIT, BET and NAR subscales loading onto the other factor (Factor 2). Factor 1 appears to measuring maladaptive attention styles of overload and inability to shift focus (OET, OIT and RED) which

implies a narrow band of attention and Factor 2 appears to be measuring adaptive attention styles like broad awareness, ability to narrow focus when needed and quick information processing (INFP, BIT, BET and NAR) which implied broader focus. What is evident from this result is that the two dimensions of attention (bandwidth and direction) are not appearing as factors therefore the underlying model that the TAIS2 intends to measure is not actually being measured by the instrument. Correlations found between the subscale scores also support the notion that bandwidth is the only dimension evident in the TAIS2. These correlations are presented in Table 10. Significant positive correlations between the BIT and BET subscales scores ($r$ = .48) and the OIT and OET subscale scores ($r$ = .47) indicate that the bandwidth dimension is the common factor between these scores; the correlations would be negative if the direction dimension was the common factor between the scores.

Table 10

*Inter-scale correlations for the TAIS2 attention subscales*

| Subscale | BIT | BET | OIT | OET | NAR | RED | INFP |
|---|---|---|---|---|---|---|---|
| BIT | - | | | | | | |
| BET | .48** | - | | | | | |
| OIT | .19* | .11 | - | | | | |
| OET | .043 | .11 | .47** | - | | | |
| NAR | .43** | .341** | .20 | .022 | - | | |
| RED | .070 | .014 | .85** | .37** | .12 | - | |
| INFP | .707** | .55** | .13 | .016 | .55** | .057 | - |

* $p < .05$. ** $p < .01$.

The factor analysis and inter-scale correlation findings for the TAIS2 do not lend support the second hypothesis of this study. Only the dimension of bandwidth is evident because the two factors found are measuring the poles of the bandwidth dimension (broad attention and narrow attention which is adaptive and overload and inability to shift focus because of an extremely narrow focus which is maladaptive).

This result is consistent with the results of Van Schoyck and Grasha (1981), Summers and Ford (1990) and Summers et al. (1991). These studies all concluded that the TAIS measure is not measuring both the direction and bandwidth dimension of attention, it is measuring only the bandwidth dimension.

The factor structure found for the TAIS2 is somewhat consistent with the factor structures found by Summers and Ford (1990) and Summers et al. (1991) for the original TAIS. These studies both found that the INFP, BIT, BET subscales of the original TAIS fall into one factor and the OIT, OET and RED scale fall into another factor which is consistent with the TAIS2 factor structure reported here. The only difference was the placement of the NAR scale. This study found that the NAR scale should be placed in the factor containing the INFP, BIT and BET subscales, whereas Summers et al. and Summers and Ford found that it should be placed in a factor on its own. The factor analysis result found in this study is also somewhat consistent with the result reported by Van Schoyck and Grasha (1981) who found that the BIT, BET and INFP subscale scores of the TAIS load on one factor and the OET, OIT and NAR subscale scores load on the other factor. They found that the RED subscale score represents a factor on its own, but the eigenvalue found for the factor indicated that it should not be considered as a separate valid factor.

These inconsistencies appearing in the factor structures may be occurring for many reasons. One reason may be due to populations sampled. This study, along with Summers and Ford (1990), used a sample of undergraduate students, whereas Van Schoyck and Grasha (1981) used a sample of tennis players and Summers et al. (1991) used a sample of basketball players. Inconsistencies may be indicating that different factor structures are evident in different populations.

However, the most desirable (given that the aim of revising the original TAIS was to improve its psychometric properties) and most plausible reason for the

inconsistency is that the revised TAIS measure (TAIS2) has decreased the measurement overlap between the scales which was a weakness of the original TAIS. Decreasing measurement overlap means that true factor structure can be exposed with more ease. Inter-scale correlations reported by Van Schoyck and Grasha (1981), Summers and Ford (1992) and Summers et al. (1991) show that each attention subscale had significant correlations with many of the other attention subscales highlighting a large amount of measurement redundancy. Inter-scale correlations found in this study indicated that each subscale significantly correlated only with the other subscales contained in its factor (with the exception of the BIT subscale score significantly correlating with the OIT subscale score) indicating an improvement in measurement redundancy. This result highlights that the factor structure that was found in this study can be interpreted with more peace of mind compared with the factor structures found by previous research.

Further evidence of the decreased measurement redundancy of the TAIS2 is highlighted by a decreased percentage in the number of items that correlated better with subscales other than the one they belong to. Table 11 presents these percentages for each attention subscale and an overall percentage for the attention subscales. The overall percentage found was 23.4% which is an improvement on the original TAIS; Albrecht and Feltz (1987) found a percentage of 48% and Ford and Summers (1992) found a percentage of 44%.

In summary, the TAIS2 displays improved construct (factorial) validity properties compared with the original TAIS. The main improvement shown by the TAIS2 is its reduced measurement redundancy as indicated by the inter-scale correlations and item-scale correlations. However, like its predecessor, the TAIS2 still measures only the bandwidth dimension of the attention (narrow and broad) and not the direction dimension (internal and external). Since the TAIS2 claims to measure

both dimensions, this finding raises serious concerns about the TAIS2's construct (factorial) validity.

Table 11

*Frequency and percentage of items in each TAIS2 attention subscale that correlate better with subscales other than the one they belong to*

| Subscale | Number of items correlating better with another subscale | Number of items in the subscale | Percentage |
|---|---|---|---|
| BIT | 3 | 14 | 21.4 |
| BET | 2 | 9 | 22.2 |
| OIT | 2 | 7 | 28.6 |
| OET | 0 | 7 | 0.00 |
| NAR | 3 | 9 | 33.3 |
| RED | 0 | 6 | 0.00 |
| INFP | 5 | 12 | 41.7 |
| All subscales | 15 | 64 | 23.4 |

### *Hypothesis Three*

In order to test the third hypothesis of the study – that the OIT and RED attention subscale scores will be positively correlated with anxiety – Pearson correlation coefficients were calculated between these two subscale scores and the transformed anxiety score calculated from the DASS-21. The correlation found between OIT subscale score and anxiety was positive and significant, $r$ (113) = .52, $p$ < .001, as was the correlation between the RED subscale score and anxiety, $r$ (113) = .51, $p$ < .001. These findings offer support to the third hypothesis of the study. On the basis of Nideffer's (1976) theory of attentional style, people who experience anxiety are more likely to narrow their attention too much (as measured by the RED subscale) and become overloaded by their internal thoughts and feelings (as measured by the OIT subscale). Since the correlations obtained are in line with what was proposed by Nideffer's theory, they support the construct validity of the TAIS2 attention subscales.

This result is somewhat inconsistent with previous research using the original TAIS. The results of this study are consistent with Nideffer et al. (1975, cited in Nideffer & Pratt, 1982) who found significant positive relationships between the OIT and RED subscale scores with anxiety (as measured by the State Trait Anxiety Inventory). However, the results of this study are inconsistent with the results of Albrecht and Feltz (1987) and Summers et al. (1991) who found that the RED subscale (but not the OIT subscale) was positively related only to sports-related anxiety. The inconsistency may be a reflection of the TAIS2 OIT and RED subscales being psychometrically better than their predecessor. The TAIS2 RED and OIT subscales were shown in this study to be internally consistent whereas their predecessors were not (Albrecht & Feltz, 1987; Summers & Ford, 1992) indicating that the items in these subscales may have not been measuring the construct intended. This provides a possible explanation as to why non-significant positive correlations were not found in previous research using the original TAIS.

*Hypotheses Four to Eight*

The remaining hypotheses of the study propose theoretical links between the TAIS2 subscales and the “Big Five” personality traits. In order to test these hypotheses, Pearson correlation coefficients were calculated between the TAIS2 subscale scores and the scores obtained from the IPIP personality inventory which measures the “Big Five” traits. These correlations are presented in Table 12.

The fourth hypothesis of the study states that the “Big Five” extroversion score will be positively correlated with the CON, SES, P/O and IEX subscales of the TAIS2. This hypothesis was fully supported as each of these correlations were significant and in the positive direction. The fifth hypothesis of the study states that the “Big Five” emotional stability score will be positively correlated with the NAR subscale of

the TAIS2 and negatively correlated with the OET, BCON and NAE subscale scores from the TAIS2. This hypothesis was partially supported. All correlations were in the expected direction but the correlations for NAR and BCON were not significant.

Table 12

*Pearson correlation coefficients calculated between the TAIS2 subscale scores and the "Big Five" personality scores*

| | "Big Five" Personality Traits | | | | |
|---|---|---|---|---|---|
| TAIS2 subscale | Emotional Stability | Conscientiousness | Extroversion | Agreeableness | Intellect |
| BET | .07 | .08 | .17 | -.01 | .33** |
| OET | -.33** | -.19* | -.10 | .04 | -.07 |
| BIT | .08 | -.34** | .23** | .11 | .48** |
| OIT | -.58** | -.28** | -.05 | -.17 | -.10 |
| NAR | .02 | .27** | .14 | .12 | .22** |
| RED | -.63** | -.34** | -.09 | -.25** | -.25** |
| INFP | .14 | .31** | .31** | .10 | .41** |
| BCON | -.04 | .16 | .14 | -.01 | .07 |
| CON | .17 | .31** | .51** | .12 | .45** |
| SES | .25** | .30** | .51** | .20 | .51** |
| P/O | .07 | .16 | .22* | -.16 | .34** |
| OBS | -.18 | -.25** | -.18 | .09 | -.23* |
| EXT | .07 | -.01 | .72** | .25** | .33** |
| INT | -.10 | .06 | -.42** | -.15 | -.03 |
| IEX | .31** | .31** | .46** | .23* | .63** |
| NAE | -.25** | -.08 | .25** | -.22* | .23* |
| PAE | .17 | .10 | .26* | .31* | .12 |
| DEP | -.61** | -.35** | -.16 | -.20* | -.17 |
| FOT | .11 | .27** | .10 | .22* | .20* |
| PUP | .20* | .33** | .36* | .10 | .37** |
| IMM | .16 | .26** | .20* | -.07 | .26** |

* $p < .05$. ** $p < .01$.

The sixth hypothesis of the study states that the “Big Five” agreeableness score will be positively correlated with the EXT and PAE subscales of the TAIS2 and negatively correlated with the INT subscale score from the TAIS2. This hypothesis was partially supported also with all correlations in the expected direction, but the INT correlation was not significant. The seventh hypothesis of the study states that the “Big Five” intellect score will be positively correlated with the BIT, BET and INFP subscales of the TAIS2 and negatively correlated with the OBS subscale score from the TAIS2. This hypothesis was fully supported as each of these correlations was significant and in the expected direction. The eighth hypothesis of the study states that the “Big Five” conscientiousness score will be positively correlated with the FOT and PUP subscales of the TAIS2. This hypothesis was fully supported as each of these correlations was significant and in the positive direction.

But one thing that should be noted is that each “Big Five” trait also significantly correlated with other TAIS2 subscale scores that were not considered to be theoretically linked to the trait. The “Big Five” extroversion score was significantly correlated with EXT, INT, INFP, NAE, PAE, PUP and IMM; the “Big Five” emotional stability score was significantly correlated with OIT, RED, SES, IEX, NAE, DEP and PUP; the “Big Five” agreeableness score was significantly correlated with RED, IEX, NAE, DEP and FOT; the “Big Five” intellect score was significantly correlated with CON, SES, P/O, EXT, IEX, NAE, FOT, PUP and IMM; and, the “Big Five” conscientiousness score was significantly correlated with OET, BIT, OIT, NAR, RED, INFP, SES, OBS, IEX, DEP, FOT and PUP. Also, some of these correlations were larger than the correlations that were theoretically expected e.g., the theoretically expected P/O and “Big Five” extraversion correlation was smaller than each of the significant unexpected correlations found between the TAIS2 subscale scores and “Big Five” extroversion.

While some of these correlations may not have been expected by Nideffer (2003b) per se, many make theoretical sense though, e.g., “Big Five” emotional stability was significantly negatively related to DEP and NAE. Scoring high on DEP (indicating increased self criticism) and NAE (indicating increased expression of negative feelings to others) would not be associated with someone who would score highly on “Big Five” emotional stability (i.e., someone who is self confident, cool, calm and steady) hence the negative correlations.

No previous research has attempted to test Nideffer’s (2003a) theoretical links between the original TAIS subscale scores with measures of the “Big Five” traits. However, previous research has linked the original TAIS subscale scores to Myers-Briggs Types Indicator (MBTI) scores. The Myers-Briggs is a personality assessment that has been shown to be related to the “Big Five” traits by Furnham (1996) with agreeableness being closely related to the thinking-feeling dimension, conscientiousness with the judging-perceiving dimension, openness (intellect) with the sensing-intuitive dimension and extroversion with the extroversion-introversion dimension. Neuroticism (which is the polar opposite of emotional stability) was not related consistently to any dimension, but neuroticism (emotional stability) is known to not be measured by the MBTI. These results indicate that comparing “Big Five” results (found in this study) to the MBTI results of Nideffer (2003b) is justifiable.

A consistency in results appears between the results of this study (utilising the TAIS2) and those of Nideffer (2003b) which utilises the original TAIS. Nideffer found positive correlations between the extroversion direction score of the MBTI and the EXT and PAE subscale scores of the TAIS and a negative correlation with INT subscale score of the TAIS. Since the MBTI extroversion direction is associated with the “Big Five” trait of extroversion, a similar pattern in correlations for EXT, PAE and INT with “Big Five” extroversion should appear. When examining the correlations in

Table 12, this pattern does appear and all correlations are significant. Nideffer found positive correlations between the intuitive direction score of the MBTI and the BIT, IEX, CON, and INT subscale scores of the TAIS. Since the MBTI intuitive direction is associated with the “Big Five” trait of intellect, positive correlations between “Big Five” intellect and BIT, IEX, CON and INT should appear. Table 12 shows that significant positive correlations are present for all but INT. Nideffer found positive correlations between the thinking direction score of the MBTI and the INFP, CON, SES and IEX subscale scores of the TAIS and a negative correlation between RED subscale score of the TAIS. Since the MBTI thinking direction is associated with the “Big Five” trait of agreeableness, a similar pattern in correlations for INFP, CON, SES, IEX and RED with “Big Five” agreeableness should appear. When examining the correlations in Table 12, all correlations were in the expected direction but only the IEX and RED correlation reached significance.

The construct validity of a measure can be demonstrated by showing that the test scores of the measure of interest are related to the scores of another test that measure similar constructs, and are unrelated to theoretically unrelated constructs. The full support shown to the predicted “Big Five” - TAIS2 relationships in the fourth, seventh and eighth hypotheses by the results plus the partial support shown to the predicted “Big Five” - TAIS2 relationships in the fifth and sixth hypotheses support the construct validity of the TAIS2 measure. The theoretically unexpected relationships found between some of the “Big Five” traits and the TAIS2 subscales do not threaten the construct validity of the TAIS2 subscales because many of the relationships can be theoretically explained using personality theory.

*Summary*

The results presented in this study indicate that the TAIS2 measure displays improved psychometric properties to the original TAIS measure. While the attention subscales of the TAIS2 show improved internal consistency, some subscales still exhibit internal consistency values below the acceptable .70 level. The TAIS2 also shows reduced measurement redundancy compared with the original TAIS. The construct validity of the TAIS2 is an improvement on the original TAIS with the interpersonal and attention subscale scores relating to a measure of anxiety and a measure of the "Big Five" personality traits as predicted. However, the construct validity of the TAIS2 cannot be fully supported because like the original version, the TAIS2 still measures only the bandwidth dimension of attention (narrow and broad) and not the direction dimension (internal and external) as claimed. The theoretical and practical limitations of these findings along with limitations to the research are discussed in depth in Chapter Six (General Discussion).

In a further attempt to investigate the psychometric properties of the TAIS2, Study Two of this thesis (Chapters Four and Five) will attempt to use this measure to predict injury occurrence in athletes according to the stress and injury model proposed by Andersen and Williams (1988). Results from this study will provide evidence for or against the predictive validity of the TAIS2. Predictive validity is demonstrated by showing that the test scores predict (on the basis of a theory or past research) a criterion measure that is obtained at a future time (Cohen & Swerdlik, 2002). Since the original TAIS measure was investigated as a possible predictor of athletic injury (Bergandi & Witting, 1988, Bond, Miller, & Chrisfield, 1988; Noun, 1997), it seems appropriate to evaluate the TAIS2's predictive validity on the same criterion variable.

# CHAPTER FOUR

## Introduction and Method for Study Two – Injury Prediction

### *Introduction*

After reviewing the literature relevant to Andersen and Williams' (1988) stress and injury model, one thing that stood out was the lack of research being done that investigates that general premise of the model. The general premise is the mediation relationship - the stress response that an athlete exhibits in a stressful athletic situation (e.g. disruptions to their peripheral vision, their attention and their cognitive appraisal) can explain why factors such as coping resources, history of stressors and personality are associated with athletic injury occurrence. Most of the studies done to this date are leaving out the stress response component of the model; they investigate only how personality, history of stressors and coping interact together to influence injury occurrence, or how these interactions influence the stress response. But, even then, studies neglect if this interaction between the stress response and the other components leads to injury occurrence. This type of research does not allow the mediation premise to be evaluated. The current state of research, therefore, provides only partial support for the stress and injury model with some of the proposed relationships supported by research and some not (mainly due to a lack of research). Figure 2 illustrates the current state of knowledge with regards to the stress and injury model diagrammatically.

Since the proposal of the stress and injury model, only two studies have investigated the mediation relationship (Andersen & Williams, 1999; Rogers & Landers, 2005) and the evidence from these studies support the mediation premise of the model indicating that the model as a whole has some merit. However, the model as a whole proposes that there is an interaction between the cognitive appraisal and the attentional/physiological change components of the stress

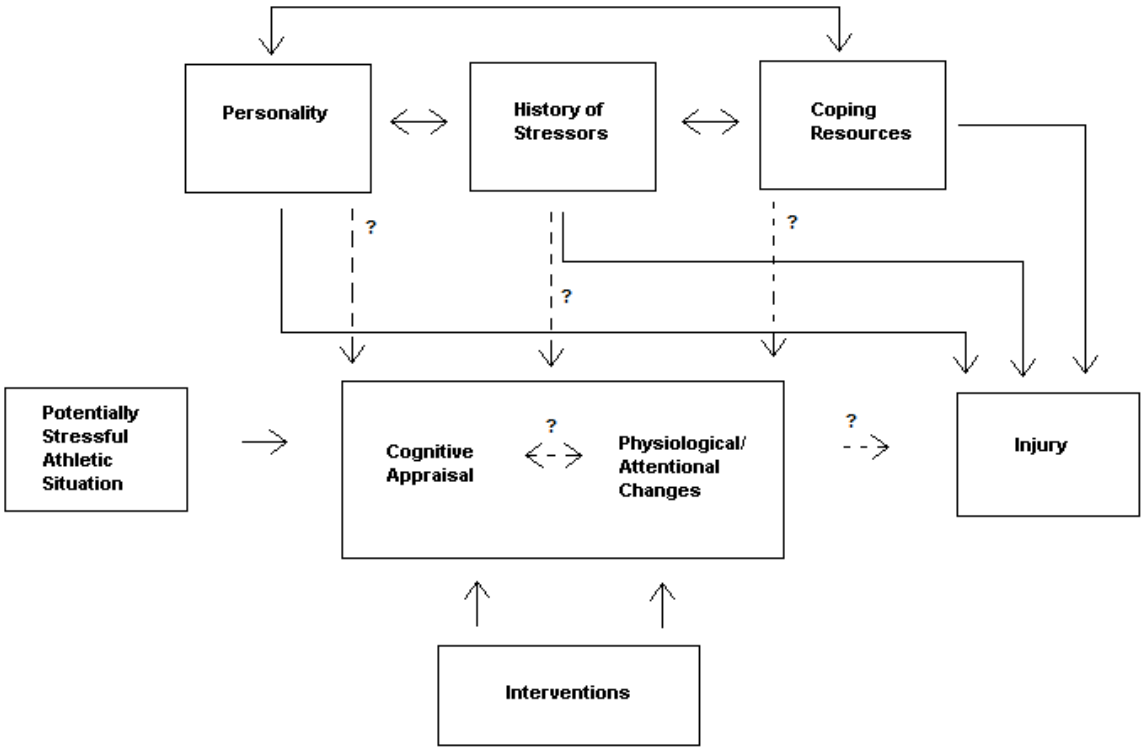


*Figure 2.* The Stress and Injury Model modified to fit the current state of evidence supporting it (solid pathways indicate supported relationships and dotted pathways with a question mark indicate those relationships that need further evaluation)

response. This proposed relationship has never been investigated either. Future research should now focus on testing the model as a whole. By doing this, evidence supporting the mediation relationship proposed by the model can be gathered which would also act as evidence for the smaller components of the model also.

There were two aims of this research study. The first aim was to use the theory behind the stress and injury model to validate the Test of Attentional and Interpersonal Style 2 (TAIS2; Nideffer, n.d.) which is a revision of the original TAIS (Nideffer, 1976). While the TAIS2 may not measure a person's current state of attention, it does measure a person's general attention style in situations where they are expected to perform. The TAIS/TAIS2 is based on Nideffer's attentional style theory (1976) which states that all individuals have a preferred attentional style, but the average person can develop all four styles and can use all four styles when the

situation demands it. A measure of general attentional style is relevant to research investigating the stress and injury model because it would be assumed that the attentional styles that an athlete reports will be the one that they will utilise when they are performing on the field. The scores of interest are the ones for maladaptive attention styles such as external distractibility (OET; distracted by external noises or movements), internal distractibility (OIT; distracted by their thoughts and feelings) and reduced focus (RED; inability to switch from an internal to an external focus when appropriate thus leading to an extremely narrow field of attention). These scores can be directly linked with the stress response component of the stress and injury model. The model proposes that a person who is likely to get injured will have disruptions in their attentional processes such as the narrowing of their visual field (which could be linked to an extremely narrow attention field) or scattered attention (one could say that distractibility would most likely lead to scattered attention). If the TAIS2 attention scores can predict injury occurrence in accordance with the stress and injury model, its predictive validity would be demonstrated.

The second aim of this study was to investigate the general premise of the stress and injury model with considerable focus on investigating the stress response (cognitive appraisal and attentional change) and how these concepts relate to injury occurrence and the personality, history of stressors and coping resources components of the model. The model proposes that the interaction between attentional change and cognitive appraisal mediates the relationship between the history of stressors, coping resources and personality components with injury occurrence. This research study directly investigated the validity of these proposed relationships. The stress and injury model also proposes a moderated mediation relationship; coping resources and personality can exert their influence directly on the stress response, but they can also exert their influence on the history of stressors

component which will then directly influence the stress response. This relationship was not investigated by this research study.

In order to test the general premise of the stress and injury model, a measure of cognitive appraisal also needed to be incorporated into the study. Past research has utilised measures that look at a person's fear of re-injury or perceived susceptibility to injury and results have been supportive of their link to previous injury, which is part of the history of stressors component (Deroche et al., 2007; Reuter & Short, 2005; Short et al., 2004). Due to these findings, an athlete's perceived risk of injury was incorporated into this study to represent the cognitive appraisal component of the model.

Based on the findings of previous research and the relationships proposed by the stress and injury model, the following hypotheses were made.

1. Maladaptive attentional styles and perceived risk of injury will separately mediate the relationship between negative life events stress and injury occurrence plus positive life events and injury occurrence. The interaction between maladaptive attentional styles and perceived risk of injury will also mediate these relationships.
2. Maladaptive attentional styles and perceived risk of injury will separately mediate the relationship between social support and injury occurrence. The interaction between maladaptive attentional styles and perceived risk of injury will also mediate this relationship.
3. Maladaptive attentional styles and perceived risk of injury will separately mediate the relationship between coping and injury occurrence. The interaction between maladaptive attentional styles and perceived risk of injury will also mediate this relationship.

4. Maladaptive attentional styles and perceived risk of injury will separately mediate the relationship between anxiety and injury occurrence. The interaction between maladaptive attentional styles and perceived risk of injury will also mediate this relationship.
5. Maladaptive attentional styles and perceived risk of injury will separately mediate the relationship between previous injury and subsequent injury. The interaction between perceived risk of injury and maladaptive attentional styles will also mediate this relationship.

If each of these hypotheses was supported, the predictive validity of the TAIS2 would be demonstrated plus support would be gained for the validity of the general premise of the stress and injury model. Due to a lack of previous research that investigates the mediation relationships proposed by the stress and injury model, no prediction statements were made regarding whether high or low scores on the hypothesised mediator variables will minimise the psychosocial factor – injury occurrence relationships.

## *Method*

### *Participants*

Forty-one recreational athletes (ranging from 18 to 61 years, *M* = 29.63 years, *SD* = 11.65 years) participated in this study. Twenty-four were male (*M* = 31.25 years, *SD* = 2.62 years) and seventeen were female (*M* = 27.35 years, *SD* = 2.34 years). Table 13 contains a gender by sport played cross tabulation of the 41 participants. Netball is the most represented sport followed by basketball and golf. Participants were rewarded by being eligible to win one of three $50 vouchers from a major department store. This research study was approved by the RMIT University

Human Research Ethics Committee (Reference Number: SETNBAPP 80 – 06 VASSOS).

Table 13

*Gender by sport played frequency cross tabulation of the participants of the study*

| Sport played | Male | Female | Total |
|---|---|---|---|
| Basketball | 3 | 3 | 6 |
| Cycling | 0 | 1 | 1 |
| Soccer | 4 | 0 | 4 |
| Golf | 5 | 1 | 6 |
| AFL Football | 4 | 0 | 4 |
| Netball | 0 | 7 | 7 |
| Tennis | 1 | 0 | 1 |
| Dance | 2 | 3 | 5 |
| Running | 3 | 2 | 5 |
| Hockey | 1 | 0 | 1 |
| Cricket | 1 | 0 | 1 |
| Total | 24 | 17 | 41 |

*Design*

Three criterion variables were utilised in the study. The first criterion variable was the number of injuries encountered by the participant two months after completing the measures of interest. For this study, injury was defined as an injury that required medical attention beyond taping and icing. The second criterion variable was the severity rating attributed to each injury encountered. The last criterion variable was a rating reflecting the playing or training time lost due to each injury.

Seven predictor variables were utilised in the study. These were the participant's: (1) attentional characteristics; (2) perceived level of risk of injury; (3) level of anxiety towards competition; (4) level of social support; (5) coping skills; (6) level of life stress; and, (7) previous injury history. These seven variables are conceptualised as predictors of athletic injury by the stress and injury model (Andersen & Williams, 1988).

The research utilised a prospective research design. Participants were asked to complete inventories that measure the seven predictor variables of the stress and injury model first. After a specified period of time, participants were followed up to complete inventories that measure the three criterion variables. This type of design allows prediction conclusions to be made which will directly test the hypotheses postulated by the stress and injury model. Petrie and Falkstein (1998) recommend this type of design for injury prediction research because it allows a better understanding to be gained about the relationships between the predictor variables and subsequent injury.

## *Materials*

### *Attention*

The Test of Attentional and Interpersonal Style 2 (TAIS2; Nideffer, n.d.) was used to measure the attention predictor variable of the research design. The TAIS2 contains 124 items that measure 21 skills that are deemed important for high level performance in any domain. The attention skills (broad external awareness, external distractibility, broad internal awareness, internal distractibility, narrow-focused attention, reduced attentional flexibility) are the only skills of interest for this research study. Items are rated on a 5-point Likert scale ranging from 1 (Never) to 5 (Always). Scoring is completed by Enhanced Performance Systems, which is owned and run by Robert Nideffer (the author of the TAIS2). Subscale scores are reported in the form of percentiles. The TAIS2 is a revised version of the original 144-item Test of Attentional and Interpersonal Style (TAIS; Nideffer, 1976). Published information regarding the psychometric properties of the revised measure is not available as the measure is currently under evaluation. Study One of this thesis evaluated the psychometric properties of the TAIS2 and Chapter Three of this thesis provides an in-

depth discussion of these findings. The literature review of this thesis (Chapter One) contains an in-depth discussion of the psychometric properties of the original TAIS.

*Life Events Stress*

The Life Events Survey for Collegiate Athletes (Petrie, 1992) was used to measure the life stress predictor variable. This survey comprises 69 items. Each item represents a possible life event that could have occurred in an individual's life. The individual is asked to indicate which life events occurred in their life in the past year and to rate their perception of the event on an 8-point Likert scale ranging from – 4 (extremely negative) to + 4 (extremely positive). Two life stress scores are obtained from this scale. One is the positive life stress score which is the sum of all the positive ratings and the other is the negative life stress score which is the sum of all the negative ratings. Petrie and Falkstein (1998) reviewed the psychometric properties of the scale and found that it displayed appropriate test-retest reliability and correlated well with other measures of life stress for athletes (however, figures for test-retest reliability were not provided).

*Anxiety*

The Sports Anxiety Scale-2 (SAS-2; Smith, Smoll, Cumming, & Grossbard, 2006) was used to measure the anxiety predictor variable. This 15-item scale measures three subscales of anxiety: (1) somatic anxiety (e.g., I feel tense); (2) cognitive worry or anxiety (e.g., I worry that I will play badly); and, (3) concentration disputation (e.g., I find it hard to concentrate on the game). Five items make up each of these subscales. The items are rated on a 4-point Likert scale ranging from 1 (not at all) to 4 (very much). Smith et al. found that the SAS-2 displayed psychometric properties superior to the original version of the SAS. The Cronbach α value for the total scale was .91, .84 for the somatic subscale, .89 for the cognitive worry or anxiety subscale and .84 for the concentration disruption subscale. Smith et al. also

used factor analysis to confirm the presence of the three sub-scales and found evidence for construct, discrminant and predictive validity.

*Social Support*

The Social Support Questionnaire (Sarason, Levin, Basham, & Sarason, 1983) was used to measure the social support predictor variable. This questionnaire contains 27 items with each item split into two parts. Individuals are asked to identify the people (by their initials) they can depend on or turn to in the situation described in the item. Individuals then rate their level of satisfaction with the social support on a 6-point Likert scale ranging from 1 (very dissatisfied) to 6 (very satisfied). Two scores are obtained from the scale. Mean total support is the mean number of supports listed for all 27 items and mean satisfaction is the mean satisfaction rating listed for the 27 items. Sarason et al. demonstrated that the scale displays high internal consistency (.97 for the mean total support score and .94 for the mean social support rating).

*Coping*

The Ways of Coping Scale (WOC; Folkman & Lazarus, 1988) was used to measure the coping skills predictor variable. This 66-item inventory measures a broad range of cognitive and behavioural strategies that an individual might utilise in order to cope with specific situations. The individual is asked to think about a stressful situation they recently experienced and are asked to rate to what extent they used the particular coping strategies listed in the inventory on a 4-point Likert scale ranging from 0 (does not apply or not used) to 3 (used a great deal). Scores for eight subscales are computed by summing the responses for the items that make up the subscale. The subscales are: confrontative coping, distancing coping, self-controlling coping, coping via social support, accepting responsibility, escape–avoidance coping, planning and problem solving, and positive reappraisal. The total score is computed

by summing scores across the eight sub-scales. Folkman and Lazarus found that the scale has adequate internal consistency with α coefficients for the eight scales ranging from .61 to .79.

*Perceived Risk of Injury*

The Risk of Injury in Sports Scale (RISSc: Kontos, Feltz, & Malina, 2000) was used to measure the perceived level of injury risk predictor variable. This 24-item scale asks individuals to rate the likelihood of injuring themselves while playing their particular sport on a 6-point Likert scale ranging from 1 (very unlikely) to 6 (very likely). The scale comprises of 6 subscales: uncontrollable injuries, controllable injuries, overuse injuries, upper body injuries, injuries due to surfaces played on and re-injury. The score for each subscale represents the average response given for the items that make up the subscale. A total score can be calculated and again, this score represents the average response given on all items in the scale. Kontos et al. (2000) reported that the RISSc has adequate reliability with reliability coefficients for the six subscales ranging from .64 to .82.

*Previous Injury*

The last measure utilised was a set of general questions regarding the participant's history of previous injury. These questions were devised by the investigator. The participant was asked to list any injuries they had experienced in the past twelve months and to rate each injury's severity on a Likert scale ranging from 1 (recovered within 1-2 days) to 7 (took more than 6 months to recover). Participants were also asked to rate the amount of playing or training time lost due to each injury on a 7-point Likert scale ranging from 1 (none) to 7 (more than 6 months). The three criterion variables (no. of injuries, severity and time lost) were measured using these questions also; the instructions were modified from reporting injuries that occurred in the past twelve months to reporting injuries that occurred in the past two months.

*Procedure*

To be eligible to participate in the study, individuals needed to be not injured at the time of commencing their participation and they had to be aged 18 years and over. Two hundred and twenty-five individuals were approached to participate in the study. Participants were approached by the investigator with the written permission of the president or coach of their respective sporting club. The sporting clubs approached were a convenience sample of sporting clubs. The investigator either knew someone who currently played at the sporting club and approached the club president or coach with that person or the investigator knew the club president or coach already and spoke to them directly. The investigator also had three third year undergraduate students who recruited participants for the project as part of their course requirements. The three students sourced sporting clubs in the same manner as the investigator did. Fifty-seven individuals returned their questionnaire package. The data from six participants was not appropriate for use in the research as the consent form or the research questionnaire was not completed adequately. Also, ten participants were not able to be contacted after two months to collect injury data leaving a research sample consisting of 41 participants.

The measures utilised in the research were assembled into a questionnaire booklet (see Appendix D). Participants who were approached were given the questionnaire booklet, a Plain Language Statement (PLS: see Appendix E) and a Consent Form (see Appendix F) along with a reply-paid envelope. Participants were asked to read the PLS, sign the consent form and complete the questionnaire booklet in their own time and to send the questionnaire booklet and consent form back in the reply-paid envelope provided. Participants were asked to provide a contact email or postal address also. The participant was sent a follow up injury questionnaire to the contact address provided two months after the questionnaire booklet was initially

received. Appendices G and H contain the follow-up questionnaires sent via mail and email. Participants who were followed up via a postal questionnaire were provided a reply-paid envelope to allow participants to send back the questionnaire.

*Statistical Analysis*

Mediation analysis was the technique deemed appropriate to evaluate the five hypotheses of this study. The aim of mediation analysis is to assess whether the relationship between two variables [A (predictor variable) and B (criterion variable)] can be explained by A and B's relationship to another variable [M (the mediator variable)] (Howell, 2002). Figures 3, 4 and 5 depict the mediation relationships to be tested by the five hypotheses of the study. This technique will be used to determine whether the maladaptive attention style and perceived risk of injury predictors act as mediators (M) on their own for the relationship between injury occurrence (B) and the other predictors like coping, social support, life events stress, anxiety and previous injury (A). The interaction of maladaptive attention style and perceived risk of injury was also hypothesised to be a mediator (M).

Many statistical procedures have been proposed in order to test mediation relationships such as those mentioned in the five hypotheses of the study. The most commonly used technique in the psychological literature is the approach initially proposed by Baron and Kenny (1986). This approach indicates that in order for a variable to be considered a mediator (M), the predictor variable (A) must significantly predict the criterion variable (B), A must significantly predict M, and M must significantly predict B when controlling for A. While being widely used, this approach has been criticised for lack of statistical power - especially when using smaller samples or when effect sizes are modest at best (MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002).

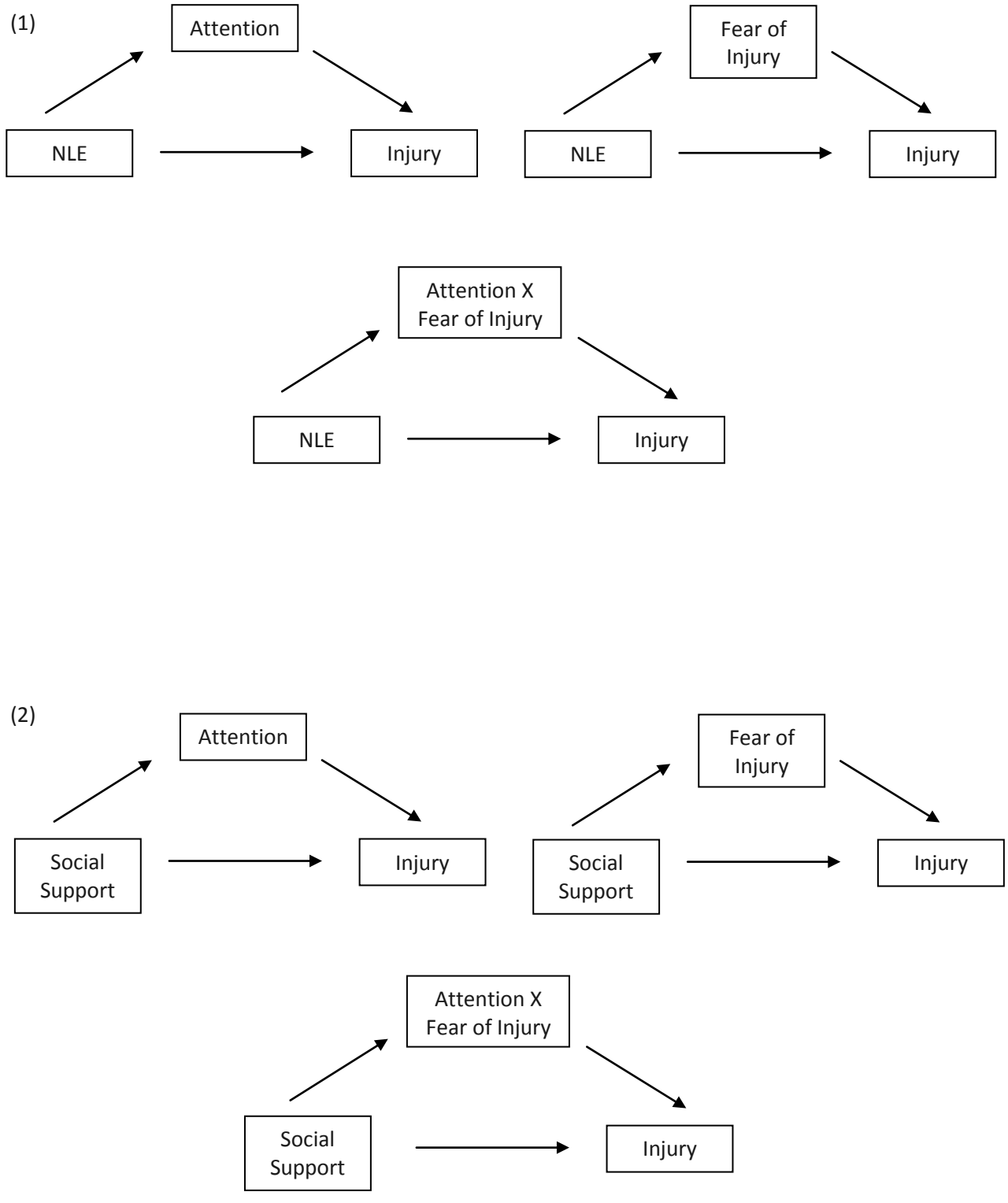


*Figure 3*. Mediation relationships proposed by the first and second hypotheses of the study

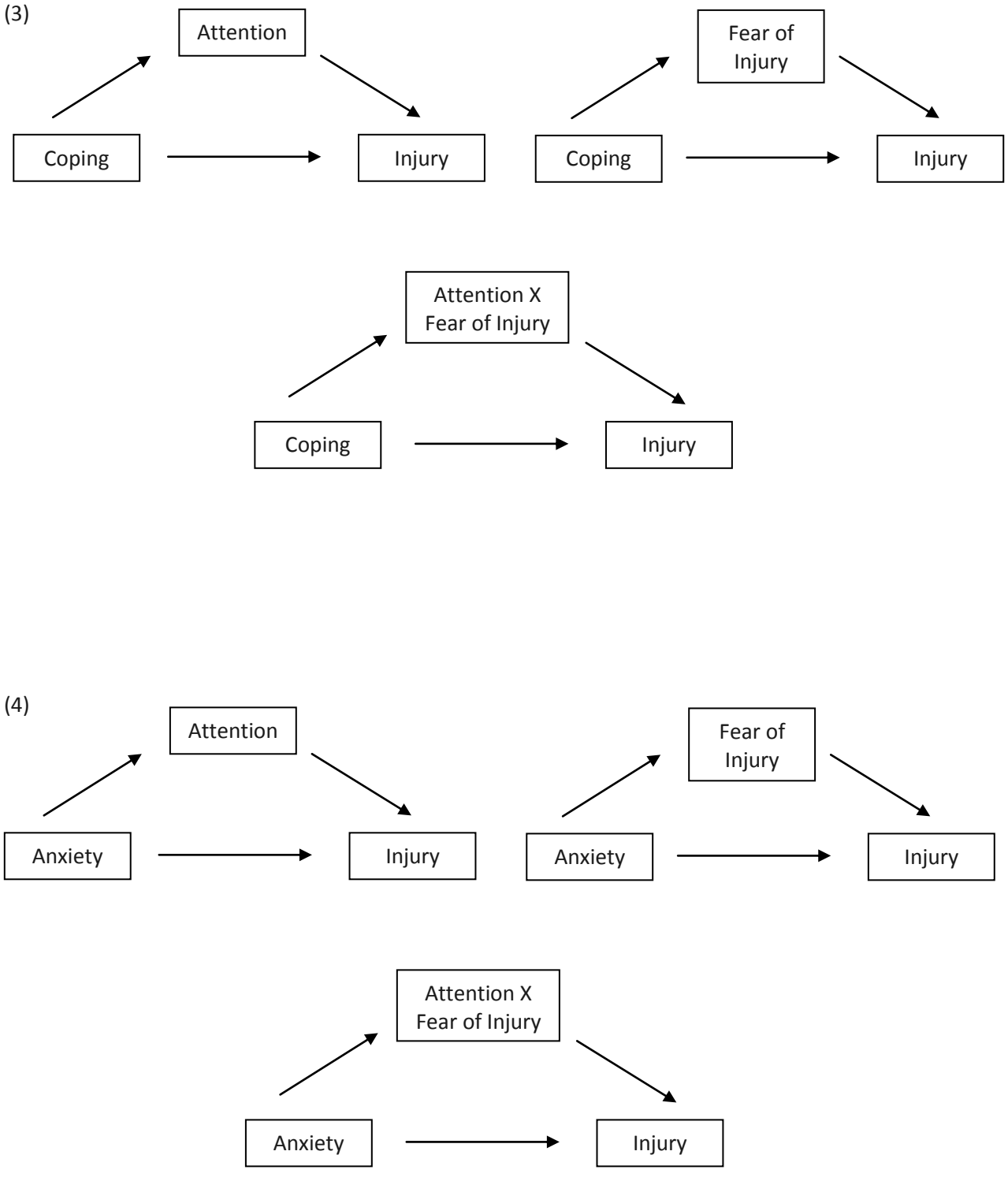


*Figure 4*. Mediation relationships proposed by the third and fourth hypotheses of the study

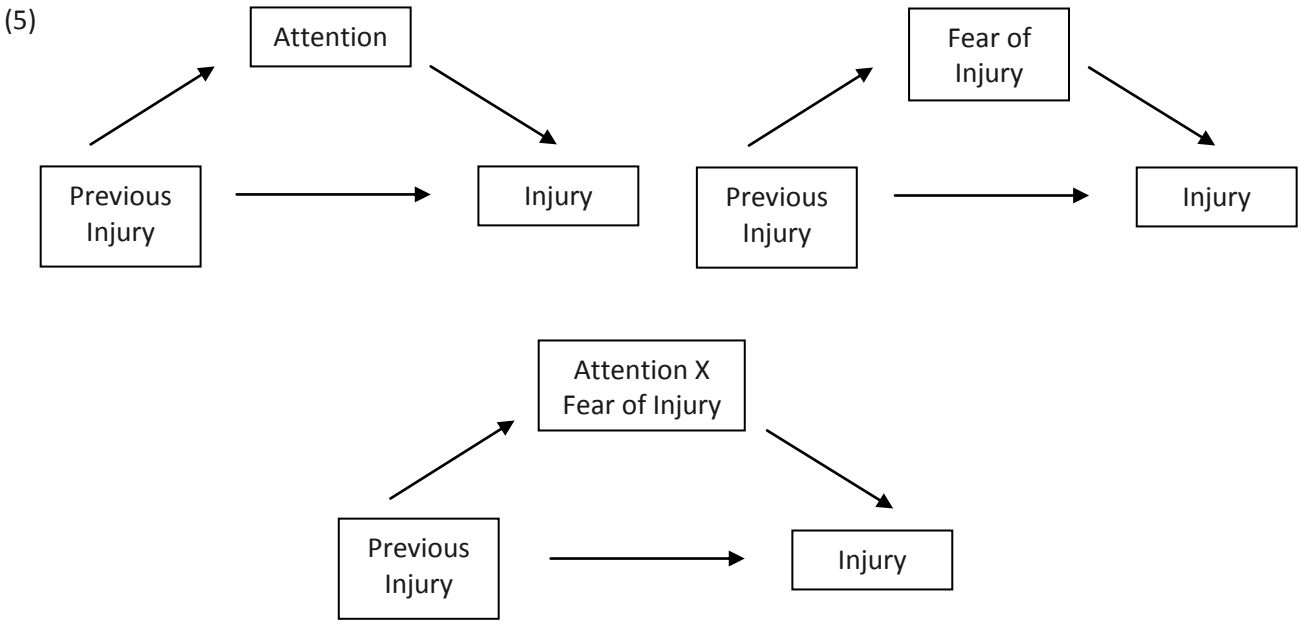


*Figure 5.* Mediation relationships proposed by the fifth hypotheses of the study

Recently, bootstrapping approaches when estimating mediation have been proposed (e.g., Mallinckrodt, Abraham, Wei, & Russell, 2006; Preacher & Hayes, 2004). Bootstrapping involves taking a large number of samples (e.g., 1000 samples) of size *n* (*n* being the original sample size of the data set) using sampling with replacement and then computing the indirect effect for each of these samples. The indirect effect is the product of the beta coefficients for (a) the regression of A (predictor variable) on M (the mediator); and (b) the regression of M (mediator) on B (the criterion variable) when A (predictor variable) is controlled. All estimates of the indirect effect represent a sampling distribution of the indirect effect with the mean indirect effect found for the 1000 samples representing the estimate of the population indirect effect value. A standard error and 95% percent confidence interval for the population indirect effect can also be calculated from this distribution. Appendix I

contains more in-depth information regarding the theory behind the bootstrapping approach when estimating mediation.

Bootstrapping approaches are a non-parametric approach to evaluating mediation; no assumptions regarding sample size, the distribution of A, B or M nor the sampling distribution of the indirect effect are made (Preacher & Hayes, 2004). Bootstrapping can also be applied to smaller sample sizes because it is not based on large-sample statistical theories. MacKinnon, Lockwood, and Williams (2004) found that bootstrapping approaches were statistically more powerful than normal theory approaches to mediation like the approach of Baron and Kenny (1986) when small samples of 25, 50, 100 and 200 were utilised and various effects sizes were present. Since this study contains a small sample of participants ($n$ = 41) plus some of the variables (especially the injury criterion variables) are skewed, the bootstrapping mediation approach that has no distribution and sample size assumptions is the method of choice for testing the five hypotheses of the study.

The data set was analysed using the bootstrapping method (with 5000 bootstrap resamples) described by Preacher and Hayes (2008). The SPSS syntax contained in the Preacher and Hayes article was used to analyse the data. Each of the six TAIS2 attention scores and the total perceived risk of injury score from the RISSc scale were entered as mediators, as were the 6 attention/perceived risk of injury interactions possible. The interaction variables were calculated by firstly converting each attention variable and the total perceived risk of injury variable into Z-scores. Then each converted attention variable was multiplied by the converted perceived risk of injury variable.

Significant mediation is said to be occurring if the 95% confidence interval for the population indirect effect does not contain zero. If a variable is shown to be a significant mediator, this indicates that, in the presence of the mediating variable, the

relationship between the predictor and criterion variables is minimised. Direct examination of the confidence intervals for each of the mediation models shown in Figures 3, 4 and 5 will directly test the five hypotheses of the study. It should be noted that mediation analyses that take into account gender and type of sport played were not conducted due to the small participant sample size.

# CHAPTER FIVE

## Results and Discussion for Study Two – Injury Prediction

### *Descriptive Statistics*

Out of the forty-one recreational athletes that participated in the study, twelve experienced injuries in the two months after completing the questionnaire booklet. Out of the twelve injured participants, four experienced two injuries; no participant reported more than two injuries in the two month period. Therefore, the number of reported injuries was sixteen. Table 14 shows the type of injuries reported by the athletes and the frequency of each injury. The two most frequently reported injuries were knee sprains and neck sprains.

Table 14

*Reported injuries (plus frequency of injury) reported by the recreational athletes at two month follow-up*

| Injury | Frequency |
|---|---|
| Groin strain | 1 |
| Rolled ankle | 1 |
| Wrist sprain | 1 |
| Torn Achilles | 1 |
| Dislocated finger | 1 |
| Knee sprain | 4 |
| Neck strain | 3 |
| Shoulder tear | 1 |
| Shin splints | 1 |
| Concussion | 1 |
| Severe swelling | 1 |
| Total | 16 |

Injured and non-injured athletes were compared using independent samples *t*-tests on each of the predictor variables. Bonferroni adjusted *p*-values were not utilised; as the *t*-tests were performed for descriptive purposes only, a conservative *p*-value was not deemed necessary. Table 15 presents these *t*-tests along with

descriptive statistics. Significant differences between injured and non-injured athletes were found only on negative life events stress (injured athletes scoring higher), total anxiety (non – injured athletes scoring higher), mean severity of previous injury (injured athletes scoring higher) and mean time lost from previous injury (injured athletes scoring higher).

Table 15

*Descriptive statistics and independent samples t-test results comparing injured and non-injured participants on each continuous predictor variable*

| Predictor | Injured | Non – injured | *t*-statistic | *p*-value |
|---|---|---|---|---|
| Positive life events stress | 14.75 (10.25) | 8.62 (6.46) | 1.92 [a] | .074 |
| Negative life events stress | 18.33 (9.78) | 10.28 (9.59) | 2.43 | .020* |
| Broad external attention (BET) | 52.67 (7.25) | 51.93 (9.61) | 0.24 | .81 |
| External distractibility(OET) | 56.33 (8.54) | 50.69 (9.94) | 1.72 | .093 |
| Broad internal attention (BIT) | 51.17 (8.60) | 53.72 (8.96) | -0.84 | .41 |
| Internal distractibility (OIT) | 42.58 (9.12) | 39.38 (10.42) | 0.93 | .36 |
| Narrow focus (NAR) | 50.17 (12.04) | 53.38 (9.47) | -0.91 | .37 |
| Reduced focus (RED) | 41.75 (7.00) | 39.66 (9.96) | 0.66 | .51 |
| Total anxiety | 25.58 (4.25) | 30.07 (7.111) | -2.49 [b] | .018* |
| Somatic anxiety | 8.25 (2.42) | 9.55 (2.70) | -1.45 | .16 |
| Concentration disruption | 6.42 (1.88) | 7.55 (2.25) | -1.54 | .13 |
| Worry | 10.92 (2.75) | 12.97 (3.80) | -1.69 | .10 |
| Total perceived risk of injury | 3.15 (0.54) | 2.90 (0.94) | 1.06 [c] | .30 |
| Mean number of social supports | 4.69 (1.27) | 4.11 (1.80) | 1.00 | .32 |
| Mean social support rating | 5.32 (0.43) | 5.35 (0.53) | -0.20 | .84 |
| Confrontive coping | 5.08 (3.55) | 6.14 (3.62) | -0.85 | .40 |
| Distancing coping | 6.08 (2.87) | 5.79 (3.45) | 0.25 | .80 |
| Self controlling coping | 9.08 (2.68) | 9.10 (3.65) | -0.017 | .99 |
| Seek social support coping | 7.17 (4.02) | 8.45 (4.01) | -0.93 | .36 |
| Accepting responsibility coping | 4.58 (2.94) | 3.76 (2.79) | 0.85 | .40 |
| Avoidance coping | 6.58 (3.63) | 7.10 (4.89) | -0.33 | .74 |
| Problem solving coping | 9.75 (3.25) | 8.34 (3.38) | 1.22 | .23 |
| Positive reappraisal coping | 4.83 (3.10) | 6.38 (4.28) | -1.13 | .27 |
| Number of previous injuries | 1.08 (0.90) | 0.48 (0.87) | 1.99 | .054 |
| Mean previous injury severity rating | 4.17 (2.77) | 0.97 (1.84) | 4.36 | .000** |
| Mean previous injury time lost | 3.46 (3.16) | 1.00 (1.90) | 2.52[d] | .024* |

*Note.* First number represents the mean with the standard deviation in brackets.
[a] based on *df* = 14.75 due to unequal variances being assumed.
[b] based on *df* = 33.54 due to unequal variances being assumed.
[c] based on *df* = 34.47 due to unequal variances being assumed.
[d] based on *df* = 14.38 due to unequal variances being assumed.
* $p < .05$. ** $p < .01$.

Table 16 presents the correlations between the three injury criterion variables and the predictor variables. Bonferroni adjusted *p*-values were not utilised for reasons stated previously. Positive life stress positively correlated with number of injuries, mean injury severity and mean time lost to injury. Negative life events positively correlated with number of injuries only. Mean time lost to injury negatively correlated with total anxiety and worry anxiety. Number of previous injuries correlated positively with number of injuries only, whereas mean previous injury severity and mean previous injury time lost correlated positively with all three criterion variables. All other relationships were non-significant.

Table 16

*Correlations between the three injury criterion variables and the predictor variables*

| | No. of injuries | Mean injury severity | Mean time lost to injury |
|---|---|---|---|
| Positive life events stress | .34* | .37* | .32* |
| Negative life events stress | .40** | .25 | .21 |
| Broad external attention (BET) | .02 | -.07 | -.04 |
| External distractibility(OET) | .26 | .25 | .25 |
| Broad internal attention (BIT) | -.14 | -.16 | .21 |
| Internal distractibility (OIT) | .11 | .004 | .01 |
| Narrow focus (NAR) | -.14 | -.11 | .21 |
| Reduced focus (RED) | .04 | .02 | .06 |
| Total anxiety | -.19 | -.30 | -.34* |
| Somatic anxiety | -.11 | -.15 | -.23 |
| Concentration disruption | -.13 | -.23 | -.23 |
| Worry | -.20 | -.30 | -.31* |
| Total perceived risk of injury | .13 | .08 | .12 |
| Mean number of social supports | .08 | .22 | .22 |
| Mean social support rating | -.06 | .10 | .06 |
| Confrontive coping | -.17 | -.17 | -.16 |
| Distancing coping | .11 | .02 | .06 |
| Self controlling coping | -.08 | -.10 | -.06 |
| Seek social support coping | -.002 | -.20 | -.20 |
| Accepting responsibility coping | .17 | .01 | .03 |
| Avoidance coping | -.11 | -.02 | -.007 |
| Problem solving coping | .28 | .01 | -.04 |
| Positive reappraisal coping | -.15 | -.11 | -.07 |
| Number of previous injuries | .35* | .30 | .26 |
| Mean previous injury severity rating | .58** | .69** | .66** |
| Mean previous injury time lost | .38* | .59** | .58** |

* $p < .05$. ** $p < .01$

*Hypotheses One and Two*

In order to test the first hypothesis of the study, which states that maladaptive attention styles and perceived risk of injury plus their interaction would mediate the relationship between life events stress and injury occurrence, mediation analysis using the bootstrapping technique proposed by Preacher and Hayes (2008) was used. The predictor variables were negative life events (NLE) stress and positive life events (PLE) stress. The criterion variables were number of injuries, mean injury severity rating and mean time lost to injury rating. The mediators were the six attention styles, total perceived injury risk and the six attention/injury risk interactions. This set of criterion variables and mediators were used to test the other four hypotheses of this study.

Table 17 shows the mediation results for NLE and PLE in the form of 95% bias corrected confidence intervals. The table indicates that each attention style and total perceived injury risk on their own did not mediate the relationship between NLE and each of the criterion variables. The same result was found for PLE and each criterion variable. Each of the interactions between the six attention styles and total perceived injury risk also failed to mediate the relationship between NLE and each criterion variable. The same result was found for PLE and each criterion variable also.

In order to test the second hypothesis of the study, which states that maladaptive attention styles and perceived risk of injury plus their interaction would mediate the relationship between social support and injury occurrence, mediation analysis using the bootstrapping technique was utilised again. The predictor variables were mean number of social supports (MSSN) and mean social support rating (MSSR). Table 18 shows the mediation results for MSSN and MSSR in the form of 95% bias corrected confidence intervals. The table indicates that each attention style and total perceived injury risk on their own did not mediate the

relationship between MSSN and each of the criterion variables. The same result was found for MSSR and each criterion variable. Each of the interactions between the six attention styles and total perceived injury risk also failed to mediate the relationship between MSSN and each criterion variable. The same result was found for MSSR and each criterion variable also.

Table 17

*Mediation results (in the form of bias corrected 95% confidence intervals calculated via the bootstrapping method) for the two life events stress predictor variables*

| | Criterion variable | | |
|---|---|---|---|
| Mediator | No. of injuries | Mean injury severity | Mean time lost to injury |
| | Negative life events stress | | |
| BET | (-0.010, 0.003) | (-0.035, 0.003) | (-0.041, 0.006) |
| BIT | (-0.004, 0.007) | (-0.006, 0.046) | (-0.005, 0.063) |
| OET | (-0.002, 0.010) | (-0.005, 0.023) | (-0.006, 0.036) |
| OIT | (-0.014, 0.005) | (-0.057, 0.011) | (-0.071, 0.015) |
| NAR | (-0.011, 0.001) | (-0.040, 0.004) | (-0.051, 0.005) |
| RED | (-0.016, 0.002) | (-0.050, 0.007) | (-0.065, 0.007) |
| Injury Risk | (-0.001, 0.007) | (-0.007, 0.020) | (-0.004, 0.032) |
| BET X Injury Risk | (-0.001, 0.002) | (-0.003, 0.008) | (-0.005, 0.010) |
| BIT X Injury Risk | (-0.001, 0.005) | (-0.003, 0.020) | (-0.004, 0.027) |
| OET X Injury Risk | (-0.003, 0.003) | (-0.002, 0.023) | (-0.004, 0.021) |
| OIT X Injury Risk | (-0.001, 0.006) | (-0.002, 0.031) | (-0.002, 0.041) |
| NAR X Injury Risk | (-0.002, 0.006) | (-0.007, 0.027) | (-0.010, 0.031) |
| RED X Injury Risk | (-0.001, 0.007) | (-0.004, 0.027) | (-0.004, 0.036) |
| | Positive life events stress | | |
| BET | (-0.011, 0.004) | (-0.044, 0.004) | (-0.047, 0.008) |
| BIT | (-0.002, 0.007) | (-0.004, 0.026) | (-0.005, 0.039) |
| OET | (-0.003, 0.009) | (-0.010, 0.021) | (-0.012, 0.026) |
| OIT | (-0.004, 0.005) | (-0.008, 0.016) | (-0.011, 0.020) |
| NAR | (-0.018, 0.001) | (-0.062, 0.003) | (-0.090, 0.001) |
| RED | (-0.003, 0.006) | (-0.014, 0.010) | (-0.025, 0.010) |
| Injury Risk | (-0.003, 0.010) | (-0.020, 0.019) | (-0.012, 0.040) |
| BET X Injury Risk | (-0.010, 0.003) | (-0.034, 0.011) | (-0.034, 0.015) |
| BIT X Injury Risk | (-0.003, 0.008) | (-0.009, 0.038) | (-0.009, 0.057) |
| OET X Injury Risk | (-0.006, 0.002) | (-0.020, 0.005) | (-0.021, 0.005) |
| OIT X Injury Risk | (-0.005, 0.009) | (-0.009, 0.051) | (-0.009, 0.078) |
| NAR X Injury Risk | (-0.011, 0.009) | (-0.015, 0.058) | (-0.019, 0.076) |
| RED X Injury Risk | (-0.013, 0.004) | (-0.044, 0.015) | (-0.054, 0.021) |

Table 18

*Mediation results (in the form of bias corrected 95% confidence intervals calculated via the bootstrapping method) for the two social support predictor variables*

| | Criterion variable | | |
|---|---|---|---|
| Mediator | No. of injuries | Mean injury severity | Mean time lost to injury |
| | Mean number of social supports | | |
| BET | (-0.028, 0.034) | (-0.253, 0.022) | (-0.025, 0.034) |
| BIT | (-0.052, 0.016) | (-0.155, 0.050) | (-0.197, 0.076) |
| OET | (-0.010, 0.002) | (-0.289, 0.003) | (-0.319, 0.004) |
| OIT | (-0.009, 0.043) | (-0.173, 0.028) | (-0.194, 0.031) |
| NAR | (-0.058, 0.017) | (-0.147, 0.052) | (-0.240, 0.073) |
| RED | (-0.013, 0.036) | (-0.139, 0.028) | (-0.177, 0.029) |
| Injury Risk | (-0.009, 0.078) | (-0.038, 0.127) | (-0.035, 0.217) |
| BET X Injury Risk | (-0.040, 0.068) | (-0.260, 0.072) | (-0.296, 0.072) |
| BIT X Injury Risk | (-0.029, 0.124) | (-0.159, 0.229) | (-0.177, 0.308) |
| OET X Injury Risk | (-0.041, 0.061) | (-0.223, 0.004) | (-0.217, 0.006) |
| OIT X Injury Risk | (-0.002, 0.099) | (-0.006, 0.243) | (-0.009, 0.302) |
| NAR X Injury Risk | (-0.024, 0.082) | (-0.023, 0.351) | (-0.034, 0.442) |
| RED X Injury Risk | (-0.016, 0.050) | (-0.055, 0.153) | (-0.075, 0.198) |
| | Mean social support rating | | |
| BET | (-0.062, 0.069) | (-0.278, 0.169) | (-0.260, 0.228) |
| BIT | (-0.062, 0.154) | (-0.206, 0.537) | (-0.262, 0.729) |
| OET | (-0.338, 0.007) | (-0.683, 0.014) | (-0.902, 0.019) |
| OIT | (-0.116, 0.033) | (-0.198, 0.186) | (-0.225, 0.250) |
| NAR | (-0.116, 0.051) | (-0.273, 0.182) | (-0.519, 0.235) |
| RED | (-0.071, 0.056) | (-0.279, 0.137) | (-0.556, 0.134) |
| Injury Risk | (-0.118, 0.041) | (-0.323, 0.120) | (-0.441, 0.151) |
| BET X Injury Risk | (-0.027, 0.080) | (-0.087, 0.200) | (-0.103, 0.224) |
| BIT X Injury Risk | (-0.012, 0.243) | (-0.038, 0.836) | (-0.051, 1.038) |
| OET X Injury Risk | (-0.127, 0.042) | (-0.482, 0.038) | (-0.537, 0.063) |
| OIT X Injury Risk | (-0.141, 0.012) | (-0.636, 0.017) | (-0.836, 0.015) |
| NAR X Injury Risk | (-0.024, 0.116) | (-0.051, 0.517) | (-0.045, 0.628) |
| RED X Injury Risk | (-0.146, 0.003) | (-0.505, 0.001) | (-0.694, 0.001) |

These results do not support the first and second hypotheses as none of the six attention styles, perceived risk of injury and the six interaction variables mediated the relationship between NLE, PLE, MSSN and MSSR with each of the three injury criterion variables. These findings do not support the predictive validity of the TAIS2 attention scores. These results are inconsistent with the findings of Andersen and Williams (1999) and Rogers and Landers (2005). Peripheral vision narrowing was found to mediate the relationship between social support and injury occurrence

(Andersen & Williams) and NLE and injury (Rogers & Landers). Inconsistency in findings may be due to the differences in methodology used across the studies and the measurement of attention. While this study used the TAIS2, a questionnaire measure of attentional style, Andersen and Williams plus Rogers and Landers used a laboratory measurement of attention which measures a person's current level of attention. They also induced a stressful situation while measuring the athlete's level of attention (e.g., asking the participant to do multiple tasks at the same time or testing the athlete one hour before an important athletic situation) therefore simulating stressful conditions that an athlete may encounter on the field. However, a plausible explanation for the inconsistency in results may also be occurring because the TAIS2 attention scales are not a valid measure of attention.

### *Hypothesis Three*

In order to test the third hypothesis of the study, which states that maladaptive attention styles and perceived risk of injury plus their interaction would mediate the relationship between coping and injury occurrence, mediation analysis using the bootstrapping technique was utilised again. The predictor variables were the eight coping styles (confrontive, distancing, self controlling, seeking social support, accepting responsibility, avoidance, problem solving and positive reappraisal). Table 19 shows the mediation results for each of the coping styles in the form of 95% bias corrected confidence intervals. The table indicates that the OET attention style was a mediator of the relationship between accepting responsibility coping and mean injury severity rating [95% CI: (0.009, 0.235)], accepting responsibility coping and mean time lost to injury [95% CI: (0.016, 0.287)], avoidance coping and number of injuries [95% CI: (0.000, 0.393)], and avoidance coping and mean injury severity rating [95% CI: (0.001, 0.110)].

Table 19

*Mediation results (in the form of bias corrected 95% confidence intervals calculated via the bootstrapping method) for the eight coping predictor variables*

| | Criterion variable | | |
|---|---|---|---|
| Mediator | No. of injuries | Mean injury severity | Mean time lost to injury |
| | | Confrontive coping | |
| BET | (-0.014, 0.051) | (-0.090, 0.093) | (-0.100, 0.128) |
| BIT | (-0.003, 0.025) | (-0.008, 0.078) | (-0.009, 0.102) |
| OET | (-0.0004, 0.045) | (-0.002, 0.120) | (-0.001, 0.150) |
| OIT | (-0.003, 0.031) | (-0.050, 0.064) | (-0.078, 0.069) |
| NAR | (-0.035, 0.005) | (-0.010, 0.020) | (-0.152, 0.010) |
| RED | (-0.007, 0.034) | (-0.052, 0.062) | (-0.095, 0.048) |
| Injury Risk | (-0.003, 0.031) | (-0.025, 0.080) | (-0.021, 0.104) |
| BET X Injury Risk | (-0.003, 0.015) | (-0.009, 0.046) | (-0.012, 0.057) |
| BIT X Injury Risk | (-0.016, 0.003) | (-0.063, 0.007) | (-0.084, 0.009) |
| OET X Injury Risk | (-0.008, 0.005) | (-0.034, 0.015) | (-0.036, 0.015) |
| OIT X Injury Risk | (-0.005, 0.013) | (-0.021, 0.047) | (-0.021, 0.064) |
| NAR X Injury Risk | (-0.003, 0.024) | (-0.009, 0.082) | (-0.010, 0.103) |
| RED X Injury Risk | (-0.025, 0.004) | (-0.084, 0.014) | (-0.099, 0.020) |
| | | Distancing coping | |
| BET | (-0.016, 0.013) | (-0.091, 0.014) | (-0.010, 0.021) |
| BIT | (-0.004, 0.025) | (-0.010, 0.099) | (-0.013, 0.142) |
| OET | (-0.007, 0.035) | (-0.023, 0.103) | (-0.027, 0.111) |
| OIT | (-0.013, 0.031) | (-0.091, 0.054) | (-0.137, 0.054) |
| NAR | (-0.018, 0.007) | (-0.058, 0.019) | (-0.092, 0.029) |
| RED | (-0.010, 0.020) | (-0.069, 0.022) | (-0.117, 0.017) |
| Injury Risk | (-0.006, 0.034) | (-0.023, 0.080) | (-0.016, 0.111) |
| BET X Injury Risk | (-0.006, 0.007) | (-0.021, 0.018) | (-0.025, 0.022) |
| BIT X Injury Risk | (-0.019, 0.003) | (-0.071, 0.007) | (-0.105, 0.009) |
| OET X Injury Risk | (-0.005, 0.012) | (-0.014, 0.065) | (-0.013, 0.061) |
| OIT X Injury Risk | (-0.003, 0.019) | (-0.008, 0.089) | (-0.011, 0.109) |
| NAR X Injury Risk | (-0.017, 0.003) | (-0.080, 0.003) | (-0.099, 0.001) |
| RED X Injury Risk | (-0.002, 0.030) | (-0.015, 0.108) | (-0.018, 0.130) |
| | | Self controlling coping | |
| BET | (-0.024, 0.069) | (-0.164, 0.146) | (-0.192, 0.189) |
| BIT | (-0.023, 0.004) | (-0.083, 0.012) | (-0.115, 0.018) |
| OET | (-0.006, 0.036) | (-0.016, 0.089) | (-0.019, 0.120) |
| OIT | (-0.007, 0.048) | (-0.082, 0.107) | (-0.129, 0.101) |
| NAR | (-0.039, 0.008) | (-0.115, 0.035) | (-0.196, 0.016) |
| RED | (-0.014, 0.028) | (-0.077, 0.054) | (-0.136, 0.042) |
| Injury Risk | (-0.012, 0.068) | (-0.041, 0.186) | (-0.044, 0.242) |
| BET X Injury Risk | (-0.006, 0.050) | (-0.017, 0.153) | (-0.033, 0.171) |
| BIT X Injury Risk | (-0.035, 0.005) | (-0.125, 0.016) | (-0.151, 0.023) |
| OET X Injury Risk | (-0.004, 0.020) | (-0.007, 0.062) | (-0.009, 0.061) |
| OIT X Injury Risk | (-0.003, 0.081) | (-0.010, 0.294) | (-0.010, 0.327) |
| NAR X Injury Risk | (-0.004, 0.025) | (-0.013, 0.109) | (-0.018, 0.149) |
| RED X Injury Risk | (-0.019, 0.010) | (-0.068, 0.036) | (-0.085, 0.046) |

* Significant mediation present

Table 19 (cont.)

*Mediation results (in the form of bias corrected 95% confidence intervals calculated via the bootstrapping method) for the eight coping predictor variables*

| Mediator | Criterion variable | | |
|---|---|---|---|
| | No. of injuries | Mean injury severity | Mean time lost to injury |
| | | Seek social support coping | |
| BET | (-0.015, 0.016) | (-0.064, 0.025) | (-0.042, 0.058) |
| BIT | (-0.005, 0.026) | (-0.013, 0.076) | (-0.017, 0.098) |
| OET | (-0.006, 0.041) | (-0.027, 0.092) | (-0.036, 0.105) |
| OIT | (-0.006, 0.013) | (-0.020, 0.040) | (-0.022, 0.044) |
| NAR | (-0.015, 0.007) | (-0.045, 0.020) | (-0.081, 0.028) |
| RED | (-0.007, 0.013) | (-0.018, 0.036) | (-0.025, 0.049) |
| Injury Risk | (-0.011, 0.009) | (-0.026, 0.025) | (-0.039, 0.026) |
| BET X Injury Risk | (-0.005, 0.016) | (-0.009, 0.068) | (-0.010, 0.088) |
| BIT X Injury Risk | (-0.028, 0.003) | (-0.067, 0.011) | (-0.097, 0.012) |
| OET X Injury Risk | (-0.026, 0.003) | (-0.080, 0.007) | (-0.077, 0.012) |
| OIT X Injury Risk | (-0.014, 0.003) | (-0.058, 0.014) | (-0.074, 0.018) |
| NAR X Injury Risk | (-0.004, 0.019) | (-0.009, 0.103) | (-0.013, 0.114) |
| RED X Injury Risk | (-0.048, -0.003)* | (-0.121, -0.003)* | (-0.145, -0.005)* |
| | | Accepting responsibility coping | |
| BET | (-0.032, 0.017) | (-0.106, 0.021) | (-0.119, 0.035) |
| BIT | (-0.006, 0.034) | (-0.016, 0.111) | (-0.021, 0.155) |
| OET | (-0.003, 0.074) | (0.009, 0.235)* | (0.016, 0.287)* |
| OIT | (-0.067, 0.043) | (-0.209, 0.134) | (-0.259, 0.146) |
| NAR | (-0.043, 0.006) | (-0.124, 0.018) | (-0.180, 0.021) |
| RED | (-0.054, 0.028) | (-0.138, 0.083) | (-0.202, 0.066) |
| Injury Risk | (-0.006, 0.032) | (-0.030, 0.104) | (-0.023, 0.139) |
| BET X Injury Risk | (-0.012, 0.006) | (-0.035, 0.016) | (-0.047, 0.016) |
| BIT X Injury Risk | (-0.033, 0.003) | (-0.097, 0.013) | (-0.134, 0.012) |
| OET X Injury Risk | (-0.004, 0.020) | (-0.008, 0.107) | (-0.011, 0.107) |
| OIT X Injury Risk | (-0.009, 0.019) | (-0.037, 0.076) | (-0.040, 0.098) |
| NAR X Injury Risk | (-0.038, 0.003) | (-0.177, 0.004) | (-0.223, 0.002) |
| RED X Injury Risk | (-0.007, 0.038) | (-0.033, 0.129) | (-0.044, 0.160) |
| | | Avoidance coping | |
| BET | (-0.012, 0.030) | (-0.083, 0.031) | (-0.078, 0.051) |
| BIT | (-0.004, 0.022) | (-0.009, 0.077) | (-0.013, 0.107) |
| OET | (0.000, 0.393)* | (0.001, 0.110)* | (-0.0002, 0.136) |
| OIT | (-0.008, 0.036) | (-0.081, 0.054) | (-0.108, 0.069) |
| NAR | (-0.027, 0.004) | (-0.089, 0.011) | (-0.116, 0.008) |
| RED | (-0.012, 0.027) | (-0.063, 0.036) | (-0.094, 0.027) |
| Injury Risk | (-0.003, 0.021) | (-0.015, 0.053) | (-0.012, 0.074) |
| BET X Injury Risk | (-0.016, 0.002) | (-0.088, 0.006) | (-0.060, 0.008) |
| BIT X Injury Risk | (-0.020, 0.004) | (-0.077, 0.010) | (-0.109, 0.009) |
| OET X Injury Risk | (-0.002, 0.020) | (-0.003, 0.066) | (-0.004, 0.067) |
| OIT X Injury Risk | (-0.005, 0.016) | (-0.020, 0.057) | (-0.023, 0.067) |
| NAR X Injury Risk | (-0.012, 0.003) | (-0.076, 0.008) | (-0.089, 0.012) |
| RED X Injury Risk | (-0.005, 0.027) | (-0.016, 0.080) | (-0.022, 0.098) |

* Significant mediation present

Table 19 (cont.)

*Mediation results (in the form of bias corrected 95% confidence intervals calculated via the bootstrapping method) for the eight coping predictor variables*

| Mediator | Criterion variable | | |
|---|---|---|---|
| | No. of injuries | Mean injury severity | Mean time lost to injury |
| | | Problem solving coping | |
| BET | (-0.050, 0.011) | (-0.126, 0.037) | (-0.105, 0.075) |
| BIT | (-0.033, 0.005) | (-0.112, 0.014) | (-0.132, 0.019) |
| OET | (-0.004, 0.034) | (-0.013, 0.096) | (-0.020, 0.114) |
| OIT | (-0.016, 0.022) | (-0.058, 0.042) | (-0.074, 0.053) |
| NAR | (-0.045, 0.003) | (-0.124, 0.013) | (-0.181, 0.008) |
| RED | (-0.027, 0.011) | (-0.068, 0.030) | (-0.108, 0.027) |
| Injury Risk | (-0.021, 0.005) | (-0.052, 0.013) | (-0.071, 0.013) |
| BET X Injury Risk | (-0.004, 0.021) | (-0.014, 0.047) | (-0.018, 0.071) |
| BIT X Injury Risk | (-0.040, 0.001) | (-0.108, 0.009) | (-0.135, 0.012) |
| OET X Injury Risk | (-0.006, 0.012) | (-0.005, 0.080) | (-0.007, 0.089) |
| OIT X Injury Risk | (-0.021, 0.006) | (-0.079, 0.023) | (-0.095, 0.026) |
| NAR X Injury Risk | (-0.021, 0.006) | (-0.102, 0.020) | (-0.119, 0.025) |
| RED X Injury Risk | (-0.003, 0.030) | (-0.015, 0.125) | (-0.021, 0.145) |
| | | Positive reappraisal coping | |
| BET | (-0.011, 0.047) | (-0.116, 0.078) | (-0.129, 0.101) |
| BIT | (-0.017, 0.006) | (-0.054, 0.020) | (-0.078, 0.030) |
| OET | (-0.001, 0.036) | (-0.002, 0.096) | (-0.003, 0.117) |
| OIT | (-0.001, 0.074) | (-0.118, 0.120) | (-0.168, 0.148) |
| NAR | (-0.041, 0.013) | (-0.145, 0.041) | (-0.234, 0.017) |
| RED | (-0.012, 0.029) | (-0.058, 0.056) | (-0.109, 0.044) |
| Injury Risk | (-0.002, 0.043) | (-0.024, 0.112) | (-0.015, 0.141) |
| BET X Injury Risk | (-0.004, 0.029) | (-0.017, 0.075) | (-0.021, 0.080) |
| BIT X Injury Risk | (-0.026, 0.003) | (-0.078, 0.011) | (-0.106, 0.012) |
| OET X Injury Risk | (-0.002, 0.018) | (-0.003, 0.073) | (-0.003, 0.073) |
| OIT X Injury Risk | (-0.004, 0.037) | (-0.016, 0.126) | (-0.016, 0.156) |
| NAR X Injury Risk | (-0.007, 0.020) | (-0.031, 0.095) | (-0.033, 0.117) |
| RED X Injury Risk | (-0.006, 0.031) | (-0.032, 0.096) | (-0.034, 0.123) |

* Significant mediation present

The correlations between accepting responsibility coping and injury severity and time lost were, $r$ ($N$ = 41) = .014, $p$ = .93, and $r$ ($N$ = 41) = .027, $p$ = .87 respectively indicating a positive (but minimal) relationship between these variables. The correlations between avoidance coping and number of injuries and injury severity were, $r$ ($N$ = 41) = -.11, $p$ = .50, and $r$ ($N$ = 41) = -.017, $p$ = .92 respectively indicating a negative (but minimal) relationship between these variables. The 95% bias corrected confidence intervals indicate that the indirect effect for OET for the previously mentioned relationships is positive which indicates that higher scores on

the OET subscale is minimising these relationships. The other five attention styles and total perceived injury risk on their own did not mediate the relationships between each of the coping styles and each of the criterion variables.

Table 19 also shows that the interaction between the RED attention style and total perceived injury risk was found to mediate the relationship between seeking social support coping and each of the criterion variables [number of injuries, 95% CI: (-0.048, -0.003); mean injury severity, 95% CI: (-0.121, -.0.003); mean time lost to injury, 95% CI (-0.145, -0.005)]. The correlations between seeking social support coping and number of injuries, injury severity and time lost were, $r$ ($N$ = 41) = -.002, $p$ = .99, $r$ ($N$ = 41) = -.19, $p$ = .23 and $r$ ($N$ = 41) = -.20, $p$ = .20 respectively indicating a negative (but minimal) relationship between these variables. The 95% bias corrected confidence intervals indicate that the indirect effect for the RED/perceived injury risk interaction for the above relationships is negative which indicates that low scores on either RED and perceived injury risk or both is minimising these relationships. All interactions between the other five attention styles and total perceived injury risk failed to mediate the relationships between each of the coping styles and each criterion variable.

These results provide some degree of support for the third hypothesis of the study, but these findings are not enough to demonstrate the predictive validity of the TAIS2 attention scores. Only the OET attention scores and the interaction between the RED attention style and perceived injury risk were found to be significant mediators. OET mediated the relationship between accepting responsibility coping with mean injury severity rating and mean time lost to injury plus the avoidance coping with number of injuries and mean injury severity relationships. Results indicate that higher scores on the OET subscale is minimising the relationships mentioned above. Therefore, increased external distractibility is explaining why those

who utilise accepting responsibility coping are experiencing severe injuries more and those utilising avoidance coping are getting injured less.

This indicates that external distractibility is both a protective and precipitating factor of injury depending on the type of coping strategy utilised by the athlete. Accepting responsibility coping is defined by the Ways of Coping Scale (Folkman & Lazarus, 1988, p. 11) as “acknowledges one’s own role in the problem with a concomitant theme of trying to put things right.” With regards to a stressful athletic situation, those who are accepting responsibility for their wrongs on the field and are actively aiming to right their wrongs while playing, becoming distracted by external cues that are taking the focus away from their aim may be leading these individuals to experience severe injuries. Avoidance coping is defined by the Ways of Coping Scale (Folkman & Lazarus, 1988, p. 11) as “wishful thinking and behavioural efforts to escape or avoid the problem.” With regards to a stressful athletic situation, those who are trying to avoid their previous wrongs on the field, becoming distracted by external cues is protective because these distractions are welcomed by the individual as they help the individual escape their wrongs leaving them less susceptible to severe injuries.

The RED/perceived injury risk interaction mediated the relationship between seeking social support coping and each of the three injury criterion variables. Results indicated that low scores on either the RED attention subscale and perceived injury risk or both is minimising this relationship. Therefore, decreased levels of reduced focus and decreased thoughts of injury susceptibility are explaining why those who utilise seeking social support coping are experiencing less severe injuries. Seeking social support coping is defined by the Ways of Coping Scale (Folkman & Lazarus, 1988, p. 11) as “efforts to seek informational support, tangible support and emotional support.” Seeking social support is a protective factor also because athletes are

experiencing less fear of re-injury and their focus while on the field is better because they are seeking the support of other (e.g., their team mates) to help them through their problems.

While no research has attempted to investigate the possible mediators of the coping-injury relationship, previous research has looked at the coping-injury relationship in depth. The coping results in this study were inconsistent with the results of Maddison and Prapavessis (2005) who found that avoidance coping (as measured by the Ways of Coping Scale which is the same measure utilised in this study) is associated with increased injury. This study found avoidance coping to be associated with lower injury. One thing that should be mentioned is that the relationships accepting responsibility, avoidance and seeking social support coping have with the injury variables found in this study are minimal and non-significant. These inconsistencies may be due to different athletic populations being sampled also; Maddison and Prapavessis utilised only a sample of rugby players whereas this study utilised a mixture of athletes from various sports.

### *Hypothesis Four*

In order to test the fourth hypothesis of the study, which states that maladaptive attention styles and perceived risk of injury plus their interaction would mediate the relationship between anxiety and injury occurrence, mediation analysis using the bootstrapping technique was utilised again. The predictor variables were the four anxiety scores (somatic, concentration disruption, worry and total anxiety). Table 20 shows the mediation results for each of the anxiety scores in the form of 95% bias corrected confidence intervals. The table indicates that the OIT attention style was a mediator of the relationship between worry anxiety and number of injuries

Table 20

*Mediation results (in the form of bias corrected 95% confidence intervals calculated via the bootstrapping method) for the four anxiety predictor variables*

| | Criterion variable | | |
|---|---|---|---|
| Mediator | No. of injuries | Mean injury severity | Mean time lost to injury |
| | | Somatic anxiety | |
| BET | (-0.011, 0.026) | (-0.118, 0.027) | (-0.073, 0.074) |
| BIT | (-0.049, 0.006) | (-0.163, 0.014) | (-0.233, 0.015) |
| OET | (-0.014, 0.055) | (-0.050, 0.101) | (-0.063, 0.130) |
| OIT | (-0.005, 0.040) | (-0.051, 0.075) | (-0.068, 0.094) |
| NAR | (-0.058, 0.018) | (-0.162, 0.062) | (-0.233, 0.045) |
| RED | (-0.009, 0.016) | (-0.058, 0.024) | (-0.099, 0.021) |
| Injury Risk | (-0.034, 0.009) | (-0.087, 0.023) | (-0.111, 0.027) |
| BET X Injury Risk | (-0.006, 0.021) | (-0.021, 0.066) | (-0.023, 0.084) |
| BIT X Injury Risk | (-0.042, 0.004) | (-0.161, 0.011) | (-0.182, 0.013) |
| OET X Injury Risk | (-0.008, 0.030) | (-0.001, 0.123) | (-0.005, 0.146) |
| OIT X Injury Risk | (-0.010, 0.027) | (-0.048, 0.107) | (-0.058, 0.133) |
| NAR X Injury Risk | (-0.025, 0.010) | (-0.119, 0.051) | (-0.119, 0.059) |
| RED X Injury Risk | (0.005, 0.065)* | (0.020, 0.211)* | (0.027, 0.293)* |
| | | Concentration disruption | |
| BET | (-0.011, 0.030) | (-0.118, 0.033) | (-0.074, 0.078) |
| BIT | (-0.025, 0.018) | (-0.086, 0.057) | (-0.118, 0.078) |
| OET | (-0.009, 0.055) | (-0.024, 0.157) | (-0.033, 0.178) |
| OIT | (-0.006, 0.096) | (-0.057, 0.264) | (-0.109, 0.252) |
| NAR | (-0.066, 0.016) | (-0.166, 0.098) | (-0.297, 0.044) |
| RED | (-0.022, 0.054) | (-0.071, 0.150) | (-0.123, 0.135) |
| Injury Risk | (-0.005, 0.058) | (-0.016, 0.153) | (-0.011, 0.197) |
| BET X Injury Risk | (-0.006, 0.023) | (-0.020, 0.068) | (-0.024, 0.082) |
| BIT X Injury Risk | (-0.006, 0.036) | (-0.023, 0.106) | (-0.029, 0.145) |
| OET X Injury Risk | (-0.004, 0.023) | (-0.012, 0.099) | (-0.011, 0.101) |
| OIT X Injury Risk | (-0.010, 0.034) | (-0.037, 0.138) | (-0.047, 0.152) |
| NAR X Injury Risk | (-0.013, 0.023) | (-0.050, 0.110) | (-0.061, 0.133) |
| RED X Injury Risk | (-0.008, 0.054) | (-0.039, 0.112) | (-0.052, 0.204) |
| | | Worry anxiety | |
| BET | (-0.007, 0.020) | (-0.048, 0.030) | (-0.032, 0.057) |
| BIT | (-0.027, 0.005) | (-0.085, 0.015) | (-0.115, 0.022) |
| OET | (-0.006, 0.049) | (-0.021, 0.125) | (-0.028, 0.140) |
| OIT | (0.000, 0.035)* | (-0.028, 0.078) | (-0.042, 0.091) |
| NAR | (-0.033, 0.016) | (-0.079, 0.073) | (-0.142, 0.038) |
| RED | (-0.010, 0.035) | (-0.038, 0.099) | (-0.061, 0.095) |
| Injury Risk | (-0.003, 0.029) | (-0.011, 0.080) | (-0.011, 0.103) |
| BET X Injury Risk | (-0.006, 0.005) | (-0.016, 0.013) | (-0.020, 0.015) |
| BIT X Injury Risk | (-0.034, 0.006) | (-0.084, 0.023) | (-0.117, 0.028) |
| OET X Injury Risk | (-0.003, 0.021) | (-0.006, 0.088) | (-0.007, 0.090) |
| OIT X Injury Risk | (-0.017, 0.003) | (-0.082, 0.007) | (-0.104, 0.008) |
| NAR X Injury Risk | (-0.016, 0.004) | (-0.077, 0.011) | (-0.101, 0.012) |
| RED X Injury Risk | (-0.007, 0.030) | (-0.025, 0.104) | (-0.034, 0.117) |

* Significant mediation present

Table 20 (cont.)

*Mediation results (in the form of bias corrected 95% confidence intervals calculated via the bootstrapping method) for the four anxiety predictor variables*

| Mediator | Criterion variable | | |
|---|---|---|---|
| | No. of injuries | Mean injury severity | Mean time lost to injury |
| | | Total anxiety | |
| BET | (-0.004, 0.012) | (-0.022, 0.024) | (-0.015, 0.041) |
| BIT | (-0.015, 0.002) | (-0.050, 0.005) | (-0.072, 0.007) |
| OET | (-0.003, 0.026) | (-0.013, 0.061) | (-0.014, 0.076) |
| OIT | (0.002, 0.024)* | (-0.012, 0.062) | (-0.020, 0.068) |
| NAR | (-0.023, 0.010) | (-0.048, 0.057) | (-0.085, 0.039) |
| RED | (-0.005, 0.017) | (-0.018, 0.049) | (-0.028, 0.054) |
| Injury Risk | (-0.003, 0.015) | (-0.008, 0.040) | (-0.008, 0.058) |
| BET X Injury Risk | (-0.002, 0.006) | (-0.007, 0.018) | (-0.009, 0.022) |
| BIT X Injury Risk | (-0.017, 0.002) | (-0.043, 0.007) | (-0.064, 0.008) |
| OET X Injury Risk | (-0.001, 0.015) | (-0.002, 0.060) | (-0.002, 0.068) |
| OIT X Injury Risk | (-0.006, 0.007) | (-0.021, 0.030) | (-0.026, 0.034) |
| NAR X Injury Risk | (-0.012, 0.002) | (-0.041, 0.010) | (-0.059, 0.011) |
| RED X Injury Risk | (-0.001, 0.021) | (-0.005, 0.083) | (-0.006, 0.103) |

* Significant mediation present

[95% CI: (0.000, 0.035)] and total anxiety and number of injuries [95% CI: (0.002, 0.024)].

The correlations between worry anxiety and total anxiety with number of injuries were, $r$ ($N$ = 41) = -.20, $p$ = .22, and $r$ ($N$ = 41) = -.19, $p$ = .23 respectively indicating a negative (but minimal) relationship between these variables. The 95% bias corrected confidence intervals indicate that the indirect effect for OIT for the above relationships is positive which indicates that higher scores on the OIT subscale is minimising the relationships mentioned above. The other five attention styles and total perceived injury risk on their own did not mediate the relationships between each of the anxiety scores and each of the criterion variables.

Table 20 also shows that the interaction between RED attention style and total perceived injury risk was found to mediate the relationship between somatic anxiety and each of the criterion variables [number of injuries, 95% CI: (0.005, 0.065); mean injury severity, 95% CI: (0.020, .0.211); mean time lost to injury, 95% CI (0.027,

0.293)]. The correlations between somatic anxiety and number of injuries, injury severity and time lost were, $r$ ($N$ = 41) = -.11, $p$ = .50, $r$ ($N$ = 41) = -.15, $p$ = .35 and $r$ = -.23, $p$ = .15 respectively indicating a negative (but minimal) relationship between these variables. The 95% bias corrected confidence intervals indicate that the indirect effect for the RED/perceived injury risk interaction for the above relationships is positive which indicates that high scores on either RED and perceived injury risk or both is minimising these relationships. All interactions between the other five attention styles and total perceived injury risk failed to mediate the relationships between each of the anxiety scores and each criterion variable.

These results provide partial support for the fourth hypothesis of this study, but again, these findings are not sufficient enough to support the predictive validity of the TAIS2 attention subscales. Only the OIT attention style and the interaction between the RED attention style and perceived injury risk were found to be significant mediators. OIT mediated the relationship between worry anxiety and total anxiety with number of injuries. Results indicate that higher scores on the OIT subscale is minimising the relationships mentioned above. Therefore, increased internal distractibility is explaining why those who experience anxiety in general and worry are getting injured less. The RED/perceived injury risk interaction mediated the relationship between somatic anxiety and each of the three injury criterion variables. Results indicated that high scores on either the RED attention subscale and perceived injury risk or both is minimising this relationship therefore increased reduced focus and increased thoughts of injury susceptibility is explaining why those who experience somatic anxiety (the physical symptoms of anxiety) are experiencing less severe injuries.

Again, no research has attempted to investigate the possible mediators of the anxiety-injury relationship; however previous research has looked at the relationship

between anxiety and injury. Contrary to the findings of this study, Hazzard (2004) found a positive relationship between anxiety and injury frequency. Again, it should be stated that the relationships between somatic anxiety, worry and total anxiety and the injury criterion variables found in this study were minimal and non-significant. These inconsistencies again may be due to different athletic populations being sampled; Hazzard utilised a sample of athletes from various sports such as hockey, softball, American football and volleyball. These sports were not represented in the sample utilised by this study.

However, the negative relationship between anxiety and injury found in this study and the evidence indicating increased internal distractibility, reduced focus and perceived injury risk are linked with decreased injury occurrence seem logical with the nature of anxiety. People who are anxious tend to be overloaded by anxious, irrational thoughts (Edelman, 2007) therefore the overload of internal stimuli (thoughts and feelings), irrational thoughts about injury and reduced focus are expected. Williams et al. (1990, 1991) found that increased anxiety was associated with peripheral narrowing therefore demonstrating the attentional changes that anxiety can cause. People with anxiety tend to avoid those situations that are anxiety provoking for them also (Edelman, 2007) therefore the presence of anxiety may be stopping athletes from putting themselves in athletic situations that may lead to injury.

### *Hypothesis Five*

In order to test the fifth hypothesis of the study, which states that maladaptive attention styles and perceived risk of injury plus their interaction would mediate the relationship between previous and subsequent injury occurrence, mediation analysis using the bootstrapping technique was utilised again. The predictor variables were the three previous injury scores (number of previous injuries, mean previous injury

severity rating and mean previous injury time lost rating). Table 21 shows the mediation results for each of the previous injury scores in the form of 95% bias corrected confidence intervals. The table indicates that each attention style and total perceived injury risk on their own did not mediate the relationships between each of the three previous injury scores and each of the criterion variables. Table 21 also shows that the interaction between the RED attention style and total perceived injury risk was found to mediate the relationship between number of previous injuries, mean previous injury severity and mean previous injury time lost with mean subsequent injury severity [number of previous injuries, 95% CI: (0.001, 0.333); mean previous injury severity, 95% CI: (0.001, .0.074); mean previous time lost, 95% CI (0.001, -0.095)] and mean subsequent time lost to injury [number of previous injuries, 95% CI: (0.003, 0.438); mean previous injury severity, 95% CI: (0.004, .0.110); mean previous time lost, 95% CI (0.002, -0.128)].

The correlations between number of previous injuries, mean previous injury severity and mean previous injury time lost with mean injury severity were, $r$ ($N$ = 41) = .30, $p$ = .061, $r$ ($N$ = 41) = .69, $p$ < .001 and $r$ ($N$ = 41) = .59, $p$ < .001 respectively indicating positive relationships between these variables. The correlations between number of previous injuries, mean previous injury severity and mean previous injury time lost with mean time lost to injury were, $r$ ($N$ = 41) = .26, $p$ = .11, $r$ ($N$ = 41) = .66, $p$ < .001 and $r$ ($N$ = 41) = .58, $p$ < .001 respectively indicating positive relationships between these variables. The 95% bias corrected confidence intervals indicate that the indirect effect for the RED/perceived injury risk interaction for the above relationships is positive which indicates that high scores on either RED and perceived injury risk or both is minimising these relationships. All interactions between the other five attention styles and total perceived injury risk failed to mediate the relationships between each of the previous injury scores and each of the criterion variables.

Table 21

*Mediation results (in the form of bias corrected 95% confidence intervals calculated via the bootstrapping method) for the three previous injury predictor variables*

| | Criterion variable | | |
|---|---|---|---|
| Mediator | No. of injuries | Mean injury severity | Mean time lost to injury |
| | Number of previous injuries | | |
| BET | (-0.048, 0.025) | (-0.220, 0.035) | (-0.310, 0.048) |
| BIT | (-0.021, 0.072) | (-0.069, 0.293) | (-0.113, 0.399) |
| OET | (-0.005, 0.135) | (-0.012, 0.380) | (-0.023, 0.432) |
| OIT | (-0.085, 0.013) | (-0.164, 0.071) | (-0.187, 0.125) |
| NAR | (-0.032, 0.052) | (-0.094, 0.134) | (-0.153, 0.220) |
| RED | (-0.024, 0.034) | (-0.221, 0.028) | (-0.261, 0.029) |
| Injury Risk | (-0.034, 0.069) | (-0.082, 0.172) | (-0.122, 0.226) |
| BET X Injury Risk | (-0.048, 0.012) | (-0.141, 0.033) | (-0.183, 0.036) |
| BIT X Injury Risk | (-0.057, 0.021) | (-0.209, 0.057) | (-0.246, 0.081) |
| OET X Injury Risk | (-0.013, 0.037) | (-0.037, 0.180) | (-0.035, 0.167) |
| OIT X Injury Risk | (-0.021, 0.051) | (-0.101, 0.208) | (-0.111, 0.287) |
| NAR X Injury Risk | (-0.023, 0.048) | (-0.118, 0.244) | (-0.142, 0.266) |
| RED X Injury Risk | (-0.001, 0.099) | (0.001, 0.333)* | (0.003, 0.438)* |
| | Mean previous injury severity | | |
| BET | (-0.012, 0.006) | (-0.053, 0.016) | (-0.057, 0.014) |
| BIT | (-0.005, 0.026) | (-0.011, 0.088) | (-0.016, 0.122) |
| OET | (-0.004, 0.039) | (-0.006, 0.104) | (-0.007, 0.112) |
| OIT | (-0.034, 0.005) | (-0.064, 0.008) | (-0.080, 0.011) |
| NAR | (-0.006, 0.033) | (-0.019, 0.060) | (-0.023, 0.127) |
| RED | (-0.021, 0.004) | (-0.038, 0.012) | (-0.017, 0.035) |
| Injury Risk | (-0.006, 0.020) | (-0.017, 0.038) | (-0.016, 0.065) |
| BET X Injury Risk | (-0.013, 0.005) | (-0.032, 0.013) | (-0.038, 0.013) |
| BIT X Injury Risk | (-0.002, 0.016) | (-0.005, 0.045) | (-0.005, 0.066) |
| OET X Injury Risk | (-0.005, 0.009) | (-0.005, 0.040) | (-0.007, 0.038) |
| OIT X Injury Risk | (-0.002, 0.015) | (-0.003, 0.078) | (-0.003, 0.112) |
| NAR X Injury Risk | (-0.005, 0.018) | (-0.020, 0.075) | (-0.026, 0.096) |
| RED X Injury Risk | (-0.002, 0.024) | (0.001, 0.074)* | (0.004, 0.110)* |
| | Mean previous time lost | | |
| BET | (-0.011, 0.012) | (-0.052, 0.016) | (-0.060, 0.018) |
| BIT | (-0.006, 0.035) | (-0.013, 0.094) | (-0.017, 0.131) |
| OET | (-0.004, 0.048) | (-0.009, 0.087) | (-0.008, 0.124) |
| OIT | (-0.038, 0.004) | (-0.065, 0.010) | (-0.094, 0.012) |
| NAR | (-0.005, 0.042) | (-0.023, 0.064) | (-0.016, 0.139) |
| RED | (-0.030, 0.004) | (-0.057, 0.010) | (-0.026, 0.037) |
| Injury Risk | (-0.004, 0.028) | (-0.026, 0.041) | (-0.014, 0.074) |
| BET X Injury Risk | (-0.020, 0.004) | (-0.047, 0.011) | (-0.060, 0.011) |
| BIT X Injury Risk | (-0.004, 0.022) | (-0.011, 0.048) | (-0.012, 0.067) |
| OET X Injury Risk | (-0.005, 0.011) | (-0.006, 0.038) | (-0.008, 0.041) |
| OIT X Injury Risk | (-0.002, 0.024) | (-0.004, 0.076) | (-0.004, 0.105) |
| NAR X Injury Risk | (-0.006, 0.025) | (-0.019, 0.084) | (-0.024, 0.106) |
| RED X Injury Risk | (-0.0001, 0.033) | (0.001, 0.095)* | (0.002, 0.128)* |

* Significant mediation present

These results provide some support for the fifth hypothesis of this study but again, these results are not sufficient to demonstrate the predictive validity of the TAIS2. Only the RED/perceived injury risk interaction was found to be a significant mediator. Results indicated that high scores on either the RED attention subscale and perceived injury risk or both is minimising the relationship between the previous injury predictors and the mean injury severity and time lost to injury. Therefore, increased reduced focus and increased thoughts of injury susceptibility are explaining why those who experience previous injury are experiencing more severe subsequent injuries.

Again, no research has attempted to investigate the possible mediators of the previous-injury relationship; however previous research has looked at the associations between previous injury with subsequent injury and perceived injury susceptibility. The positive associations between previous injury and subsequent injury found in this study are consistent with Quarrie et al. (2001) who found a positive association between previous injury and time lost to injury in a sample of rugby players. The finding that perceived risk of injury acts as a mediator of the previous-injury relationship is consistent with the findings of Short et al. (2004), Reuter and Short (2005) and Deroche et al. (2007) who found that previous injury predicts susceptibility to previous injury. This study took this finding one step further to show that this susceptibility caused by previous injury can lead to subsequent injury (but in interaction only with reduced attentional focus).

### *Summary*

The results presented in this study indicated that attention style and perceived injury susceptibility and their interaction act as mediators of some of the relationships proposed by the stress and injury model. External distractibility acted as a mediator

of the relationships between accepting responsibility and avoidance coping with injury. Internal distractibility was found to be a mediator of the worry-injury and total anxiety-injury relationships. Lastly, reduced focus and perceived susceptibility interacted together to mediate the relationship between seeking social support coping, previous injury, previous injury severity and previous injury time lost with subsequent injury. However, many of the proposed hypotheses were not supported by the mediation results.

So what do these findings imply about the predictive validity of the TAIS? What do these findings imply about the validity of the stress and injury model? The last chapter of this thesis addresses the theoretical and practical implications of these findings plus the findings from Study One. Limitations of the two research studies plus directions for future research are also discussed in depth.

# CHAPTER SIX

## General Discussion

### *A Summary of Findings from Study One plus their Implications*

Study One of this thesis was concerned with investigating the psychometric properties of the revised version of the TAIS - the TAIS2. The results from Study One indicated that four out of the seven TAIS2 attention subscales produced acceptable internal consistency; the BIT, OET and NAR attention subscales did not. This is an improvement on the internal consistency for the original TAIS attention subscales. The construct validity of the TAIS2 is also improved compared with the original TAIS with the RED and OIT attention subscale scores relating to DASS-21 anxiety scores in the predicted direction and the attention and interpersonal subscales related to measures of the “Big Five” personality traits as predicted. However, the construct validity of the TAIS2 cannot be fully supported because, like the original version, factor analysis results indicated that the TAIS2 attention subscales still measure only the bandwidth dimension of the attention (narrow and broad) and not the direction dimension (internal and external) as claimed. The TAIS2 attention subscales also showed reduced measurement redundancy which may explain the improved psychometric properties compared with the original TAIS.

These findings imply that the revised version of the TAIS2 is a more appropriate measure to be utilised in psychological research compared with the original TAIS. However, the TAIS2 cannot be fully supported as being psychometrically sound on the basis of these findings only. This study was the first to investigate the psychometrics of the TAIS2; the findings of this study need to be replicated in order to establish that these findings were not due to sampling error.

Regardless of the somewhat positive findings regarding the psychometric properties of the TAIS2, this measure is not recommended for future use in clinical

practice or research unless changes are made to the copyright agreement that is linked to this measure. The TAIS2 is copyright protected to such an extent that doing scientific validation research on the instrument is frustrating and challenging. The creator does not wish for the item-scale make up to be revealed which, for commercial reasons, is quite understandable. However, this makes it very difficult for any independent researcher to run appropriate validation tests and to report validation and reliability findings in a manner that would be accepted by the scientific community. For example, when this study was devised, the key aim to the research was to run statistical techniques such as confirmatory factor analysis, a validation technique that allows an investigator to check that items actually load onto their proposed subscale. However, since the scoring procedure is copyright protected, the investigator was not able to gain access to the information that states which items make up the subscales unless an agreement was made to not report item numbers and their content. While access was gained, doing the confirmatory factor analysis seemed pointless because the results would not be allowed to be published (which would result in many a legal headache for the investigator if they were published). This type of information is crucial to a reader (be it a researcher or practitioner) who is trying to make a decision about whether or not to use the scale in their research or clinical practice. This raises one key question: why have copyright to such an extent that no one (other than the creator) can validate the tool?

While the copyright protection may have commercial advantages for the creator (which would be an acceptable answer to the question mentioned in the above paragraph), having copyright to the extent that the TAIS2 has more commercial disadvantages than advantages. Test creators use the validation research done by others in order to pinpoint the weaknesses in their tool which allows them to understand what issues need to be rectified for future versions of the

scale. However, copyright protection is limiting what can be reported. A summarised view of the truth regarding the test can only be provided, for example, one can only report in their research manuscript that one or two items would increase the internal consistency of a scale if they were to be deleted, but the creator who is reading the manuscript would not know which items are being referred to. Not having this information would hinder a test creator's quest to improve their instrument. If a measure is constantly not being reviewed and modified for the better, researchers and practitioners would become wary of using the tool in their work. If people are not using the tool, then the commercial advantages that copyright is suppose to provide would not be worth much.

### *A Summary of Findings from Study Two plus their Implications*

In a further attempt to investigate the psychometric properties of the TAIS2, Study Two of this thesis used the TAIS2 attention scores to predict injury occurrence in athletes according to the stress and injury model proposed by Andersen and Williams (1988). Results from study would not only demonstrate the predictive validity of the TAIS2, it would also demonstrate the validity of the general premise of the stress and injury model, which states that the interaction between attentional change and cognitive appraisal while in a stressful athletic situation will mediate the relationship between various psychosocial factors like coping, social support and life stress with athletic injury. The TAIS2 attention subscales were selected as measures of attention. Perceived risk of injury was utilised as a measure of cognitive appraisal.

Mediation results indicated that many of the attention subscales of the TAIS2 on their own did not mediate the relationships between life stress, social support, coping, anxiety and previous injury with subsequent injury as predicted by the stress and injury model. External distractibility (the OET subscale) and internal distractibility

(the OIT subscale) were the only significant single mediators. OET acted as a mediator of the relationships between accepting responsibility and avoidance coping with injury and OIT was found to be a mediator of the worry-injury and total anxiety-injury relationships. Perceived risk of injury was not a significant mediator of any relationships on its own, however, it interacted with the RED subscale of the TAIS2 to mediate the relationship between seeking social support coping, somatic anxiety, previous injury, previous injury severity and previous injury time lost with subsequent injury.

A broader theoretical implication of the findings of Study Two has to do with the predictive validity of the TAIS2 attention subscales and their appropriateness for use in injury prediction research. Using the definition of Cohen and Swerdlik (2002), if the TAIS2 attention scores can predict injury occurrence along the lines of the stress and injury model (i.e., as a mediator), this would demonstrate some degree of predictive validity of TAIS2 attention subscales. Since three of the five hypotheses received only partial support, this indicates that not all the TAIS2 attention scores were significant mediators of the relationships proposed by the stress and injury model. However, the scores conceptually linked to the stress and injury model (OET, OIT and RED) did mediate some relationships. These results indicate only partial support for the predictive validity properties of the TAIS2 attention scores.

These results further imply that questionnaire measures of attention have some merit for use in injury prediction research which increases the merits of Petrie and Falkstein's (1998) recommendation for the use of questionnaire measures in research compared with laboratory measures. However, the TAIS2 is not recommended to be used in injury prediction research until further validation work is done on the measure. The somewhat positive results for the TAIS2 in Study 2 may be a reflection of (a) the relationships uncovered are a true representation of what

effect the attention styles have on injury risk; or (b) a measure that is not reliable and valid to the extent acceptable by the scientific community therefore uncovering relationships that are real. Until more validation research is done on the TAIS2, one cannot make a justifiable case for which reflection above is more likely.

These results have broader implications for the stress and injury model also. The results imply that altered attention (in the form of distractibility and reduced focus) on their own or in interaction with a person's perceived risk of injury can explain why certain psychosocial factors (e.g., coping, anxiety and previous injury) have a significant positive or negative relationship with injury in athletes. These results indicate that the stress response of the stress and injury model does play a role in predicting athletic injury in the way the model proposes because the TAIS2 attention styles that were conceptually linked to the attention portion of the stress response (OET, OIT and RED) were the only significant mediators found.

Some support was also gained for the notion that an interaction between attention and cognitive appraisal can predict injury occurrence which is a new development in the injury prediction area, as this relationship appears to have never been investigated by any other published research on the stress and injury model. The attentional style that interacted with perceived risk of injury was the reduced focus style (RED) which fits well with the initial theory stated by Andersen and Williams (1988). They indicated that increased narrowing of the visual field may occur during the stress response in athletes who are experiencing stress which conceptually can be linked to a tendency to use an extremely narrow attention field (RED) in performance situations. However, the findings of Study Two offer only partial support to the inclusion of the stress response component in the model as proposed, because altered attention and perceived risk of injury on their own or in

interaction with each other did not mediate all the psychosocial-injury relationships proposed by the model.

Setting aside the TAIS2 measurement issues, these findings also have practical implications for coaches and other professionals who are involved with athletes and their preparation for competition. Psychosocial predictors to athletic injury have been researched extensively in the past and research has pointed to significant positive and negative associations between the two. However, these findings may have not been considered as useful because of a lack of understanding as to why the psychosocial factors are linked. The findings of this study offer tentative support for why certain psychosocial factors may be linked to injury e.g., because they are associated with the use of inappropriate attention styles on the field. Some of the findings also pointed to patterns of attention style and psychosocial predictors that are protective, i.e., lead to decreased frequency of injuries. Having this understanding as to why certain psychosocial factors are linked to increased or decreased injury can make it easier to explain to coaches, professionals involved with athletes and athletes themselves why making changes to psychosocial aspects of their life may be useful in protecting them against injury.

This increased understanding may lead to more acceptance of psychological interventions in the sports domain. Interventions to decrease injury in athletes based on previous findings regarding the stress and injury model have been trialled before with success. For example, Johnson, Ekengren, and Andersen (2005) identified a sample of soccer players who were at risk of injury according to the stress and injury model. Half of those players at risk were given a six session therapy program that targeted the athlete's relaxation, stress management, goal settings skills, and their self confidence. The therapy also allowed the athlete to discuss key issues in their

sport and their life in general. The other half were given no intervention. The results of the study found that the injury rate in the group that received the therapy program was significantly lower than the group who received no therapy. Since research indicates that psychological intervention can lead to positive outcomes for an athlete with regards to injury, more needs to be done to convince the sporting community that psychology has a role to play. Increased understanding of why psychosocial variables are linked to poor performance or injury may be a good place to start.

### *Limitations of the Research and Directions for Future Research*

One of the key limitations of both research studies presented in this thesis is small sample size. Appropriate statistical techniques for small sample sizes were adopted in both studies; however these statistical techniques are more statistically powerful with larger sample sizes. While, the mediation technique used in Study Two (bootstrapping) is statistically more powerful for a small sample compared with other available methods, this form of analysis is much more statistically powerful with a larger rather than a smaller sample (Fritz & MacKinnon, 2007). Larger sample sizes are also recommended for the factor analysis techniques employed in this thesis (Coakes et al., 2008; Tabachnick & Fidell, 2007). Before adopting the theoretical and practical implications of the findings of the two studies of this thesis, the findings of both studies need to be replicated using larger sample sizes.

With regards to Study One, the small sample size restricted the analyses that could have been performed to evaluate the psychometrics of the TAIS2. Techniques such as confirmatory factor analysis can check whether the proposed factor structure for an instrument is a good fit for the responses collected from a sample. This form of psychometric evaluation is recommended for future research as an evaluation of the psychometric properties of the TAIS2 on different populations. However, the issue of

the TAIS2's copyrighted scoring (discussed previously) will be a factor in whether a researcher will be able to run this type of analysis. In Study One, the TAIS2 psychometrics were evaluated only on a sample of undergraduate students. However, since the TAIS2 measures the skills needed for high level performance, the psychometric properties of the TAIS2 should be evaluated using many different populations, e.g., athletes, managers and executives. Comparison of results across various samples will directly assess whether the psychometrics of the TAIS2 are consistent across diverse populations.

The methodology used in Study Two had some limitations that should be noted. Requiring participants to send questionnaires back may have been a factor in the larger number of dropouts/non-completions. Armstrong and Lusk (1987) found that questionnaire return rates when reply paid business envelopes are used (as per the procedure in Study Two) range from 5.60 - 66.30% (average of 34.01%). The response rate for Study Two was 25.33% which is low according to the figures reported by Armstrong and Lusk. Many individuals may have completed the questionnaire in their own time but did not send it back to the investigator, e.g., they may not have been motivated to complete their participation in the study or they forgot to put it in the mail. The same can be said with regards to the postal follow-up questionnaire. However, the use of email to follow-up participants was more successful. Future researchers may want to consider the use of an internet-based questionnaire which is an accessible medium for most individuals. The success of the email follow-up procedure in Study Two is evidence of the advantages of internet-based research compared with traditional pen and paper methods. This form of questionnaire administration could also be adopted for future research wanting to evaluate the psychometric properties of the TAIS2.

A further limitation of Study Two was the participant recruitment procedure adopted. The investigator used a convenience sample of sporting clubs. While this procedure identified 225 eligible participants who were all approached and provided with a questionnaire package, this number was still too low. Future research may want to consider advertising their research in local newspapers or on sporting websites. This would allow the researcher to reach the wider sporting community instead of just relying on personal contacts.

Another limitation of Study Two was that all participants were recreational and not professional athletes. The stress and injury model may be more applicable to professional athletes. As a professional athlete's full time profession is to compete in their sport and perform to a certain (high) standard, the presence of maladaptive psychosocial factors may have more of an influence on these athletes compared with recreational athletes which in turn could increase risk of injury. Future research should attempt to recruit semi-professional or professional athletes to evaluate the validity of the stress and injury model.

The mediation results for the life events stress and social support relationships with subsequent injury found in Study Two were inconsistent with previous research findings. This inconsistency was attributed to differences in methodology – one difference being the introduction of a stressful situation when measuring the attention of an athlete. Theoretically, the stress response of an athlete is occurring during the time of a potentially stressful athletic situation therefore measurements of attention and cognitive appraisal should be taken as close as possible to a stressful athletic situation for the athlete (be it a training session or important game or competition meet). This was not included in Study Two but should be included in any future research as this would test the model as it is theoretically presented.

Future research should also look at the moderated mediation relationship proposed by the stress and injury model which was not investigated in Study Two. It is proposed that an athlete's history of stressors will contribute directly to an athlete's stress response, whereas personality characteristics and coping resources will exert their influence either directly or through the effects of an athlete's history of stressors. Therefore, future research should investigate the moderating influence social support, coping and anxiety has on attentional change and cognitive appraisal's ability to mediate the relationship between life events stress and injury.

### *General Conclusion*

The results of the two studies presented in this thesis indicate that the TAIS2 attention subscales show improved internal consistency and construct validity compared with the original version of the TAIS. However, the factor analysis findings that indicated that the seven attention scores do not reduce to two factors reflecting both of the dimensions of Nideffer's (1976) theory of attentional style (bandwidth and direction) provide the biggest threat to supporting the TAIS2's case for being a psychometrically valid measure. These two factors were expected as the attention items were created along the lines of this theory. Only the dimension of bandwidth was reflected in the two factors found in this research study.

In an attempt to demonstrate the predictive validity of the TAIS2 attention subscales, scores from these subscales were used to predict athletic injury in accordance with the stress and injury model proposed by Andersen and Williams (1988); the scales were used to measure the attention portion of this model. Attentional change (as measured by the TAIS2) on its own and in interaction with cognitive appraisal (which was defined as a perceived risk of injury) were predicted to be mediators of certain psychosocial and athletic injury relationships. Mediation

results indicated external distractibility (OET subscale) and internal distractibility (OIT subscale) were the only significant single mediators. Perceived risk of injury was not a significant mediator of any relationships on its own. However, it interacted with reduced focus (RED subscale) to mediate some psychosocial and athletic injury relationships. These offer partial support to the general premise of the stress and injury model (which has never been investigated before) and also lend partial support to the predictive validity of the TAIS2.

Coupled together, these results highlight the psychometric inadequacies of the TAIS2 measure. One must have evidence of the sound psychometrics in order to use a measure with confidence. While the TAIS2 measure has promise – on face value, the measure looks acceptable and items appear to measure what they intend to measure – the measure has major copyright complications behind it that make independent validation research frustrating and extremely challenging. Without proper validation research done by independent researchers, one cannot be too comfortable with using the TAIS2 in their clinical practice or research studies.

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# APPENDICES

## Appendix A - Table of Post 1998 Research Done on the Stress and Injury Model

Table 22

*A summary of post 1998 research on risk factors and the prediction of athletic injury*

| Author(s) | Type of design | Sample | Summary of key findings |
|---|---|---|---|
| Andersen & Williams (1999) | Prospective | 196 intercollegiate athletes from 10 sports (gymnastics, swimming, cross country, track and field, wrestling, American football, softball, volleyball and basketball) | Negative life events stress (NLS) predicted injury with high NLS associated with more injury; high NLS ($R^2$ = .18) and greater peripheral narrowing ($R^2$ = .08) during the stressful condition was positively associated with a higher number of injuries for those with low levels of social support |
| Deroche et al. (2007) | Neither prospective or retrospective | 235 French rugby players (from local and national leagues) | Perceived susceptibility to injury was predicted by previous injury after removing the influence of age and time since last injury. Neuroticism and self esteem also predicted susceptibility after removing previous injury's influence. Neuroticism continued to predict susceptibility in the presence of previous injury. |
| Dunn et al. (2001) | Prospective | 425 high school athletes from basketball, wrestling and gymnastics | General life stress predicted time lost to injury significantly for both men and women above and beyond that predicted by socially desirable responding; Sports specific stressful events predicted time lost to injury over and above that predicted by general life stress and socially desirable responding for females only ($R^2$ = .07) |
| Falkstein (1999) [Experiment 1] | Prospective | 79 college American footballers | Negative life stress (NLS) did not significantly predict injury time loss nor did positive life stress (PLS); coping and social support did no moderate these relationships; Athletic identity moderated the relationship between NLS and injury time loss i.e. time loss greatest for those with high NLS/low identity; Conjunctive moderation found that athletes with low social support/problem solving coping had a stronger relationship between NLS and time loss (approximately significant) as did low support/identity, high anxiety/low identity and low coping/identity |
| Falkstein (1999) [Experiment 2] | Prospective | 98 college American footballers | Negative life stress (NLS) significantly predicted injury time loss but not positive life stress (PLS); Conjunctive moderation found that athletes with low social support/problem and emotion focused coping had a stronger relationship between NLS and time loss as did low support/high anxiety, high anxiety/low support, high anxiety/low emotion coping, high anxiety/low identity and high identity/low emotion coping. |
| Ford et al. (2000) | Prospective | 121 elite athletes from Australian rules football, basketball, cricket, hockey, netball and volleyball | High levels of optimism and hardiness were related to decreased levels of time lost to injury when positive life changes increased in an athlete's life; High levels of global self esteem was related to decreased levels of time lost to injury when total and negative life changes increased in an athlete's life |

Note: Unless mentioned, it can be assumed that no sex, age, type of sport and playing status influence on injury was found or investigated

Table 22 (cont.)

*A summary of post 1998 research on risk factors and the prediction of athletic injury*

| Author(s) | Type of design | Sample | Summary of key findings |
|---|---|---|---|
| Galambos et al. (2005) | Retrospective | 845 athletes from the Queensland Academy of Sport from various sports | Increased levels of mood disturbances and life stress were present amongst injured compared with non injured athletes; Mood and life stress scores could correctly classify the athletes into injured, healed and non injured groups with 39% accuracy compared with 33% accuracy by chance; Mood and stress scores explained 10% of the variance in injury frequency and 10% in time lost due to injury |
| Gunnoe et al. (2001) | Retrospective | 331 high school American football athletes | More injuries occurred during the actual games than at practice sessions; injuries tend to occur more in preseason compared with the season proper and the play-offs; those with higher levels of total life stress and negative life stress are more likely to become injured and have multiple injuries |
| Hazzard (2004) | Prospective | 209 college athletes from American football, hockey, softball, soccer and volleyball | Significant positive relationship between total anxiety and injury frequency but not severity; Significant negative relationship between coping and injury frequency and severity; Significant positive relationship between mood disturbance and injury frequency and severity; High levels of coping moderated the effect of high anxiety and mood disturbance on injury frequency and severity (lower levels for anxiety but for mood disturbance, higher levels were found); gender influence on the relationship between anxiety and injury (females had more anxiety and more injury), playing status and type of sport did not influence this relationship. |
| Kontos (2004) | Prospective | 260 adolescent soccer players (between 11 and 14 years of age) | Previous injury was not correlated with injury; estimation and overestimation of ability were significantly positively related to previous injury; athletes that indicated low or average levels of perceived risk or estimation of ability were at higher risk of injury compared with those with high levels |
| Laws-Gallien (2001) | Retrospective | 108 female softball players | Negative life stress was significantly different between injured and non injured athletes; Non injured athletes had more social support and more coping behaviours; Social support and coping skills did not moderate the relationship between negative life events and injury |
| Maddison & Prapavessis (2005) [Study 1] | Prospective | 470 rugby league and union players | Significant correlation between negative life events (NLE) and injury (frequency, time lost) when athlete had high avoidance coping, low social support and high avoidance and low social support and high levels of problem-focused coping (this for time lost only); significant correlation between NLE and time lost for those with low social support, high avoidance coping and high levels of previous injury |

Note: Unless mentioned, it can be assumed that no sex, age, type of sport and playing status influence on injury was found or investigated

Table 22 (cont.)

*A summary of post 1998 research on risk factors and the prediction of athletic injury*

| Author(s) | Type of design | Sample | Summary of key findings |
|---|---|---|---|
| Noh et al. (2005) | Prospective | 105 Korean dancers | Freedom from worry and confidence significantly predicted injury frequency ($R^2$ = .21); freedom from worry and negative dance stress significantly predicted duration of injury ($R^2$ = .17) |
| Patterson et al. (1998) | Prospective | 46 dancers from a major ballet company | Total negative life events (TNLE) and minor negative life events (MNLE) were significantly related to subsequent injuries; social support moderated the effect of TNLE ($R^2$= .22) and MNLE ($R^2$ = .21) on subsequent injury: strong significant positive correlations between both TNLE and MNLE and subsequent injuries for those with low social support |
| Quarrie et al. (2001) | Prospective | 258 male rugby union players | Athletes who played in higher grades and had reported preseason injury had higher injury incidence during the season; players that had preseason injury missed a greater proportion of the season compared with those with no injury |
| Reuter & Short (2005) | Retrospective | 154 athletes from 3 different sports (swimming/diving, track and field, baseball) | Previous injury significantly affected athletes' fear of re-injury; male track athletes had more fear of injury compared with female track athletes but female swimmers and baseball athletes had more fear of injury compared with males; females indicated greater probability of injury than males; males less confident that females in avoiding injury; no sport by gender interaction for worry or concern about injury or confidence in avoiding injury; no socially desirable responding occurring |
| Rogers & Landers (2005) | Prospective | 171 adolescent soccer players (ranged from 14 to 18 years of age) | Increased total life events stress and negative life events (NLE) stress significantly increased likelihood of injury; increased levels of psychological coping decreased likelihood of injury, social support and perceived stress did not play a role in the likelihood of injury; psychological coping moderated the relationship between NLE stress and injury; peripheral vision (PV) provides a unique contribution to the prediction of injury above and beyond N-LES, social support and coping; PV mediated the effect of N-LES on injury occurrence |
| Short et al. (2004) | Retrospective | 434 athletes from three different sports (ice hockey, soccer and American football) | Previous injury was positively related to probability of injury and worry and concern about injury and negatively related to confidence in avoiding injury; generally, previously injured females indicated greater probability of re-injury than previously injured males but there was a sport effect present; sport by gender interaction for worry or concern about injury: female hockey players report more worry about injury than female soccer players and male hockey players report less worry about injury than male soccer players |

Note: Unless mentioned, it can be assumed that no sex, age, type of sport and playing status influence on injury was found or investigated

# Appendix B - Questionnaire Booklet for Study One

**Hello,**

**The following booklet contains a number of standard psychological inventories that measure the way you concentrate on tasks, your style of interaction with other, your personality style and your current levels of stress, anxiety and depression. These measures have been used in many research studies in psychology in the past. No trick questions are contained in any of the measures.**

**There are a number of points to be aware of before you start completing it:**

1. **Please ensure that you read the introductory instructions at the top of each measure carefully and make your responses with those instructions in mind.**

2. **Please make sure that you respond to every item in each of the measures, even if you are a little uncertain about your exact response. Choose the option that seems closest to how you think you would respond.**

**It's best not to take too long thinking about your answers. It's best to use the response category that seems most immediately correct.**

**Some demographic information is also needed. Please fill in the following:**

**Current Age (in years):** _____

**Gender (tick the appropriate box):** MALE ☐

FEMALE ☐

**Number of years of education completed (E.g. for someone who has completed up to Year 12, the number of years of education is 13 years (7 in primary school, 6 in secondary school):**

_____

**Do you identify yourself as a member of another cultural background other than Australian (please tick the appropriate box)?**

YES ☐ NO ☐

**If YES, please specify your cultural background** _____

**Thank you very much for your participation in this research**

*Read each item carefully and then circle the answer that most resembles the frequency with which it describes you or your behaviour.*

| | | Never | Rarely | Sometimes | Frequently | Always |
|---|---|---|---|---|---|---|
| **1.** | I am more comfortable when leading and directing the team, than I am when I have to follow | **1** | **2** | **3** | **4** | **5** |
| **2.** | I am at my best when situations are at their worst | **1** | **2** | **3** | **4** | **5** |
| **3.** | I am more trusting in my ability to analyse and make good decisions on the basis of limited information than others are in their abilities to make the same decisions | **1** | **2** | **3** | **4** | **5** |
| **4.** | I do a better job of meeting the expectations of others (e.g., teachers, professors, employers, or coaches) because I read people well and can tell what is really important to them | **1** | **2** | **3** | **4** | **5** |
| **5.** | Asking the right questions when problem solving has become such an automatic process for me that I am to able to make decisions more quickly than others. | **1** | **2** | **3** | **4** | **5** |
| **6.** | I am sensitive to the feelings of others and if I think they are upset with me I have a hard time keeping my concerns from interfering with my ability to concentrate | **1** | **2** | **3** | **4** | **5** |
| **7.** | I don't like people telling me what to do | **1** | **2** | **3** | **4** | **5** |
| **8.** | I am able to communicate difficult concepts and technical information to non-technical people in ways that they can understand | **1** | **2** | **3** | **4** | **5** |
| **9.** | I am frustrated by the fact that people can't seem to make decisions quickly enough | **1** | **2** | **3** | **4** | **5** |
| **10.** | My family knows that my work comes first | **1** | **2** | **3** | **4** | **5** |
| **11.** | I have a greater capacity than others, to physically practice the same thing (e.g., a move in sports, or a musical piece) over and over again until it's perfect | **1** | **2** | **3** | **4** | **5** |
| **12.** | When my job or other people aren't putting pressure on me to perform, I'm putting pressure on myself | **1** | **2** | **3** | **4** | **5** |
| **13.** | Others ask me to edit and/or help them organize their thoughts and presentations. | **1** | **2** | **3** | **4** | **5** |
| **14.** | I enjoy spending time developing long range plans and objectives and the strategies required to accomplish them. | **1** | **2** | **3** | **4** | **5** |
| **15.** | People become lazy or complacent when they aren't being challenged. | **1** | **2** | **3** | **4** | **5** |
| **16.** | My feelings (e.g., anger, anxiety, and frustration) interfere with my ability to stay focused. | **1** | **2** | **3** | **4** | **5** |
| **17.** | I am motivated by wanting to win and/or by being better at something than others are | **1** | **2** | **3** | **4** | **5** |
| **18.** | I am more comfortable when I have to take the lead in social situations than others seem to be | **1** | **2** | **3** | **4** | **5** |
| **19.** | I have an artist's eye, seeing shades of colour and nuances and/or details in the things around me that other's don't see | **1** | **2** | **3** | **4** | **5** |
| **20.** | When a team-mate or co-worker makes a mistake I am the first person to give them a pat on the back, tell them it's okay, and let them know I still have confidence in them | **1** | **2** | **3** | **4** | **5** |
| **21.** | I enjoy having my ideas challenged by others. | **1** | **2** | **3** | **4** | **5** |
| **22.** | Given we all have the same information, I make decisions faster than other people. | **1** | **2** | **3** | **4** | **5** |

| | | Never | Rarely | Sometimes | Frequently | Always |
|---|---|---|---|---|---|---|
| **23.** | My confrontiveness causes others to get defensive | **1** | **2** | **3** | **4** | **5** |
| **24.** | When playing a game or sport I can 'get into the zone,' becoming so involved in the competition things seem to happen in slow motion | **1** | **2** | **3** | **4** | **5** |
| **25.** | No matter how successful I am, I'm not satisfied for long. I can't help challenging myself to improve | **1** | **2** | **3** | **4** | **5** |
| **26.** | I may give up control to others, but it's on my terms, not theirs | **1** | **2** | **3** | **4** | **5** |
| **27.** | I am thinking all the time, even when I sleep I'm solving problems and coming up with new ideas | **1** | **2** | **3** | **4** | **5** |
| **28.** | When people ask me questions I don't accept the questions at face value, instead I answer in a way that gets at the issue underlying the question | **1** | **2** | **3** | **4** | **5** |
| **29.** | I am more challenging and confrontive than others | **1** | **2** | **3** | **4** | **5** |
| **30.** | I prefer establishing my own rules to having others establish rules for me. | **1** | **2** | **3** | **4** | **5** |
| **31.** | I get so caught up in thoughts and feelings I fail to react quickly enough to things (e.g., I swing late at a pitch in baseball, or fail to notice when someone needs help) | **1** | **2** | **3** | **4** | **5** |
| **32.** | In sports and/or games I have over-learned the skills required to make adjustments to an opponent’s move, or to recover from a mistake, and my decisions occur automatically without conscious thought on my part | **1** | **2** | **3** | **4** | **5** |
| **33.** | I set intermediate and long-term goals and am willing to make whatever sacrifices (e.g., working long hours, being away from family and friends) it takes to accomplish those goals | **1** | **2** | **3** | **4** | **5** |
| **34.** | I am not afraid to speak up in groups, expressing my thoughts and ideas and challenging the thoughts and ideas of others | **1** | **2** | **3** | **4** | **5** |
| **35.** | In sports and games I analyse my opponent's skills and then develop a game plan designed to exploit his/her weaknesses | **1** | **2** | **3** | **4** | **5** |
| **36.** | I become so involved in projects or in problem solving I forget to eat and can go for days with very little sleep | **1** | **2** | **3** | **4** | **5** |
| **37.** | When it comes to accepting people’s ideas, opinions, or positions on issues I am a natural sceptic, automatically looking for the flaws in their argument | **1** | **2** | **3** | **4** | **5** |
| **38.** | When something needs to be done, I do it; I don't wait for someone to ask | **1** | **2** | **3** | **4** | **5** |
| **39.** | In a crisis, people turn to me for leadership | **1** | **2** | **3** | **4** | **5** |
| **40.** | When I am worried about something, I have a hard time letting it go | **1** | **2** | **3** | **4** | **5** |
| **41.** | I am happy in a support role, letting others take the lead | **1** | **2** | **3** | **4** | **5** |
| **42.** | Anger is a powerful motivating force for me | **1** | **2** | **3** | **4** | **5** |
| **43.** | Spending time with others is not high on my list of priorities | **1** | **2** | **3** | **4** | **5** |
| **44.** | I have more emotional energy and am able to work longer and harder than most people | **1** | **2** | **3** | **4** | **5** |
| **45.** | Within a matter of minutes I can take a complex idea or proposal and reduce it to three or four key points or deliverables | **1** | **2** | **3** | **4** | **5** |

| | | Never | Rarely | Sometimes | Frequently | Always |
|---|---|---|---|---|---|---|
| **46.** | I can sell anybody, anything | **1** | **2** | **3** | **4** | **5** |
| **47.** | I am more comfortable working in a situation where the rules and expectations are very clearly spelled out, and people follow them, than I am working in a situation where the rules are vague | **1** | **2** | **3** | **4** | **5** |
| **48.** | I am one of the leaders and organizers in social situations | **1** | **2** | **3** | **4** | **5** |
| **49.** | I perform better in situations where I can use my analytical skills and prepare in advance, than I perform when I have to react on the spot to unexpected events | **1** | **2** | **3** | **4** | **5** |
| **50.** | Ask anyone who knows me and they will tell you I've been very successful | **1** | **2** | **3** | **4** | **5** |
| **51.** | I feel like a failure | **1** | **2** | **3** | **4** | **5** |
| **52.** | Whether I am writing, discussing, or debating an issue, my thoughts and ideas seem to flow in a logical, rational, and organized way without any effort on my part | **1** | **2** | **3** | **4** | **5** |
| **53.** | I make mistakes because I overanalyse situations, reading more into them than I should | **1** | **2** | **3** | **4** | **5** |
| **54.** | Whether I am buying a house, making a business decision, or ordering food in a restaurant, I make decisions more quickly than others | **1** | **2** | **3** | **4** | **5** |
| **55.** | In high-pressure situations I would rather others take the lead. | **1** | **2** | **3** | **4** | **5** |
| **56.** | In school or at work I have difficulty deciding what the professor, or my boss, thinks is most important, and I try to do too much | **1** | **2** | **3** | **4** | **5** |
| **57.** | Other people need more balance between family, friends, and work, than I do | **1** | **2** | **3** | **4** | **5** |
| **58.** | 57. I like new challenges and am easily bored, so unless it's impossible, I avoid situations where I have to do the same thing over and over. | **1** | **2** | **3** | **4** | **5** |
| **59.** | I don't need much stimulation from others and am quite comfortable working in isolation or alone | **1** | **2** | **3** | **4** | **5** |
| **60.** | Others will tell you I am a good debater, presenting my ideas in a very compelling way | **1** | **2** | **3** | **4** | **5** |
| **61.** | I am a person who spends time thinking about 'bigger issues,' engaging theoretical, philosophical and/or academic questions | **1** | **2** | **3** | **4** | **5** |
| **62.** | I want to be the person making the decisions when pressure is high and a lot is at stake | **1** | **2** | **3** | **4** | **5** |
| **63.** | Others will tell you I'm competitive | **1** | **2** | **3** | **4** | **5** |
| **64.** | I would rather work in an environment where you have the opportunity to win or lose, than in one where everyone receives the same rewards. | **1** | **2** | **3** | **4** | **5** |
| **65.** | I have difficulty concentrating when there is a lot going on around me. | **1** | **2** | **3** | **4** | **5** |
| **66.** | When I need to stay focused on a task, I am able to completely shut out everything else. So much so that others will tell you I don't even know they are around | **1** | **2** | **3** | **4** | **5** |
| **67.** | I am quicker to confront issues than others | **1** | **2** | **3** | **4** | **5** |

| | | Never | Rarely | Sometimes | Frequently | Always |
|---|---|---|---|---|---|---|
| **68.** | I am more likely to have problems because I am too supportive, than I am to have problems because I am too confrontive. | **1** | **2** | **3** | **4** | **5** |
| **69.** | In sports or when playing a game, I am more capable than most of seeing the whole field or court and of finding an open player, or a weakness in my opponent I can take advantage of. | **1** | **2** | **3** | **4** | **5** |
| **70.** | I have good instincts and perform well in situations where I have to react to the unexpected | **1** | **2** | **3** | **4** | **5** |
| **71.** | I feel guilty. | **1** | **2** | **3** | **4** | **5** |
| **72.** | In planning or problem solving meetings I take a leadership role, providing the organizational structure and direction the group needs | **1** | **2** | **3** | **4** | **5** |
| **73.** | In situations, where everything is on the line I want to be the person who can win it, or lose it | **1** | **2** | **3** | **4** | **5** |
| **74.** | I confuse other people by giving them too much information | **1** | **2** | **3** | **4** | **5** |
| **75.** | I would rather be part of a team where everyone gets along well but we lose, than be a member of team where we win, but don't like each other | **1** | **2** | **3** | **4** | **5** |
| **76.** | People perform better when you support them, than they do when you criticize them | **1** | **2** | **3** | **4** | **5** |
| **77.** | Others will tell you I bring people together, making them feel like part of the team, and motivating them in positive ways | **1** | **2** | **3** | **4** | **5** |
| **78.** | When I have a serious problem, or I am under time pressure to produce something in a hurry, I have to isolate myself to keep from becoming distracted | **1** | **2** | **3** | **4** | **5** |
| **79.** | I am in control, taking a leadership role in interactions with others | **1** | **2** | **3** | **4** | **5** |
| **80.** | In school I was one of the first people to finish timed tests | **1** | **2** | **3** | **4** | **5** |
| **81.** | I compare my skills and abilities to those of people I admire and respect, to see how I measure up | **1** | **2** | **3** | **4** | **5** |
| **82.** | When people make mistakes I say things I later regret (e.g., yell at them, call them stupid, etc | **1** | **2** | **3** | **4** | **5** |
| **83.** | I am a critical thinker, asking why, and refusing to take things others say or do, at face value; I want to see the data | **1** | **2** | **3** | **4** | **5** |
| **84.** | I take longer to make important decisions than others, because I want to make sure I have as much data as possible so I can anticipate potential problems and avoid mistakes | **1** | **2** | **3** | **4** | **5** |
| **85.** | I am more flexible, and more willing to bend rules when I think that's needed, than others seem to be | **1** | **2** | **3** | **4** | **5** |
| **86.** | I am a person who pays attention to, and is concerned about details and doing things right | **1** | **2** | **3** | **4** | **5** |
| **87.** | When someone does a good job I let him/her know it | **1** | **2** | **3** | **4** | **5** |
| **88.** | I enjoy and need time alone | **1** | **2** | **3** | **4** | **5** |
| **89.** | It is easier for me to work, or exercise when others are involved and we provide the motivation and support we all need to keep going | **1** | **2** | **3** | **4** | **5** |
| **90.** | When practicing, exercising, or training, I don't need the support or involvement of others to keep going | **1** | **2** | **3** | **4** | **5** |

| | | Never | Rarely | Sometimes | Frequently | Always |
|---|---|---|---|---|---|---|
| **91.** | People take advantage of me because I am too supportive | **1** | **2** | **3** | **4** | **5** |
| **92.** | Others see me as an extrovert | **1** | **2** | **3** | **4** | **5** |
| **93.** | I become so absorbed in things I am working on hours pass and it seems like minutes | **1** | **2** | **3** | **4** | **5** |
| **94.** | I am more effective and get more accomplished when I work in isolation | **1** | **2** | **3** | **4** | **5** |
| **95.** | I rely more on intuition and my ability to sense what's needed in a situation than I do on my logical problem solving skills | **1** | **2** | **3** | **4** | **5** |
| **96.** | I am judgmental of others | **1** | **2** | **3** | **4** | **5** |
| **97.** | When others are beginning to feel burned out, I am just getting started | **1** | **2** | **3** | **4** | **5** |
| **98.** | When others let me down and/or disappoint me I let them know | **1** | **2** | **3** | **4** | **5** |
| **99.** | When a group I am involved with seems to be lacking direction I step in and provide it | **1** | **2** | **3** | **4** | **5** |
| **100.** | When involved in a game (e.g., cards) or competition I make mistakes because I get distracted or faked out by my opponent | **1** | **2** | **3** | **4** | **5** |
| **101.** | I am able to learn new information more quickly, and with less effort than others | **1** | **2** | **3** | **4** | **5** |
| **102.** | My ability to pull ideas together in a neat, concise way gets interfered with by the fact that I have more ideas and/or thoughts than I know what to do with | **1** | **2** | **3** | **4** | **5** |
| **103.** | My need to socialize, and/or my willingness to help others prevents me from completing things as quickly as I would otherwise | **1** | **2** | **3** | **4** | **5** |
| **104.** | I have a greater capacity than others, to practice or rehearse something (e.g., memorizing things like math tables, spelling words, or rehearsing a speech or a part in a play) until it's perfect | **1** | **2** | **3** | **4** | **5** |
| **105.** | I am more supportive and more of a positive motivator for the people I work with than others | **1** | **2** | **3** | **4** | **5** |
| **106.** | It is important to follow the rules | **1** | **2** | **3** | **4** | **5** |
| **107.** | I feel ashamed | **1** | **2** | **3** | **4** | **5** |
| **108.** | I am more aware of, and sensitive to, the moods and feelings of the people around me than others seem to be | **1** | **2** | **3** | **4** | **5** |
| **109.** | In my position or job, I can compete successfully against anyone | **1** | **2** | **3** | **4** | **5** |
| **110.** | I am more comfortable when my job involves interacting with and/or socializing with others, than I am when I have to isolate myself and work alone | **1** | **2** | **3** | **4** | **5** |
| **111.** | My ability to concentrate gets interfered with by things going on around me (e.g., people talking, noises, movement) | **1** | **2** | **3** | **4** | **5** |
| **112.** | Others will tell you if I take on a job or project, or set a goal for myself, I quickly outperform the competition | **1** | **2** | **3** | **4** | **5** |
| **113.** | I am a better problem solver than others seem to be | **1** | **2** | **3** | **4** | **5** |
| **114.** | I am a burden to others | **1** | **2** | **3** | **4** | **5** |

| | | Never | Rarely | Sometimes | Frequently | Always |
|---|---|---|---|---|---|---|
| **115.** | I become so angry I either fail to think about the consequences of my actions, or I tell myself I don't care about the consequences (e.g., getting even in a game like football when someone fouls you) | **1** | **2** | **3** | **4** | **5** |
| **116.** | Others see me as an introvert | **1** | **2** | **3** | **4** | **5** |
| **117.** | My ability to analyse people and situations gets me into trouble in sports or games where I have to stop thinking and just react | **1** | **2** | **3** | **4** | **5** |
| **118.** | I have so many thoughts and ideas I have a hard time picking one and sticking with it | **1** | **2** | **3** | **4** | **5** |
| **119.** | I perform better in situations where there is structure and where external distractions are kept to a minimum | **1** | **2** | **3** | **4** | **5** |
| **120.** | I manage to get my way and to get my point across because I am more sensitive to people's needs and reactions than others are | **1** | **2** | **3** | **4** | **5** |
| **121.** | I want my boss to give me a goal or target, and then get out of the way and let me accomplish it | **1** | **2** | **3** | **4** | **5** |
| **122.** | I am confident in my ability to quickly evaluate a crisis and make decisions that not only deal with the immediate problem, but also take into account any effects that decision might have on 'the bigger picture' (e.g., what future problems my immediate solution might lead to) | **1** | **2** | **3** | **4** | **5** |
| **123.** | I make friends everywhere I go | **1** | **2** | **3** | **4** | **5** |
| **124.** | I am willing to work harder and take more time than others to learn because I want to make sure I do things right | **1** | **2** | **3** | **4** | **5** |

# DASS21

Please read each statement and circle a number 0, 1, 2 or 3 which indicates how much the statement applied to you *over the past week*. There are no right or wrong answers. Do not spend too much time on any statement.

*The rating scale is as follows:*

0 Did not apply to me at all
1 Applied to me to some degree, or some of the time
2 Applied to me to a considerable degree, or a good part of time
3 Applied to me very much, or most of the time

| | | | | | |
|---|---|---|---|---|---|
| 1 | I found it hard to wind down | 0 | 1 | 2 | 3 |
| 2 | I was aware of dryness of my mouth | 0 | 1 | 2 | 3 |
| 3 | I couldn't seem to experience any positive feeling at all | 0 | 1 | 2 | 3 |
| 4 | I experienced breathing difficulty (eg, excessively rapid breathing, breathlessness in the absence of physical exertion) | 0 | 1 | 2 | 3 |
| 5 | I found it difficult to work up the initiative to do things | 0 | 1 | 2 | 3 |
| 6 | I tended to over-react to situations | 0 | 1 | 2 | 3 |
| 7 | I experienced trembling (eg, in the hands) | 0 | 1 | 2 | 3 |
| 8 | I felt that I was using a lot of nervous energy | 0 | 1 | 2 | 3 |
| 9 | I was worried about situations in which I might panic and make a fool of myself | 0 | 1 | 2 | 3 |
| 10 | I felt that I had nothing to look forward to | 0 | 1 | 2 | 3 |
| 11 | I found myself getting agitated | 0 | 1 | 2 | 3 |
| 12 | I found it difficult to relax | 0 | 1 | 2 | 3 |
| 13 | I felt down-hearted and blue | 0 | 1 | 2 | 3 |
| 14 | I was intolerant of anything that kept me from getting on with what I was doing | 0 | 1 | 2 | 3 |
| 15 | I felt I was close to panic | 0 | 1 | 2 | 3 |
| 16 | I was unable to become enthusiastic about anything | 0 | 1 | 2 | 3 |
| 17 | I felt I wasn't worth much as a person | 0 | 1 | 2 | 3 |
| 18 | I felt that I was rather touchy | 0 | 1 | 2 | 3 |
| 19 | I was aware of the action of my heart in the absence of physical exertion (eg, sense of heart rate increase, heart missing a beat) | 0 | 1 | 2 | 3 |
| 20 | I felt scared without any good reason | 0 | 1 | 2 | 3 |
| 21 | I felt that life was meaningless | 0 | 1 | 2 | 3 |

Below are phrases describing people's behaviours. Please use the rating scale to indicate **how accurately each statement describes you as you generally are *now***, not as you wish to be in the future. Describe yourself as you honestly see yourself, in relation to other people you know of the same sex as you are, and roughly your same age. Please read each statement carefully, and then circle the number for the response category that is most accurate for each item.

| | Very inaccurate | Moderately inaccurate | Neither inaccurate nor accurate | Moderately accurate | Very accurate |
|---|---|---|---|---|---|
| 1. I worry about things. | **1** | **2** | **3** | **4** | **5** |
| 2. I leave my belongings around. | **1** | **2** | **3** | **4** | **5** |
| 3. I often forget to put things back in their proper place. | **1** | **2** | **3** | **4** | **5** |
| 4. I have difficulty understanding abstract ideas. | **1** | **2** | **3** | **4** | **5** |
| 5. I pay attention to details. | **1** | **2** | **3** | **4** | **5** |
| 6. I am relaxed most of the time. | **1** | **2** | **3** | **4** | **5** |
| 7. I shirk my duties. | **1** | **2** | **3** | **4** | **5** |
| 8. I feel comfortable around people. | **1** | **2** | **3** | **4** | **5** |
| 9. I have frequent mood swings. | **1** | **2** | **3** | **4** | **5** |
| 10. I am not interested in abstract ideas. | **1** | **2** | **3** | **4** | **5** |
| 11. I feel little concern for others. | **1** | **2** | **3** | **4** | **5** |
| 12. I use difficult words. | **1** | **2** | **3** | **4** | **5** |
| 13. I am interested in people. | **1** | **2** | **3** | **4** | **5** |
| 14. I make people feel at ease. | **1** | **2** | **3** | **4** | **5** |
| 15. I spend time reflecting on things. | **1** | **2** | **3** | **4** | **5** |
| 16. I am quiet around strangers. | **1** | **2** | **3** | **4** | **5** |
| 17. I feel others' emotions. | **1** | **2** | **3** | **4** | **5** |
| 18. I seldom feel blue. | **1** | **2** | **3** | **4** | **5** |
| 19. I have a vivid imagination. | **1** | **2** | **3** | **4** | **5** |
| 20. I am not really interested in others. | **1** | **2** | **3** | **4** | **5** |
| 21. I often feel blue. | **1** | **2** | **3** | **4** | **5** |
| 22. I sympathize with others' feelings. | **1** | **2** | **3** | **4** | **5** |
| 23. I change my mood a lot. | **1** | **2** | **3** | **4** | **5** |
| 24. I am exacting in my work. | **1** | **2** | **3** | **4** | **5** |

| | Very inaccurate | Moderately inaccurate | Neither inaccurate nor accurate | Moderately accurate | Very accurate |
|---|---|---|---|---|---|
| 25. I get irritated easily. | **1** | **2** | **3** | **4** | **5** |
| 26. I start conversations. | **1** | **2** | **3** | **4** | **5** |
| 27. I am always prepared. | **1** | **2** | **3** | **4** | **5** |
| 28. I keep in the background. | **1** | **2** | **3** | **4** | **5** |
| 29. I have a soft heart. | **1** | **2** | **3** | **4** | **5** |
| 30. I make a mess of things. | **1** | **2** | **3** | **4** | **5** |
| 31. I don't talk a lot. | **1** | **2** | **3** | **4** | **5** |
| 32. I take time out for others. | **1** | **2** | **3** | **4** | **5** |
| 33. I don't mind being the centre of attention. | **1** | **2** | **3** | **4** | **5** |
| 34. I do not have a good imagination. | **1** | **2** | **3** | **4** | **5** |
| 35. I am quick to understand things. | **1** | **2** | **3** | **4** | **5** |
| 36. I am full of ideas. | **1** | **2** | **3** | **4** | **5** |
| 37. I have excellent ideas. | **1** | **2** | **3** | **4** | **5** |
| 38. I get chores done right away. | **1** | **2** | **3** | **4** | **5** |
| 39. I am the life of the party. | **1** | **2** | **3** | **4** | **5** |
| 40. I talk to a lot of different people at parties. | **1** | **2** | **3** | **4** | **5** |
| 41. I insult people. | **1** | **2** | **3** | **4** | **5** |
| 42. I don't like to draw attention to myself. | **1** | **2** | **3** | **4** | **5** |
| 43. I have little to say. | **1** | **2** | **3** | **4** | **5** |
| 44. I have a rich vocabulary. | **1** | **2** | **3** | **4** | **5** |
| 45. I am easily disturbed. | **1** | **2** | **3** | **4** | **5** |
| 46. I get stressed out easily. | **1** | **2** | **3** | **4** | **5** |
| 47. I like order. | **1** | **2** | **3** | **4** | **5** |
| 48. I am not interested in other people's problems. | **1** | **2** | **3** | **4** | **5** |
| 49. I get upset easily. | **1** | **2** | **3** | **4** | **5** |
| 50. I follow a schedule. | **1** | **2** | **3** | **4** | **5** |

# Appendix C - Plain Language Statement for Study One

**INVITATION TO PARTICIPATE IN A RESEARCH PROJECT**
**PROJECT INFORMATION STATEMENT**

**PORTFOLIO OF:** Science, Engineering and Technology
**SCHOOL:** School of Health Sciences (Division of Psychology)

**PROJECT TITLE:** An evaluation of the psychometric properties of the revised version of the Test of Attentional and Interpersonal Style (TAIS2)

**Name(s) of investigators:**

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Dr. Mervyn Jackson (Supervisor) **Phone:** 9925-7367 **Email:** merv.jackson@rmit.edu.au

Prof. Ken Greenwood (Supervisor) **Phone:** 9925 7360 **Email:** ken.greenwood@rmit.edu.au

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You are invited to participate in a research project being conducted by the Division of Psychology, RMIT University. This information sheet describes the project in straight forward language, or 'plain English'. Please read this sheet carefully and be confident that you understand its content before deciding whether to give permission to participate. If you have any questions about the project, please ask one of the investigators.

***Who is involved in this research project? Why is it being conducted?***
This research is being conducted by Maria Vassos as part of the Doctor of Psychology (Clinical) degree at RMIT University. The research is being conducted under the supervision of Dr. Mervyn Jackson and Prof. Ken Greenwood. The research will focus on evaluating the usefulness of the Test of Attentional and Interpersonal Style (TAIS2) as a psychological measurement tool. This research has received ethical approval from the RMIT Human Research Ethics Committee.

***Why have you been approached?***
You have been approached because you are a student over the age of 18 years.

***What is the project about? What are the questions being addressed?***
The project will attempt to demonstrate that the Test of Attentional and Interpersonal Style (TAIS2) is a psychometrically acceptable test of the skills that are necessary for high level performance e.g. leadership, ability to concentrate on tasks and interaction with others. In order to demonstrate that a test is psychometrically acceptable, it must be compared to others tests that assess similar concepts in order to determine if the test measures what it's designed to measure (validity). It must also be examined closely to check that it provides consistent results (reliability).

***If I agree to participate, what will I be required to do?***
As a participant, you will complete a questionnaire booklet that contains the Test of Attentional and Interpersonal Style (TAIS2), a standard measure of personality and a standard measure of stress, anxiety and depression. Examples of some of the questions you may encounter in the questionnaire booklet are "I don't like telling people what to do" or "I found it difficult to relax" This questionnaire should not take longer than 25 minutes to complete. If you would like to look at the questionnaire material before consenting to being part of the research, you are most welcome to.

***What are the risks or disadvantages associated with participation?***
Most participants do not experience any discomfort or distress when completing the standard measures included in the questionnaire booklet. But if you find that you are feeling uncomfortable, upset or distressed after completing the measures used in the research, please contact Maria Vassos, Dr. Mervyn Jackson or Prof. Ken Greenwood (contact details provided on this statement). Alternatively, if you wish to talk to someone independent of the research study, please contact the RMIT University Counselling Service on 9925 4365.

***What are the benefits associated with participation?***
Your participation will assist the researchers in demonstrating the usefulness of the Test of Attentional and Interpersonal Style (TAIS2) as a psychological measure to be used in future research or in clinical practice.

***What will happen to the information that I provide?***
Please note that you are not required to put your name on the questionnaire booklet therefore the information you will provide will be anonymous. Your information will only be seen by the researches directly involved in this project. The information you provide will be locked in a filing cabinet in the offices of the investigators and only the investigators will have access to these filing cabinets. The information will be stored for five years and destroyed after this time period. The results of the study will be written up as a research report and will be submitted for publication. No information will be provided in the report that could lead to participants being identified.

Because of the nature of the data collection, written informed consent will not be obtained from you. Your consent is assumed by your completion of the questionnaire and the return of the questionnaire.

***What are my rights as a participant?***
As a participant, you have the right to withdraw from the study at any time, without prejudice. You also have the right to request that any of the information that you provide be destroyed. You also have the right to have any questions answered at anytime.

***Whom should I contact if I have any questions?***
Please do not hesitate to contact, Maria Vassos (m.vassos@student.rmit.edu,au; 9925-7742 or 0403278292), Dr. Mervyn Jackson (merv.jackson@rmit.edu.au; 9925-7367) or Prof. Ken Greenwood (ken.greenwood@rmit.edu.au; 9925 7360) if you have any questions or concerns about any aspect of your participation before consenting to participate or during the study.

Yours sincerely

Ms Maria Vassos
Doctor of Psychology Student
RMIT University

Dr. Mervyn Jackson
Lecturer in Psychology
RMIT University

Prof. Ken Greenwood
Head of Health Sciences
RMIT University

# Appendix D - Questionnaire Booklet for Study Two

**Hello,**

**The following booklet contains a number of standard psychological inventories that measure psychological and social factors such as stress, attention style and social support that are associated with injury risk in athletes. These measures have been used in many research studies in psychology in the past. No trick questions are contained in any of the measures.**

**There are a number of points to be aware of before you start completing it:**

1. **Please ensure that you read the introductory instructions at the top of each measure carefully and make your responses with those instructions in mind.**

2. **Please make sure that you respond to every item in each of the measures, even if you are a little uncertain about your exact response. Choose the option that seems closest to how you think you would respond.**

**It's best not to take too long thinking about your answers. It's best to use the response category that seems most immediately correct.**

**Some demographic information is also needed. Please fill in the following:**

**Current Age (in years):** _____

**Gender (tick the appropriate box):** MALE ☐

FEMALE ☐

**Type of Sport Played:** _____

**Thank you very much for your participation in this research**

*Please indicate how likely you think it is that the following events will happen to you while playing your sport.*

**WHAT DO YOU THINK ARE THE CHANCES THAT YOU WILL (circle your answers):**

| | | Very unlikely | Unlikely | Somewhat unlikely | Somewhat likely | Likely | Very likely |
|---|---|---|---|---|---|---|---|
| **1.** | Injure yourself in a collision with an opponent? | **1** | **2** | **3** | **4** | **5** | **6** |
| **2.** | Have the same injury that someone else on your team recently had? | **1** | **2** | **3** | **4** | **5** | **6** |
| **3.** | Re-injure an area that you have recently injured? | **1** | **2** | **3** | **4** | **5** | **6** |
| **4.** | Be injured in a practice? | **1** | **2** | **3** | **4** | **5** | **6** |
| **5.** | Fall down and injure yourself? | **1** | **2** | **3** | **4** | **5** | **6** |
| **6.** | Be injured from a foul or 'cheap shot' by an opponent? | **1** | **2** | **3** | **4** | **5** | **6** |
| **7.** | Be injured by more aggressive opponents? | **1** | **2** | **3** | **4** | **5** | **6** |
| **8.** | Be injured by running into an object on the field or court (e.g. goal posts, boards, etc.)? | **1** | **2** | **3** | **4** | **5** | **6** |
| **9.** | Be injured by bigger or stronger opponents? | **1** | **2** | **3** | **4** | **5** | **6** |
| **10.** | Be injured from not 'taking a break' from your sport? | **1** | **2** | **3** | **4** | **5** | **6** |
| **11.** | Injure yourself on a poor playing surface (e.g. wet or bumpy field, poor ice, etc.)? | **1** | **2** | **3** | **4** | **5** | **6** |
| **12.** | Be injured trying to perform a skill that you have just learnt? | **1** | **2** | **3** | **4** | **5** | **6** |
| **13.** | Be injured from playing too many sports at the same time? | **1** | **2** | **3** | **4** | **5** | **6** |
| **14.** | Be injured performing a skill that is hard for you to do? | **1** | **2** | **3** | **4** | **5** | **6** |
| **15.** | Injure your ankle? | **1** | **2** | **3** | **4** | **5** | **6** |
| **16.** | Be injured from practicing too hard? | **1** | **2** | **3** | **4** | **5** | **6** |
| **17.** | Be injured by not paying attention to what you are doing? | **1** | **2** | **3** | **4** | **5** | **6** |
| **18.** | Injure your neck or spine? | **1** | **2** | **3** | **4** | **5** | **6** |
| **19.** | Be injured from competing too hard | **1** | **2** | **3** | **4** | **5** | **6** |
| **20.** | Be injured by losing your focus while playing your sport? | **1** | **2** | **3** | **4** | **5** | **6** |
| **21.** | Trip and injure yourself? | **1** | **2** | **3** | **4** | **5** | **6** |
| **22.** | Injure yourself on a piece of dangerous equipment? | **1** | **2** | **3** | **4** | **5** | **6** |
| **23.** | Injure your arm or wrist? | **1** | **2** | **3** | **4** | **5** | **6** |
| **24.** | Injure your shoulder? | **1** | **2** | **3** | **4** | **5** | **6** |

*Read each item carefully and then circle the answer that most resembles the frequency with which it describes you or your behaviour.*

| | | Never | Rarely | Sometimes | Frequently | Always |
|---|---|---|---|---|---|---|
| **1.** | I am more comfortable when leading and directing the team, than I am when I have to follow | **1** | **2** | **3** | **4** | **5** |
| **2.** | I am at my best when situations are at their worst | **1** | **2** | **3** | **4** | **5** |
| **3.** | I am more trusting in my ability to analyse and make good decisions on the basis of limited information than others are in their abilities to make the same decisions | **1** | **2** | **3** | **4** | **5** |
| **4.** | I do a better job of meeting the expectations of others (e.g., teachers, professors, employers, or coaches) because I read people well and can tell what is really important to them | **1** | **2** | **3** | **4** | **5** |
| **5.** | Asking the right questions when problem solving has become such an automatic process for me that I am to able to make decisions more quickly than others. | **1** | **2** | **3** | **4** | **5** |
| **6.** | I am sensitive to the feelings of others and if I think they are upset with me I have a hard time keeping my concerns from interfering with my ability to concentrate | **1** | **2** | **3** | **4** | **5** |
| **7.** | I don't like people telling me what to do | **1** | **2** | **3** | **4** | **5** |
| **8.** | I am able to communicate difficult concepts and technical information to non-technical people in ways that they can understand | **1** | **2** | **3** | **4** | **5** |
| **9.** | I am frustrated by the fact that people can't seem to make decisions quickly enough | **1** | **2** | **3** | **4** | **5** |
| **10.** | My family knows that my work comes first | **1** | **2** | **3** | **4** | **5** |
| **11.** | I have a greater capacity than others, to physically practice the same thing (e.g., a move in sports, or a musical piece) over and over again until it's perfect | **1** | **2** | **3** | **4** | **5** |
| **12.** | When my job or other people aren't putting pressure on me to perform, I'm putting pressure on myself | **1** | **2** | **3** | **4** | **5** |
| **13.** | Others ask me to edit and/or help them organize their thoughts and presentations. | **1** | **2** | **3** | **4** | **5** |
| **14.** | I enjoy spending time developing long range plans and objectives and the strategies required to accomplish them. | **1** | **2** | **3** | **4** | **5** |
| **15.** | People become lazy or complacent when they aren't being challenged. | **1** | **2** | **3** | **4** | **5** |
| **16.** | My feelings (e.g., anger, anxiety, and frustration) interfere with my ability to stay focused. | **1** | **2** | **3** | **4** | **5** |
| **17.** | I am motivated by wanting to win and/or by being better at something than others are | **1** | **2** | **3** | **4** | **5** |
| **18.** | I am more comfortable when I have to take the lead in social situations than others seem to be | **1** | **2** | **3** | **4** | **5** |
| **19.** | I have an artist's eye, seeing shades of colour and nuances and/or details in the things around me that other's don't see | **1** | **2** | **3** | **4** | **5** |
| **20.** | When a team-mate or co-worker makes a mistake I am the first person to give them a pat on the back, tell them it's okay, and let them know I still have confidence in them | **1** | **2** | **3** | **4** | **5** |
| **21.** | I enjoy having my ideas challenged by others. | **1** | **2** | **3** | **4** | **5** |
| **22.** | Given we all have the same information, I make decisions faster than other people. | **1** | **2** | **3** | **4** | **5** |

| | | Never | Rarely | Sometimes | Frequently | Always |
|---|---|---|---|---|---|---|
| **23.** | My confrontiveness causes others to get defensive | **1** | **2** | **3** | **4** | **5** |
| **24.** | When playing a game or sport I can 'get into the zone,' becoming so involved in the competition things seem to happen in slow motion | **1** | **2** | **3** | **4** | **5** |
| **25.** | No matter how successful I am, I'm not satisfied for long. I can't help challenging myself to improve | **1** | **2** | **3** | **4** | **5** |
| **26.** | I may give up control to others, but it's on my terms, not theirs | **1** | **2** | **3** | **4** | **5** |
| **27.** | I am thinking all the time, even when I sleep I'm solving problems and coming up with new ideas | **1** | **2** | **3** | **4** | **5** |
| **28.** | When people ask me questions I don't accept the questions at face value, instead I answer in a way that gets at the issue underlying the question | **1** | **2** | **3** | **4** | **5** |
| **29.** | I am more challenging and confrontive than others | **1** | **2** | **3** | **4** | **5** |
| **30.** | I prefer establishing my own rules to having others establish rules for me. | **1** | **2** | **3** | **4** | **5** |
| **31.** | I get so caught up in thoughts and feelings I fail to react quickly enough to things (e.g., I swing late at a pitch in baseball, or fail to notice when someone needs help) | **1** | **2** | **3** | **4** | **5** |
| **32.** | In sports and/or games I have over-learned the skills required to make adjustments to an opponent’s move, or to recover from a mistake, and my decisions occur automatically without conscious thought on my part | **1** | **2** | **3** | **4** | **5** |
| **33.** | I set intermediate and long-term goals and am willing to make whatever sacrifices (e.g., working long hours, being away from family and friends) it takes to accomplish those goals | **1** | **2** | **3** | **4** | **5** |
| **34.** | I am not afraid to speak up in groups, expressing my thoughts and ideas and challenging the thoughts and ideas of others | **1** | **2** | **3** | **4** | **5** |
| **35.** | In sports and games I analyse my opponent's skills and then develop a game plan designed to exploit his/her weaknesses | **1** | **2** | **3** | **4** | **5** |
| **36.** | I become so involved in projects or in problem solving I forget to eat and can go for days with very little sleep | **1** | **2** | **3** | **4** | **5** |
| **37.** | When it comes to accepting people’s ideas, opinions, or positions on issues I am a natural sceptic, automatically looking for the flaws in their argument | **1** | **2** | **3** | **4** | **5** |
| **38.** | When something needs to be done, I do it; I don't wait for someone to ask | **1** | **2** | **3** | **4** | **5** |
| **39.** | In a crisis, people turn to me for leadership | **1** | **2** | **3** | **4** | **5** |
| **40.** | When I am worried about something, I have a hard time letting it go | **1** | **2** | **3** | **4** | **5** |
| **41.** | I am happy in a support role, letting others take the lead | **1** | **2** | **3** | **4** | **5** |
| **42.** | Anger is a powerful motivating force for me | **1** | **2** | **3** | **4** | **5** |
| **43.** | Spending time with others is not high on my list of priorities | **1** | **2** | **3** | **4** | **5** |
| **44.** | I have more emotional energy and am able to work longer and harder than most people | **1** | **2** | **3** | **4** | **5** |
| **45.** | Within a matter of minutes I can take a complex idea or proposal and reduce it to three or four key points or deliverables | **1** | **2** | **3** | **4** | **5** |

| | | Never | Rarely | Sometimes | Frequently | Always |
|---|---|---|---|---|---|---|
| **46.** | I can sell anybody, anything | **1** | **2** | **3** | **4** | **5** |
| **47.** | I am more comfortable working in a situation where the rules and expectations are very clearly spelled out, and people follow them, than I am working in a situation where the rules are vague | **1** | **2** | **3** | **4** | **5** |
| **48.** | I am one of the leaders and organizers in social situations | **1** | **2** | **3** | **4** | **5** |
| **49.** | I perform better in situations where I can use my analytical skills and prepare in advance, than I perform when I have to react on the spot to unexpected events | **1** | **2** | **3** | **4** | **5** |
| **50.** | Ask anyone who knows me and they will tell you I've been very successful | **1** | **2** | **3** | **4** | **5** |
| **51.** | I feel like a failure | **1** | **2** | **3** | **4** | **5** |
| **52.** | Whether I am writing, discussing, or debating an issue, my thoughts and ideas seem to flow in a logical, rational, and organized way without any effort on my part | **1** | **2** | **3** | **4** | **5** |
| **53.** | I make mistakes because I overanalyse situations, reading more into them than I should | **1** | **2** | **3** | **4** | **5** |
| **54.** | Whether I am buying a house, making a business decision, or ordering food in a restaurant, I make decisions more quickly than others | **1** | **2** | **3** | **4** | **5** |
| **55.** | In high-pressure situations I would rather others take the lead. | **1** | **2** | **3** | **4** | **5** |
| **56.** | In school or at work I have difficulty deciding what the professor, or my boss, thinks is most important, and I try to do too much | **1** | **2** | **3** | **4** | **5** |
| **57.** | Other people need more balance between family, friends, and work, than I do | **1** | **2** | **3** | **4** | **5** |
| **58.** | 57. I like new challenges and am easily bored, so unless it's impossible, I avoid situations where I have to do the same thing over and over. | **1** | **2** | **3** | **4** | **5** |
| **59.** | I don't need much stimulation from others and am quite comfortable working in isolation or alone | **1** | **2** | **3** | **4** | **5** |
| **60.** | Others will tell you I am a good debater, presenting my ideas in a very compelling way | **1** | **2** | **3** | **4** | **5** |
| **61.** | I am a person who spends time thinking about 'bigger issues,' engaging theoretical, philosophical and/or academic questions | **1** | **2** | **3** | **4** | **5** |
| **62.** | I want to be the person making the decisions when pressure is high and a lot is at stake | **1** | **2** | **3** | **4** | **5** |
| **63.** | Others will tell you I'm competitive | **1** | **2** | **3** | **4** | **5** |
| **64.** | I would rather work in an environment where you have the opportunity to win or lose, than in one where everyone receives the same rewards. | **1** | **2** | **3** | **4** | **5** |
| **65.** | I have difficulty concentrating when there is a lot going on around me. | **1** | **2** | **3** | **4** | **5** |
| **66.** | When I need to stay focused on a task, I am able to completely shut out everything else. So much so that others will tell you I don't even know they are around | **1** | **2** | **3** | **4** | **5** |
| **67.** | I am quicker to confront issues than others | **1** | **2** | **3** | **4** | **5** |
| **68.** | I am more likely to have problems because I am too supportive, than I am to have problems because I am too confrontive. | **1** | **2** | **3** | **4** | **5** |

| | | Never | Rarely | Sometimes | Frequently | Always |
|---|---|---|---|---|---|---|
| **69.** | In sports or when playing a game, I am more capable than most of seeing the whole field or court and of finding an open player, or a weakness in my opponent I can take advantage of. | **1** | **2** | **3** | **4** | **5** |
| **70.** | I have good instincts and perform well in situations where I have to react to the unexpected | **1** | **2** | **3** | **4** | **5** |
| **71.** | I feel guilty. | **1** | **2** | **3** | **4** | **5** |
| **72.** | In planning or problem solving meetings I take a leadership role, providing the organizational structure and direction the group needs | **1** | **2** | **3** | **4** | **5** |
| **73.** | In situations, where everything is on the line I want to be the person who can win it, or lose it | **1** | **2** | **3** | **4** | **5** |
| **74.** | I confuse other people by giving them too much information | **1** | **2** | **3** | **4** | **5** |
| **75.** | I would rather be part of a team where everyone gets along well but we lose, than be a member of team where we win, but don't like each other | **1** | **2** | **3** | **4** | **5** |
| **76.** | People perform better when you support them, than they do when you criticize them | **1** | **2** | **3** | **4** | **5** |
| **77.** | Others will tell you I bring people together, making them feel like part of the team, and motivating them in positive ways | **1** | **2** | **3** | **4** | **5** |
| **78.** | When I have a serious problem, or I am under time pressure to produce something in a hurry, I have to isolate myself to keep from becoming distracted | **1** | **2** | **3** | **4** | **5** |
| **79.** | I am in control, taking a leadership role in interactions with others | **1** | **2** | **3** | **4** | **5** |
| **80.** | In school I was one of the first people to finish timed tests | **1** | **2** | **3** | **4** | **5** |
| **81.** | I compare my skills and abilities to those of people I admire and respect, to see how I measure up | **1** | **2** | **3** | **4** | **5** |
| **82.** | When people make mistakes I say things I later regret (e.g., yell at them, call them stupid, etc | **1** | **2** | **3** | **4** | **5** |
| **83.** | I am a critical thinker, asking why, and refusing to take things others say or do, at face value; I want to see the data | **1** | **2** | **3** | **4** | **5** |
| **84.** | I take longer to make important decisions than others, because I want to make sure I have as much data as possible so I can anticipate potential problems and avoid mistakes | **1** | **2** | **3** | **4** | **5** |
| **85.** | I am more flexible, and more willing to bend rules when I think that's needed, than others seem to be | **1** | **2** | **3** | **4** | **5** |
| **86.** | I am a person who pays attention to, and is concerned about details and doing things right | **1** | **2** | **3** | **4** | **5** |
| **87.** | When someone does a good job I let him/her know it | **1** | **2** | **3** | **4** | **5** |
| **88.** | I enjoy and need time alone | **1** | **2** | **3** | **4** | **5** |
| **89.** | It is easier for me to work, or exercise when others are involved and we provide the motivation and support we all need to keep going | **1** | **2** | **3** | **4** | **5** |
| **90.** | When practicing, exercising, or training, I don't need the support or involvement of others to keep going | **1** | **2** | **3** | **4** | **5** |
| **91.** | People take advantage of me because I am too supportive | **1** | **2** | **3** | **4** | **5** |

| | | Never | Rarely | Sometimes | Frequently | Always |
|---|---|---|---|---|---|---|
| **92.** | Others see me as an extrovert | **1** | **2** | **3** | **4** | **5** |
| **93.** | I become so absorbed in things I am working on hours pass and it seems like minutes | **1** | **2** | **3** | **4** | **5** |
| **94.** | I am more effective and get more accomplished when I work in isolation | **1** | **2** | **3** | **4** | **5** |
| **95.** | I rely more on intuition and my ability to sense what's needed in a situation than I do on my logical problem solving skills | **1** | **2** | **3** | **4** | **5** |
| **96.** | I am judgmental of others | **1** | **2** | **3** | **4** | **5** |
| **97.** | When others are beginning to feel burned out, I am just getting started | **1** | **2** | **3** | **4** | **5** |
| **98.** | When others let me down and/or disappoint me I let them know | **1** | **2** | **3** | **4** | **5** |
| **99.** | When a group I am involved with seems to be lacking direction I step in and provide it | **1** | **2** | **3** | **4** | **5** |
| **100.** | When involved in a game (e.g., cards) or competition I make mistakes because I get distracted or faked out by my opponent | **1** | **2** | **3** | **4** | **5** |
| **101.** | I am able to learn new information more quickly, and with less effort than others | **1** | **2** | **3** | **4** | **5** |
| **102.** | My ability to pull ideas together in a neat, concise way gets interfered with by the fact that I have more ideas and/or thoughts than I know what to do with | **1** | **2** | **3** | **4** | **5** |
| **103.** | My need to socialize, and/or my willingness to help others prevents me from completing things as quickly as I would otherwise | **1** | **2** | **3** | **4** | **5** |
| **104.** | I have a greater capacity than others, to practice or rehearse something (e.g., memorizing things like math tables, spelling words, or rehearsing a speech or a part in a play) until it's perfect | **1** | **2** | **3** | **4** | **5** |
| **105.** | I am more supportive and more of a positive motivator for the people I work with than others | **1** | **2** | **3** | **4** | **5** |
| **106.** | It is important to follow the rules | **1** | **2** | **3** | **4** | **5** |
| **107.** | I feel ashamed | **1** | **2** | **3** | **4** | **5** |
| **108.** | I am more aware of, and sensitive to, the moods and feelings of the people around me than others seem to be | **1** | **2** | **3** | **4** | **5** |
| **109.** | In my position or job, I can compete successfully against anyone | **1** | **2** | **3** | **4** | **5** |
| **110.** | I am more comfortable when my job involves interacting with and/or socializing with others, than I am when I have to isolate myself and work alone | **1** | **2** | **3** | **4** | **5** |
| **111.** | My ability to concentrate gets interfered with by things going on around me (e.g., people talking, noises, movement) | **1** | **2** | **3** | **4** | **5** |
| **112.** | Others will tell you if I take on a job or project, or set a goal for myself, I quickly outperform the competition | **1** | **2** | **3** | **4** | **5** |
| **113.** | I am a better problem solver than others seem to be | **1** | **2** | **3** | **4** | **5** |
| **114.** | I am a burden to others | **1** | **2** | **3** | **4** | **5** |

| | | Never | Rarely | Sometimes | Frequently | Always |
|---|---|---|---|---|---|---|
| **115.** | I become so angry I either fail to think about the consequences of my actions, or I tell myself I don't care about the consequences (e.g., getting even in a game like football when someone fouls you) | **1** | **2** | **3** | **4** | **5** |
| **116.** | Others see me as an introvert | **1** | **2** | **3** | **4** | **5** |
| **117.** | My ability to analyse people and situations gets me into trouble in sports or games where I have to stop thinking and just react | **1** | **2** | **3** | **4** | **5** |
| **118.** | I have so many thoughts and ideas I have a hard time picking one and sticking with it | **1** | **2** | **3** | **4** | **5** |
| **119.** | I perform better in situations where there is structure and where external distractions are kept to a minimum | **1** | **2** | **3** | **4** | **5** |
| **120.** | I manage to get my way and to get my point across because I am more sensitive to people's needs and reactions than others are | **1** | **2** | **3** | **4** | **5** |
| **121.** | I want my boss to give me a goal or target, and then get out of the way and let me accomplish it | **1** | **2** | **3** | **4** | **5** |
| **122.** | I am confident in my ability to quickly evaluate a crisis and make decisions that not only deal with the immediate problem, but also take into account any effects that decision might have on 'the bigger picture' (e.g., what future problems my immediate solution might lead to) | **1** | **2** | **3** | **4** | **5** |
| **123.** | I make friends everywhere I go | **1** | **2** | **3** | **4** | **5** |
| **124.** | I am willing to work harder and take more time than others to learn because I want to make sure I do things right | **1** | **2** | **3** | **4** | **5** |

*Many athletes get tense or nervous before or during games, meets or matches. This happens even to professional athletes. Please read each question. Then, circle the number that indicates* ***how you USUALLY feel before or while you compete in sports.*** *There are no right or wrong answers. Please be as truthful as you can.*

| | **Before or while I compete in sports:** | Not At All | A Little Bit | Pretty Much | Very Much |
|---|---|---|---|---|---|
| 1. | It is hard to concentrate on the game. | 1 | 2 | 3 | 4 |
| 2. | My body feels tense. | 1 | 2 | 3 | 4 |
| 3. | I worry that I will not play well. | 1 | 2 | 3 | 4 |
| 4. | It is hard for me to focus on what I am supposed to do. | 1 | 2 | 3 | 4 |
| 5. | I worry that I will let others down. | 1 | 2 | 3 | 4 |
| | **Before or while I compete in sports:** | Not At All | A Little Bit | Pretty Much | Very Much |
| 6. | I feel tense in my stomach. | 1 | 2 | 3 | 4 |
| 7. | I lose focus on the game. | 1 | 2 | 3 | 4 |
| 8. | I worry that I will not play my best. | 1 | 2 | 3 | 4 |
| 9. | I worry that I will play badly. | 1 | 2 | 3 | 4 |
| 10. | My muscles feel shaky. | 1 | 2 | 3 | 4 |
| | **Before or while I compete in sports:** | Not At All | A Little Bit | Pretty Much | Very Much |
| 11. | I worry that I will mess up during the game. | 1 | 2 | 3 | 4 |
| 12. | My stomach feels upset. | 1 | 2 | 3 | 4 |
| 13. | I cannot think clearly during the game. | 1 | 2 | 3 | 4 |
| 14. | My muscles feel tight because I am nervous. | 1 | 2 | 3 | 4 |
| 15. | I have a hard time focusing on what my coach tells me to do. | 1 | 2 | 3 | 4 |

*The following questions ask about people in your environment who provide you with help or support. Each question has two parts. For the first part, list all the people you know, excluding yourself, whom you can count on for help or support in the manner described. Give the person's initials and their relationship to you (see example). Do not list more than one person next to each of the numbers beneath the question.*

*For the second part, circle* ***how satisfied you are with the overall support you have.***

*If you have no support for a question, circle the words "No one", but still rate your level of satisfaction. Do not list more than nine persons for each question.*

*Please answer all questions as best as you can. All your responses will be kept confidential.*

**EXAMPLE:**

Who do you know whom you can trust with information that could get you into trouble?

| | | | | | |
|---|---|---|---|---|---|
| No one | 1) | T.N. (brother) | 4) | T.N. (father) | 7) |
| | 2) | L.M. (friend) | 5) | L.M. (employer) | 8) |
| | 3) | R.S. (friend) | 6) | | 9) |

How satisfied?

| | | | | | |
|---|---|---|---|---|---|
| 6-very satisfied | 5-fairly satisfied | 4-a little satisfied | 3-a little dissatisfied | 2-fairly dissatisfied | 1-very dissatisfied |

**1. Whom can you really count on to listen to you when you need to talk?**

| | | | |
|---|---|---|---|
| No one | 1) | 4) | 7) |
| | 2) | 5) | 8) |
| | 3) | 6) | 9) |

How satisfied?

| | | | | | |
|---|---|---|---|---|---|
| 6-very satisfied | 5-fairly satisfied | 4-a little satisfied | 3-a little dissatisfied | 2-fairly dissatisfied | 1-very dissatisfied |

**2. Whom could you really count on to help you if a person whom you thought was a good friend insulted you and told you that he/she didn't want to see you again?**

| | | | |
|---|---|---|---|
| No one | 1) | 4) | 7) |
| | 2) | 5) | 8) |
| | 3) | 6) | 9) |

How satisfied?

| | | | | | |
|---|---|---|---|---|---|
| 6-very satisfied | 5-fairly satisfied | 4-a little satisfied | 3-a little dissatisfied | 2-fairly dissatisfied | 1-very dissatisfied |

**3. Whose lives do you feel you are an important part of?**

| | | | |
|---|---|---|---|
| No one | 1) | 4) | 7) |
| | 2) | 5) | 8) |
| | 3) | 6) | 9) |

How satisfied?

| | | | | | |
|---|---|---|---|---|---|
| 6-very satisfied | 5-fairly satisfied | 4-a little satisfied | 3-a little dissatisfied | 2-fairly dissatisfied | 1-very dissatisfied |

**4. Whom do you feel would help you if you were married and had just separated from your spouse?**

| | | | |
|---|---|---|---|
| No one | 1) | 4) | 7) |
| | 2) | 5) | 8) |
| | 3) | 6) | 9) |

How satisfied?

| | | | | | |
|---|---|---|---|---|---|
| 6-very satisfied | 5-fairly satisfied | 4-a little satisfied | 3-a little dissatisfied | 2-fairly dissatisfied | 1-very dissatisfied |

**5. Whom would you really count on to help you out in a crisis situation, even though they would have to go out of their way to do so?**

| | | | |
|---|---|---|---|
| No one | 1) | 4) | 7) |
| | 2) | 5) | 8) |
| | 3) | 6) | 9) |

How satisfied?

| | | | | | |
|---|---|---|---|---|---|
| 6-very satisfied | 5-fairly satisfied | 4-a little satisfied | 3-a little dissatisfied | 2-fairly dissatisfied | 1-very dissatisfied |

**6. Whom can you talk with frankly, without having to watch what you say?**

| | | | |
|---|---|---|---|
| No one | 1) | 4) | 7) |
| | 2) | 5) | 8) |
| | 3) | 6) | 9) |

How satisfied?

| | | | | | |
|---|---|---|---|---|---|
| 6-very satisfied | 5-fairly satisfied | 4-a little satisfied | 3-a little dissatisfied | 2-fairly dissatisfied | 1-very dissatisfied |

**7. Who helps you feel that you truly have something positive to contribute to others?**

| | | | |
|---|---|---|---|
| No one | 1) | 4) | 7) |
| | 2) | 5) | 8) |
| | 3) | 6) | 9) |

How satisfied?

| | | | | | |
|---|---|---|---|---|---|
| 6-very satisfied | 5-fairly satisfied | 4-a little satisfied | 3-a little dissatisfied | 2-fairly dissatisfied | 1-very dissatisfied |

**8. Whom can you really count on to distract you from your worries when you feel under stress?**

| | | | |
|---|---|---|---|
| No one | 1) | 4) | 7) |
| | 2) | 5) | 8) |
| | 3) | 6) | 9) |

How satisfied?

| | | | | | |
|---|---|---|---|---|---|
| 6-very satisfied | 5-fairly satisfied | 4-a little satisfied | 3-a little dissatisfied | 2-fairly dissatisfied | 1-very dissatisfied |

**9. Whom can you really count on to be dependable when you need help?**

| | | | |
|---|---|---|---|
| No one | 1) | 4) | 7) |
| | 2) | 5) | 8) |
| | 3) | 6) | 9) |

How satisfied?

| | | | | | |
|---|---|---|---|---|---|
| 6-very satisfied | 5-fairly satisfied | 4-a little satisfied | 3-a little dissatisfied | 2-fairly dissatisfied | 1-very dissatisfied |

**10. Whom can you really count on to help you out if you had just been fired from your job or expelled from school?**

| | | | |
|---|---|---|---|
| No one | 1) | 4) | 7) |
| | 2) | 5) | 8) |
| | 3) | 6) | 9) |

How satisfied?

| | | | | | |
|---|---|---|---|---|---|
| 6-very satisfied | 5-fairly satisfied | 4-a little satisfied | 3-a little dissatisfied | 2-fairly dissatisfied | 1-very dissatisfied |

**11. With whom can you totally be yourself?**

| | | | |
|---|---|---|---|
| No one | 1) | 4) | 7) |
| | 2) | 5) | 8) |
| | 3) | 6) | 9) |

How satisfied?

| | | | | | |
|---|---|---|---|---|---|
| 6-very satisfied | 5-fairly satisfied | 4-a little satisfied | 3-a little dissatisfied | 2-fairly dissatisfied | 1-very dissatisfied |

**12. Whom do you feel really appreciates you as a person?**

| | | | |
|---|---|---|---|
| No one | 1) | 4) | 7) |
| | 2) | 5) | 8) |
| | 3) | 6) | 9) |

How satisfied?

| | | | | | |
|---|---|---|---|---|---|
| 6-very satisfied | 5-fairly satisfied | 4-a little satisfied | 3-a little dissatisfied | 2-fairly dissatisfied | 1-very dissatisfied |

**13. Whom can you really count on to give you useful suggestions that help you to avoid making mistakes?**

| | | | |
|---|---|---|---|
| No one | 1) | 4) | 7) |
| | 2) | 5) | 8) |
| | 3) | 6) | 9) |

How satisfied?

| | | | | | |
|---|---|---|---|---|---|
| 6-very satisfied | 5-fairly satisfied | 4-a little satisfied | 3-a little dissatisfied | 2-fairly dissatisfied | 1-very dissatisfied |

**14. Whom can you count on to listen openly and uncritically to your innermost feelings?**

| | | | |
|---|---|---|---|
| No one | 1) | 4) | 7) |
| | 2) | 5) | 8) |
| | 3) | 6) | 9) |

How satisfied?

| | | | | | |
|---|---|---|---|---|---|
| 6-very satisfied | 5-fairly satisfied | 4-a little satisfied | 3-a little dissatisfied | 2-fairly dissatisfied | 1-very dissatisfied |

**15. Who will comfort you when you need it by holding you in their arms?**

| | | | |
|---|---|---|---|
| No one | 1) | 4) | 7) |
| | 2) | 5) | 8) |
| | 3) | 6) | 9) |

How satisfied?

| | | | | | |
|---|---|---|---|---|---|
| 6-very satisfied | 5-fairly satisfied | 4-a little satisfied | 3-a little dissatisfied | 2-fairly dissatisfied | 1-very dissatisfied |

**16. Whom do you feel would help if a good friend of yours had been in a car accident and was hospitalised in a serious condition?**

| | | | |
|---|---|---|---|
| No one | 1) | 4) | 7) |
| | 2) | 5) | 8) |
| | 3) | 6) | 9) |

How satisfied?

| | | | | | |
|---|---|---|---|---|---|
| 6-very satisfied | 5-fairly satisfied | 4-a little satisfied | 3-a little dissatisfied | 2-fairly dissatisfied | 1-very dissatisfied |

**17. Whom can you really count on to help you feel more relaxed when you are under pressure or tense?**

| | | | |
|---|---|---|---|
| No one | 1) | 4) | 7) |
| | 2) | 5) | 8) |
| | 3) | 6) | 9) |

How satisfied?

| | | | | | |
|---|---|---|---|---|---|
| 6-very satisfied | 5-fairly satisfied | 4-a little satisfied | 3-a little dissatisfied | 2-fairly dissatisfied | 1-very dissatisfied |

**18. Whom do you feel would help if a family member very close to you died?**

| | | | |
|---|---|---|---|
| No one | 1) | 4) | 7) |
| | 2) | 5) | 8) |
| | 3) | 6) | 9) |

How satisfied?

| | | | | | |
|---|---|---|---|---|---|
| 6-very satisfied | 5-fairly satisfied | 4-a little satisfied | 3-a little dissatisfied | 2-fairly dissatisfied | 1-very dissatisfied |

**19. Who accepts you totally, including both your worst and your best points?**

| | | | |
|---|---|---|---|
| No one | 1) | 4) | 7) |
| | 2) | 5) | 8) |
| | 3) | 6) | 9) |

How satisfied?

| | | | | | |
|---|---|---|---|---|---|
| 6-very satisfied | 5-fairly satisfied | 4-a little satisfied | 3-a little dissatisfied | 2-fairly dissatisfied | 1-very dissatisfied |

**20. Whom can you really count on to care about you, regardless of what is happening to you?**

| | | | |
|---|---|---|---|
| No one | 1) | 4) | 7) |
| | 2) | 5) | 8) |
| | 3) | 6) | 9) |

How satisfied?

| | | | | | |
|---|---|---|---|---|---|
| 6-very satisfied | 5-fairly satisfied | 4-a little satisfied | 3-a little dissatisfied | 2-fairly dissatisfied | 1-very dissatisfied |

**21. Whom can you really count on to listen to you when you are very angry at someone else?**

| | | | |
|---|---|---|---|
| No one | 1) | 4) | 7) |
| | 2) | 5) | 8) |
| | 3) | 6) | 9) |

How satisfied?

| | | | | | |
|---|---|---|---|---|---|
| 6-very satisfied | 5-fairly satisfied | 4-a little satisfied | 3-a little dissatisfied | 2-fairly dissatisfied | 1-very dissatisfied |

**22. Whom can you really count on to tell you, in a thoughtful manner, when you need to improve in some way?**

| | | | |
|---|---|---|---|
| No one | 1) | 4) | 7) |
| | 2) | 5) | 8) |
| | 3) | 6) | 9) |

How satisfied?

| | | | | | |
|---|---|---|---|---|---|
| 6-very satisfied | 5-fairly satisfied | 4-a little satisfied | 3-a little dissatisfied | 2-fairly dissatisfied | 1-very dissatisfied |

**23. Whom can you really count on to help you feel better when you are feeling generally down-in-the-dumps?**

| | | | |
|---|---|---|---|
| No one | 1) | 4) | 7) |
| | 2) | 5) | 8) |
| | 3) | 6) | 9) |

How satisfied?

| | | | | | |
|---|---|---|---|---|---|
| 6-very satisfied | 5-fairly satisfied | 4-a little satisfied | 3-a little dissatisfied | 2-fairly dissatisfied | 1-very dissatisfied |

**24. Whom do you feel truly loves you deeply?**

| | | | |
|---|---|---|---|
| No one | 1) | 4) | 7) |
| | 2) | 5) | 8) |
| | 3) | 6) | 9) |

How satisfied?

| | | | | | |
|---|---|---|---|---|---|
| 6-very satisfied | 5-fairly satisfied | 4-a little satisfied | 3-a little dissatisfied | 2-fairly dissatisfied | 1-very dissatisfied |

**25. Whom can you count on to console you when you are upset?**

| | | | |
|---|---|---|---|
| No one | 1) | 4) | 7) |
| | 2) | 5) | 8) |
| | 3) | 6) | 9) |

How satisfied?

| | | | | | |
|---|---|---|---|---|---|
| 6-very satisfied | 5-fairly satisfied | 4-a little satisfied | 3-a little dissatisfied | 2-fairly dissatisfied | 1-very dissatisfied |

**26. Whom can you really count on to support you in major decisions you make?**

| | | | |
|---|---|---|---|
| No one | 1) | 4) | 7) |
| | 2) | 5) | 8) |
| | 3) | 6) | 9) |

How satisfied?

| | | | | | |
|---|---|---|---|---|---|
| 6-very satisfied | 5-fairly satisfied | 4-a little satisfied | 3-a little dissatisfied | 2-fairly dissatisfied | 1-very dissatisfied |

**27. Whom can you really count on to help you feel better when you are very irritable, ready to get angry at almost everything?**

| | | | |
|---|---|---|---|
| No one | 1) | 4) | 7) |
| | 2) | 5) | 8) |
| | 3) | 6) | 9) |

How satisfied?

| | | | | | |
|---|---|---|---|---|---|
| 6-very satisfied | 5-fairly satisfied | 4-a little satisfied | 3-a little dissatisfied | 2-fairly dissatisfied | 1-very dissatisfied |

*In order to respond to the statements in this questionnaire, you must have a specific stressful situation in mind. Take a few moments and think about the most stressful situation that you have experienced in the* ***past week***.

*By "stressful" we mean a situation that was difficult or troubling for you, either because you felt distressed about what happened, or because you had to use considerable effort to deal with the situation. The situation may have involved your family, your job, your friends, or something else important to you. Before responding to the statements, think about the details of this stressful situation, such as where it happened, who was involved, how you acted, and why it was important to you. While you may still be involved in the situation, or it could have already happened, it should be the most stressful situation you experienced during the week.*

*As you respond to each statement, please keep this situation in mind.*

**Read each statement carefully and indicate, by circling 0, 1, 2, or 3, to what extent you used it in the situation.**

**Key:** **0 =** Does not apply or not used **1 =** Used somewhat
**2 =** Used quite a bit **3 =** Used a great deal.

**Please try to respond to each question.**

| | | | | | |
|---|---|---|---|---|---|
| **1.** | I just concentrated on what I had to do next - the next step | **0** | **1** | **2** | **3** |
| **2.** | I tried to analyse the problem in order to understand it better | **0** | **1** | **2** | **3** |
| **3.** | I turned to work or another activity to take my mind off things | **0** | **1** | **2** | **3** |
| **4.** | I felt that time would have made a difference – the only thing was to wait | **0** | **1** | **2** | **3** |
| **5.** | I bargained or compromised to get something positive from the situation | **0** | **1** | **2** | **3** |
| **6.** | I did something that I didn't think would work, but at least I was doing something | **0** | **1** | **2** | **3** |
| **7.** | I tried to get the person responsible to change his or her mind | **0** | **1** | **2** | **3** |
| **8.** | I talked to someone to find out more about the situation | **0** | **1** | **2** | **3** |
| **9.** | I criticised or lectured myself | **0** | **1** | **2** | **3** |
| **10.** | I tried not to burn my bridges, but leave things open somewhat | **0** | **1** | **2** | **3** |
| **11.** | I hoped for a miracle | **0** | **1** | **2** | **3** |
| **12.** | I went along with fate; sometimes I just have bad luck | **0** | **1** | **2** | **3** |
| **13.** | I went on as if nothing had happened | **0** | **1** | **2** | **3** |
| **14.** | I tried to keep my feelings to myself | **0** | **1** | **2** | **3** |
| **15.** | I looked for the silver lining, so to speak; I tried to look on the bright side of things | **0** | **1** | **2** | **3** |
| **16.** | I slept more than usual | **0** | **1** | **2** | **3** |
| **17.** | I expressed anger to the person(s) who caused the problem | **0** | **1** | **2** | **3** |
| **18.** | I accepted sympathy and understanding from someone | **0** | **1** | **2** | **3** |

**Key:** **0 =** Does not apply or not used **1 =** Used somewhat
**2 =** Used quite a bit **3 =** Used a great deal.

| | | | | | |
|---|---|---|---|---|---|
| **19.** | I told myself things that helped me feel better | **0** | **1** | **2** | **3** |
| **20.** | I was inspired to do something creative about the problem | **0** | **1** | **2** | **3** |
| **21.** | I tried to forget the whole thing | **0** | **1** | **2** | **3** |
| **22.** | I got professional help | **0** | **1** | **2** | **3** |
| **23.** | I changed or grew as a person | **0** | **1** | **2** | **3** |
| **24.** | I waited to see what would happen before doing anything | **0** | **1** | **2** | **3** |
| **25.** | I apologised or did something to make up | **0** | **1** | **2** | **3** |
| **26.** | I made a plan of action and followed it | **0** | **1** | **2** | **3** |
| **27.** | I accepted the next best thing to what I wanted | **0** | **1** | **2** | **3** |
| **28.** | I let my feelings out somehow | **0** | **1** | **2** | **3** |
| **29.** | I realised that I had brought the problem on myself | **0** | **1** | **2** | **3** |
| **30.** | I came out of the experience better than when I went in | **0** | **1** | **2** | **3** |
| **31.** | I talked to someone who could do something concrete about the problem | **0** | **1** | **2** | **3** |
| **32.** | I tried to get away from it for a while by resting or taking a vacation | **0** | **1** | **2** | **3** |
| **33.** | I tried to make myself feel better by eating, drinking, smoking, using drugs, or medications, etc. | **0** | **1** | **2** | **3** |
| **34.** | I took a big chance or did something very risky to solve the problem | **0** | **1** | **2** | **3** |
| **35.** | I tried not to act too harshly or follow my first hunch | **0** | **1** | **2** | **3** |
| **36.** | I found new faith | **0** | **1** | **2** | **3** |
| **37.** | I maintained my pride and kept a stiff upper lift | **0** | **1** | **2** | **3** |
| **38.** | I rediscovered what was important in my life | **0** | **1** | **2** | **3** |
| **39.** | I changed something so that things would turn out all right | **0** | **1** | **2** | **3** |
| **40.** | I generally avoided being with people | **0** | **1** | **2** | **3** |
| **41.** | I didn’t let it get to me; I refused to think too much about it | **0** | **1** | **2** | **3** |
| **42.** | I asked advice from a relative or friend I respected | **0** | **1** | **2** | **3** |
| **43.** | I kept others from knowing how bad things were | **0** | **1** | **2** | **3** |
| **44.** | I made light of the situation; I refused to get too serious about it | **0** | **1** | **2** | **3** |
| **45.** | I talked to someone about how I was feeling | **0** | **1** | **2** | **3** |

**Key:** **0 =** Does not apply or not used **1 =** Used somewhat
**2 =** Used quite a bit **3 =** Used a great deal.

| | | | | | |
|---|---|---|---|---|---|
| **46.** | I stood my ground and fought for what I wanted | **0** | **1** | **2** | **3** |
| **47.** | I took it out on other people | **0** | **1** | **2** | **3** |
| **48.** | I drew on my past experiences; I was in a similar situation before | **0** | **1** | **2** | **3** |
| **49.** | I knew what had to be done, so I doubled my efforts to make things work | **0** | **1** | **2** | **3** |
| **50.** | I refused to believe that it had happened | **0** | **1** | **2** | **3** |
| **51.** | I promised myself that things would be different next time | **0** | **1** | **2** | **3** |
| **52.** | I came up with a couple of different solutions to the problem | **0** | **1** | **2** | **3** |
| **53.** | I accepted the situation, since nothing could be done | **0** | **1** | **2** | **3** |
| **54.** | I tried to keep my feelings about the problem from interfering with other things | **0** | **1** | **2** | **3** |
| **55.** | I wished that I could change what had happened or how I felt | **0** | **1** | **2** | **3** |
| **56.** | I changed something about myself | **0** | **1** | **2** | **3** |
| **57.** | I daydreamed or imagined a better time or place than the one I was in | **0** | **1** | **2** | **3** |
| **58.** | I wished that the situation would go away or somehow be over with | **0** | **1** | **2** | **3** |
| **59.** | I had fantasies or wishes about how things might turn out | **0** | **1** | **2** | **3** |
| **60.** | I prayed | **0** | **1** | **2** | **3** |
| **61.** | I prepared myself for the worst | **0** | **1** | **2** | **3** |
| **62.** | I went over in my mind what I say or do | **0** | **1** | **2** | **3** |
| **63.** | I thought about how a person I admire would handle this situation and used that as a model | **0** | **1** | **2** | **3** |
| **64.** | I tried to see things from the other person’s point of view | **0** | **1** | **2** | **3** |
| **65.** | I reminded myself how much worse things could happen | **0** | **1** | **2** | **3** |
| **66.** | I jogged or exercised | **0** | **1** | **2** | **3** |

*Listed below are 69 events that sometimes occur in the lives of athletes. These events often produce change within an individual's life that requires some adjustment by the individual. For each event that you have experienced in the last year (12 months):*

*1. Place **a check (X) in the column 0 months to 1 year** to indicate that you **have experienced the event within the last year**. Please make sure that each check corresponds to the event that has happened to you in the one-year time frame. Remember, only respond to those events that you have experienced within the last year. If you have not experienced an event within the last year, leave that item blank.*

*2. Indicate what kind of an effect it had on your life when the event occurred. A rating of **- 4** would indicate that the event had an **extremely negative effect** on you. A rating of **+ 4** would indicate that the event had an **extremely positive effect** on you. For those events that have happened more than once, indicate the average effect across all occurrences.*

*The events are listed in no particular order, and there are no right or wrong answers. Please respond to each event honestly as applies to you.*

| | | 0 months to 1 year | Extremely negative | Negative | Moderately negative | Somewhat negative | Somewhat positive | Moderately positive | Positive | Extremely positive |
|---|---|---|---|---|---|---|---|---|---|---|
| **1.** | Marriage | | **- 4** | **- 3** | **- 2** | **- 1** | **+ 1** | **+ 2** | **+ 3** | **+ 4** |
| **2.** | Death of mate (boyfriend, girlfriend, spouse, significant other) | | **- 4** | **- 3** | **- 2** | **- 1** | **+ 1** | **+ 2** | **+ 3** | **+ 4** |
| **3.** | Major change in sleeping habits (increase or decrease in amount of sleep) | | **- 4** | **- 3** | **- 2** | **- 1** | **+ 1** | **+ 2** | **+ 3** | **+ 4** |
| **4.** | Death of close family member(s)<br>(a) Father<br>(b) Mother<br>(c) Brother<br>(d) Sister<br>(e) Grandfather<br>(f) Grandmother<br>(g) Other | | **- 4** | **- 3** | **- 2** | **- 1** | **+ 1** | **+ 2** | **+ 3** | **+ 4** |
| **5.** | Major change in eating habits (increase or decrease in food intake) | | **- 4** | **- 3** | **- 2** | **- 1** | **+ 1** | **+ 2** | **+ 3** | **+ 4** |
| **6.** | Death of close friend(s) | | **- 4** | **- 3** | **- 2** | **- 1** | **+ 1** | **+ 2** | **+ 3** | **+ 4** |
| **7.** | Outstanding personal achievement | | **- 4** | **- 3** | **- 2** | **- 1** | **+ 1** | **+ 2** | **+ 3** | **+ 4** |
| **8.** | For males: mate pregnant | | **- 4** | **- 3** | **- 2** | **- 1** | **+ 1** | **+ 2** | **+ 3** | **+ 4** |
| **9.** | For female: becoming pregnant | | **- 4** | **- 3** | **- 2** | **- 1** | **+ 1** | **+ 2** | **+ 3** | **+ 4** |
| **10.** | Sexual difficulties | | **- 4** | **- 3** | **- 2** | **- 1** | **+ 1** | **+ 2** | **+ 3** | **+ 4** |
| **11.** | Being fired from job | | **- 4** | **- 3** | **- 2** | **- 1** | **+ 1** | **+ 2** | **+ 3** | **+ 4** |

| | | 0 months to 1 year | Extremely negative | Negative | Moderately negative | Somewhat negative | Somewhat positive | Moderately positive | Positive | Extremely positive |
|---|---|---|---|---|---|---|---|---|---|---|
| **12.** | Being apart from mate (boy/girlfriend, spouse, etc.) due to sport | | **- 4** | **- 3** | **- 2** | **- 1** | **+ 1** | **+ 2** | **+ 3** | **+ 4** |
| **13** | Serious illness or injury of close family member(s)<br>(a) Father<br>(b) Mother<br>(c) Brother<br>(d) Sister<br>(e) Grandfather<br>(f) Grandmother<br>(g) Other | | **- 4** | **- 3** | **- 2** | **- 1** | **+ 1** | **+ 2** | **+ 3** | **+ 4** |
| **14.** | Major changes in the number (more or less) of arguments with mate | | **- 4** | **- 3** | **- 2** | **- 1** | **+ 1** | **+ 2** | **+ 3** | **+ 4** |
| **15.** | Major personal injury or illness | | **- 4** | **- 3** | **- 2** | **- 1** | **+ 1** | **+ 2** | **+ 3** | **+ 4** |
| **16.** | Major change in frequency (increased or decreased) of social activities due to participation in sport | | **- 4** | **- 3** | **- 2** | **- 1** | **+ 1** | **+ 2** | **+ 3** | **+ 4** |
| **17.** | Serious illness or injury of close friends | | **- 4** | **- 3** | **- 2** | **- 1** | **+ 1** | **+ 2** | **+ 3** | **+ 4** |
| **18.** | Breaking up with mate (boy/girlfriend, etc.) | | **- 4** | **- 3** | **- 2** | **- 1** | **+ 1** | **+ 2** | **+ 3** | **+ 4** |
| **19.** | Beginning a new school experience (new school) | | **- 4** | **- 3** | **- 2** | **- 1** | **+ 1** | **+ 2** | **+ 3** | **+ 4** |
| **20.** | Engagement | | **- 4** | **- 3** | **- 2** | **- 1** | **+ 1** | **+ 2** | **+ 3** | **+ 4** |
| **21.** | Academic probation/ineligibility | | **- 4** | **- 3** | **- 2** | **- 1** | **+ 1** | **+ 2** | **+ 3** | **+ 4** |
| **22.** | Being dismissed from team or school events | | **- 4** | **- 3** | **- 2** | **- 1** | **+ 1** | **+ 2** | **+ 3** | **+ 4** |
| **23.** | Failing an important exam | | **- 4** | **- 3** | **- 2** | **- 1** | **+ 1** | **+ 2** | **+ 3** | **+ 4** |
| **24.** | Major change in relationship with coach (better or worse) | | **- 4** | **- 3** | **- 2** | **- 1** | **+ 1** | **+ 2** | **+ 3** | **+ 4** |
| **25.** | Failing a course | | **- 4** | **- 3** | **- 2** | **- 1** | **+ 1** | **+ 2** | **+ 3** | **+ 4** |
| **26.** | Major change in the length and/or conditions of training/practice (better or worse) | | **- 4** | **- 3** | **- 2** | **- 1** | **+ 1** | **+ 2** | **+ 3** | **+ 4** |
| **27.** | Financial problems | | **- 4** | **- 3** | **- 2** | **- 1** | **+ 1** | **+ 2** | **+ 3** | **+ 4** |
| **28.** | Major change in relationship with family member(s) (better or worse) | | **- 4** | **- 3** | **- 2** | **- 1** | **+ 1** | **+ 2** | **+ 3** | **+ 4** |

| | | 0 months to 1 year | Extremely negative | Negative | Moderately negative | Somewhat negative | Somewhat positive | Moderately positive | Positive | Extremely positive |
|---|---|---|---|---|---|---|---|---|---|---|
| **29.** | Conflict with family | | **- 4** | **- 3** | **- 2** | **- 1** | **+ 1** | **+ 2** | **+ 3** | **+ 4** |
| **30.** | For males: mate having an abortion | | **- 4** | **- 3** | **- 2** | **- 1** | **+ 1** | **+ 2** | **+ 3** | **+ 4** |
| **31.** | For females: having an abortion | | **- 4** | **- 3** | **- 2** | **- 1** | **+ 1** | **+ 2** | **+ 3** | **+ 4** |
| **32.** | Major change in the amount (more or less) of academic activity (homework, class time, etc.) | | **- 4** | **- 3** | **- 2** | **- 1** | **+ 1** | **+ 2** | **+ 3** | **+ 4** |
| **33.** | Pressure to gain/lose weight because of participation in sport | | **- 4** | **- 3** | **- 2** | **- 1** | **+ 1** | **+ 2** | **+ 3** | **+ 4** |
| **34.** | Discriminations from team-mates/ coaches | | **- 4** | **- 3** | **- 2** | **- 1** | **+ 1** | **+ 2** | **+ 3** | **+ 4** |
| **35.** | Major change in relationship(s) with team-mate(s) (better or worse) | | **- 4** | **- 3** | **- 2** | **- 1** | **+ 1** | **+ 2** | **+ 3** | **+ 4** |
| **36.** | Suspended from team for non-academic reasons | | **- 4** | **- 3** | **- 2** | **- 1** | **+ 1** | **+ 2** | **+ 3** | **+ 4** |
| **37.** | Trouble with academic counsellor | | **- 4** | **- 3** | **- 2** | **- 1** | **+ 1** | **+ 2** | **+ 3** | **+ 4** |
| **38.** | Major change in use of alcohol/drugs (increased or decreased) | | **- 4** | **- 3** | **- 2** | **- 1** | **+ 1** | **+ 2** | **+ 3** | **+ 4** |
| **39.** | Beginning sexual activity | | **- 4** | **- 3** | **- 2** | **- 1** | **+ 1** | **+ 2** | **+ 3** | **+ 4** |
| **40.** | Major change in relationship(s) with friend(s) (better or worse) | | **- 4** | **- 3** | **- 2** | **- 1** | **+ 1** | **+ 2** | **+ 3** | **+ 4** |
| **41.** | Recovery from illness/injury/operation | | **- 4** | **- 3** | **- 2** | **- 1** | **+ 1** | **+ 2** | **+ 3** | **+ 4** |
| **42.** | Major change in level of athletic performance in actual competition (better or worse) | | **- 4** | **- 3** | **- 2** | **- 1** | **+ 1** | **+ 2** | **+ 3** | **+ 4** |
| **43.** | Divorce or separation of your parents | | **- 4** | **- 3** | **- 2** | **- 1** | **+ 1** | **+ 2** | **+ 3** | **+ 4** |
| **44.** | Major change in level of responsibility on team (increased or decreased) | | **- 4** | **- 3** | **- 2** | **- 1** | **+ 1** | **+ 2** | **+ 3** | **+ 4** |
| **45.** | Receiving an athletic scholarship | | **- 4** | **- 3** | **- 2** | **- 1** | **+ 1** | **+ 2** | **+ 3** | **+ 4** |
| **46.** | Not attaining personal goals in sport | | **- 4** | **- 3** | **- 2** | **- 1** | **+ 1** | **+ 2** | **+ 3** | **+ 4** |
| **47.** | Major change in playing status on team | | **- 4** | **- 3** | **- 2** | **- 1** | **+ 1** | **+ 2** | **+ 3** | **+ 4** |
| **48.** | Injury to team-mates | | **- 4** | **- 3** | **- 2** | **- 1** | **+ 1** | **+ 2** | **+ 3** | **+ 4** |

| | | 0 months to 1 year | Extremely negative | Negative | Moderately negative | Somewhat negative | Somewhat positive | Moderately positive | Positive | Extremely positive |
|---|---|---|---|---|---|---|---|---|---|---|
| **49.** | Being absent from school because of participation in sport | | **- 4** | **- 3** | **- 2** | **- 1** | **+ 1** | **+ 2** | **+ 3** | **+ 4** |
| **50.** | Troubles with athletic situation and/or athletic director | | **- 4** | **- 3** | **- 2** | **- 1** | **+ 1** | **+ 2** | **+ 3** | **+ 4** |
| **51.** | Difficulties with trainer/physician | | **- 4** | **- 3** | **- 2** | **- 1** | **+ 1** | **+ 2** | **+ 3** | **+ 4** |
| **52.** | Major change in playing time (playing more or less) due to injury | | **- 4** | **- 3** | **- 2** | **- 1** | **+ 1** | **+ 2** | **+ 3** | **+ 4** |
| **53.** | Major errors/mistakes in actual competition | | **- 4** | **- 3** | **- 2** | **- 1** | **+ 1** | **+ 2** | **+ 3** | **+ 4** |
| **54.** | Losing your position on the team | | **- 4** | **- 3** | **- 2** | **- 1** | **+ 1** | **+ 2** | **+ 3** | **+ 4** |
| **55.** | No recognition/praise of accomplishments from coaching staff | | **- 4** | **- 3** | **- 2** | **- 1** | **+ 1** | **+ 2** | **+ 3** | **+ 4** |
| **56.** | Pressure from family to perform well | | **- 4** | **- 3** | **- 2** | **- 1** | **+ 1** | **+ 2** | **+ 3** | **+ 4** |
| **57.** | Loss of confidence due to injury | | **- 4** | **- 3** | **- 2** | **- 1** | **+ 1** | **+ 2** | **+ 3** | **+ 4** |
| **58.** | Unable to find a job | | **- 4** | **- 3** | **- 2** | **- 1** | **+ 1** | **+ 2** | **+ 3** | **+ 4** |
| **59.** | Change in coaching staff | | **- 4** | **- 3** | **- 2** | **- 1** | **+ 1** | **+ 2** | **+ 3** | **+ 4** |
| **60.** | For females: menstrual period/PMS | | **- 4** | **- 3** | **- 2** | **- 1** | **+ 1** | **+ 2** | **+ 3** | **+ 4** |
| **61.** | Major change in level of academic performance (doing better or worse) | | **- 4** | **- 3** | **- 2** | **- 1** | **+ 1** | **+ 2** | **+ 3** | **+ 4** |
| **62.** | Making career decisions | | **- 4** | **- 3** | **- 2** | **- 1** | **+ 1** | **+ 2** | **+ 3** | **+ 4** |
| **63.** | Being cut/dropped from the team | | **- 4** | **- 3** | **- 2** | **- 1** | **+ 1** | **+ 2** | **+ 3** | **+ 4** |
| **64.** | Continual poor performance on the team | | **- 4** | **- 3** | **- 2** | **- 1** | **+ 1** | **+ 2** | **+ 3** | **+ 4** |
| **65.** | Change in graduation schedule | | **- 4** | **- 3** | **- 2** | **- 1** | **+ 1** | **+ 2** | **+ 3** | **+ 4** |
| **66.** | Major change in family finances (increased or decreased) | | **- 4** | **- 3** | **- 2** | **- 1** | **+ 1** | **+ 2** | **+ 3** | **+ 4** |
| **67.** | Major change in attitude towards sport (enjoy more or less) | | **- 4** | **- 3** | **- 2** | **- 1** | **+ 1** | **+ 2** | **+ 3** | **+ 4** |
| **68.** | Victim of harassment/abuse (sexual, emotional, physical) | | **- 4** | **- 3** | **- 2** | **- 1** | **+ 1** | **+ 2** | **+ 3** | **+ 4** |

| | | 0 months to 1 year | Extremely negative | Negative | Moderately negative | Somewhat negative | Somewhat positive | Moderately positive | Positive | Extremely positive |
|---|---|---|---|---|---|---|---|---|---|---|
| **69.** | Victim of personal attack (rape, robbery, assault, etc.) | | **- 4** | **- 3** | **- 2** | **- 1** | **+ 1** | **+ 2** | **+ 3** | **+ 4** |
| | Other events may have occurred to you in the past year but were not included on this list. If there were such events, please list them below | | | | | | | | | |
| **70.** | | | **- 4** | **- 3** | **- 2** | **- 1** | **+ 1** | **+ 2** | **+ 3** | **+ 4** |
| **71.** | | | **- 4** | **- 3** | **- 2** | **- 1** | **+ 1** | **+ 2** | **+ 3** | **+ 4** |
| **72.** | | | **- 4** | **- 3** | **- 2** | **- 1** | **+ 1** | **+ 2** | **+ 3** | **+ 4** |
| **73.** | | | **- 4** | **- 3** | **- 2** | **- 1** | **+ 1** | **+ 2** | **+ 3** | **+ 4** |
| **74.** | | | **- 4** | **- 3** | **- 2** | **- 1** | **+ 1** | **+ 2** | **+ 3** | **+ 4** |

*Please answer the following questions:*

**1.** In the past 12 months, did you experience any **medical *injuries*** that were due to training or playing your sport? By injury, I mean an injury that you required medical attention beyond taping or icing, for example: hamstring strain, broken bone, bruising etc. (Please tick appropriate box)

**Yes** ☐

**No** ☐

**2.** If you answered **Yes** to Question 1, can you provide a description of each of the injuries that you had in the past 12 months?

Next to each injury, please rate the **severity** of the injury on the following scale:

**1** = Recovered within a 1-2 days
**2** = Recovered within a week
**3** = Recovered within 2-3 weeks
**4** = Recovered within a month
**5** = Recovered within 2-3 months
**6** = Recovered within 4-6 months
**7** = Took more than 6 months to recover

Also, next to the severity rating, please rate ***how much training and playing time you lost*** because of the injury on the following scale:

**1** = None
**2** = 1-2 days
**3** = 1 week
**4** = 2-3 weeks
**5** = 1 month
**6** = 2-3 months
**7** = 4-6 months
**8** = More than 6 months

| **INJURIES** | **SEVERITY** | **TIME MISSED** |
|---|---|---|
| 1. _____ | _____ | _____ |
| 2. _____ | _____ | _____ |
| 3. _____ | _____ | _____ |
| 4. _____ | _____ | _____ |
| 5. _____ | _____ | _____ |
| 6. _____ | _____ | _____ |
| 7. _____ | _____ | _____ |

In order to complete your participation in this research study, we would like to collect some information regarding your injury status two months from now. Please indicate below how you would like to be contacted so that this information can be collected (please tick a box):

☐ **Via post**
A one page questionnaire will be sent to you. Please indicate your postal address below:

_____

_____

_____

☐ **Via email**
A one page questionnaire will be sent to you in an email attachment. Please indicate your email address below:

_____

_____

**THANK YOU FOR YOUR PARTICIPATION!**

# Appendix E - Plain Language Statement for Study Two

**INVITATION TO PARTICIPATE IN A RESEARCH PROJECT**
**PROJECT INFORMATION STATEMENT**

**PORTFOLIO OF:** Science, Engineering and Technology
**SCHOOL:** School of Health Sciences (Division of Psychology)

**PROJECT TITLE:** The role of perceived risk of injury and visual attention in the prediction of athletic injury

**Name(s) of investigators:**

Maria Vassos (Student Researcher) **Phone:** 9925-7742 or 0403278292 **Email:** m.vassos@student.rmit.edu.au

Dr. Mervyn Jackson (Supervisor) **Phone:** 9925-7367 **Email:** merv.jackson@rmit.edu.au

Prof. Ken Greenwood (Supervisor) **Phone:** 9925 7360 **Email:** ken.greenwood@rmit.edu.au

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You are invited to participate in a research project being conducted by the Division of Psychology, RMIT University. This information sheet describes the project in straight forward language, or 'plain English'. Please read this sheet carefully and be confident that you understand its content before deciding whether to give permission to participate. If you have any questions about the project, please ask one of the investigators.

***Who is involved in this research project? Why is it being conducted?***
This research is being conducted by Maria Vassos as part of the Doctor of Psychology (Clinical) degree at RMIT University. The research is being conducted under the supervision of Dr. Mervyn Jackson and Prof. Ken Greenwood. The research will focus on investigating the psychological and social factors that may increase the risk of injury in athletes. Some of these factors include an athlete's level of social support, their coping skills and their level of anxiety. This research has received ethical approval from the RMIT Human Research Ethics Committee.

***Why have you been approached?***
You have been approached because you are an athlete who trains for and participates in a sport.

***What is the project about? What are the questions being addressed?***
The project will attempt to find the psychological and social factors that predict injury occurrence in athletes. The main question under investigation is to examine if an athlete's level of anxiety, social support, previous injury, stress and coping skills will influence two responses: their ability to pay attention to the world around them in an athletic stressful situation and the amount of risk to injury that the athlete believes the stressful situation will pose to them.

***If I agree to participate, what will I be required to do?***
As a participant, you will complete a questionnaire booklet that contains standard measures of risk of athletic injury, attention style, stress, anxiety, social support and coping skills along with some questions regarding your previous history of injury. Examples of some of the questions you may encounter in the questionnaire booklet are "how much do you worry that you will not play well?" or "who can you really count on to listen to you when you need to talk?" This questionnaire should not take longer than 45 minutes to complete. You will be followed up two months later to complete a short questionnaire about any injuries that you may have experienced in that two

month period. If you would like to look at the questionnaire material before consenting to being part of the research, you are most welcome to.

***What are the risks or disadvantages associated with participation?***
Most participants do not experience any discomfort or distress when completing the standard measures included in the questionnaire booklet. But if you find that you are feeling uncomfortable, upset or distressed after completing the measures used in the research, please contact Maria Vassos, Dr. Mervyn Jackson or Prof. Ken Greenwood (contact details provided on this statement). Alternatively, if you wish to talk to someone independent of the research study, please contact the RMIT University Counselling Service on 9925 4365.

***What are the benefits associated with participation?***
Participants will be in the running to win a $50 Coles Myer gift voucher. Three vouchers of this value will be offered. Three participants will be chosen at random to win these vouchers. Only participants who have completed both parts of the research project (questionnaire and injury data questionnaire two months later) will be eligible to win the vouchers.

***What will happen to the information that I provide?***
The information you will provide will be used to assess if the proposed research question has support. The information will also be used to determine if the measures utilised in the questionnaire are appropriate for use with an athlete population. The results of the research will be written up as a research report and will be submitted for publication. No information will be provided in the report that could lead to participants being identified. Each participant will be assigned an arbitrary numerical code so that they can be identified. The reason for this is so that each athlete's injury data can be matched to their responses on the questionnaire booklet. The only people who will have access to these codes and the names of the participants they match will be the investigators. The information you provide will be locked in a filing cabinet in the offices of the investigators and only the investigators will have access to these filing cabinets. The information will be stored for five years and destroyed after this time period.

***What are my rights as a participant?***
As a participant, you have the right to withdraw from the study at any time, without prejudice. You also have the right to request that any of the information that you provide be destroyed. You also have the right to have any questions answered at anytime.

***Whom should I contact if I have any questions?***
Please do not hesitate to contact, Maria Vassos (m.vassos@student.rmit.edu,au; 9925-7742 or 0403278292), Dr. Mervyn Jackson (merv.jackson@rmit.edu.au; 9925-7367) or Prof. Ken Greenwood (ken.greenwood@rmit.edu.au; 9925 7360) if you have any questions or concerns about any aspect of your participation before consenting to participate or during the study.

Yours sincerely

Ms Maria Vassos
Doctor of Psychology Student
RMIT University

Dr. Mervyn Jackson
Lecturer in Psychology
RMIT University

Prof. Ken Greenwood
Head of Health Sciences
RMIT University

Appendix F - Consent Form for Study Two

## Consent Form for Persons Participating In Research Projects Involving Interviews, Questionnaires or Disclosure of Personal Information

| | | | |
|---|---|---|---|
| **Portfolio** | **Science, Engineering and Technology** | | |
| **School of** | **School of Health Sciences (Division of Psychology)** | | |
| **Project Title:** | **The role of perceived risk of injury and visual attention in the prediction of athletic injury** | | |
| **Name(s) of investigators: (1)** | **Maria Vassos (student researcher)** | Phone: | **99257742 or 0403278292** |
| **(2)** | **Dr. Mervyn Jackson (Supervisor)** | Phone: | **99257367** |
| **(3)** | **Prof. Ken Greenwood (Supervisor)** | Phone: | **9925 7360** |

**Name of participant:** _____

1. I have received a statement explaining the research design and questionnaires involved in this project.
2. I consent to participate in the above project; the particulars of which - including details of the questionnaire utilised - have been explained to me.
3. I authorise the investigator to administer the questionnaires.
4. I acknowledge that:
   - (a) Having read Plain Language Statement, I agree to the general purpose, methods and demands of the study.
   - (b) I have been informed that I am free to withdraw from the project at any time and to withdraw any unprocessed data previously supplied.
   - (c) The project is for the purpose of research and/or teaching. It may not be of direct benefit to me.
   - (d) The privacy of the personal information I provide will be safeguarded and only disclosed where I have consented to the disclosure or as required by law.
   - (e) The security of the research data is assured during and after completion of the study. The data collected during the study may be published, and a report of the project outcomes will be provided by December 2008. Any information which will identify me will not be used.

### Participant's Consent

**Participant:** _____ **Date:** _____
*(Signature)*

Any complaints about your participation in this project may be directed to the Executive Officer, RMIT Human Research Ethics Committee, Research & Innovation, RMIT, GPO Box 2476V, Melbourne, 3001. The telephone number is (03) 9925 2251. Details of the complaints procedure are available from the above address.

## Appendix G - Follow up Questionnaire (via Post) for Study Two

Dear Participant,

Thank you for participating in the research project **'The role of perceived risk of injury and visual attention in the prediction of athletic injury'** run by the Psychology Department at RMIT University. In order to complete your participation in the project, we require you to complete the attached one page questionnaire. The questionnaire asks you to list any injuries you had in the past two months and to rate their severity. Please complete the questionnaire and send it back to us in the provided reply paid envelope.

If you have any queries regarding the questionnaire or the research, please contact me on 99257742 or alternatively, you can email me on m.vassos@student.rmit.edu.au

Regards
Maria Vassos

*Please answer the following questions:*

**1.** In the past 12 months, did you experience any **medical *injuries*** that were due to training or playing your sport? By injury, I mean an injury that you required medical attention beyond taping or icing, for example: hamstring strain, broken bone, bruising etc. (Please tick appropriate box)

**Yes** ☐

**No** ☐

**2.** If you answered **Yes** to Question 1, can you provide a description of each of the injuries that you had in the past 12 months?

Next to each injury, please rate the **severity** of the injury on the following scale:

**1** = Recovered within a 1-2 days
**2** = Recovered within a week
**3** = Recovered within 2-3 weeks
**4** = Recovered within a month
**5** = Recovered within 2-3 months
**6** = Recovered within 4-6 months
**7** = Took more than 6 months to recover

Also, next to the severity rating, please rate ***how much training and playing time you lost*** because of the injury on the following scale:

**1** = None
**2** = 1-2 days
**3** = 1 week
**4** = 2-3 weeks
**5** = 1 month
**6** = 2-3 months
**7** = 4-6 months
**8** = More than 6 months

| **INJURIES** | **SEVERITY** | **TIME MISSED** |
|---|---|---|
| 1. _____ | _____ | _____ |
| 2. _____ | _____ | _____ |
| 3. _____ | _____ | _____ |
| 4. _____ | _____ | _____ |
| 5. _____ | _____ | _____ |
| 6. _____ | _____ | _____ |
| 7. _____ | _____ | _____ |

## Appendix H - Follow up Questionnaire (via Email) for Study Two

Dear Participant,

Thank you for participating in the research project **'The role of perceived risk of injury and visual attention in the prediction of athletic injury'** run by the Division of Psychology at RMIT University. In order to complete your participation in the project, some follow up data in required regarding your injury status in the past two months.

**If YOU DID NOT** experience any physical injuries in the past two months, please reply to this email stating "NO INJURY". **If YOU DID** experience a physical injury, please complete the attached one page questionnaire. The questionnaire asks you to list any injuries you had in the past two months and to rate their severity. Please download the questionnaire, complete it electronically and send it via email to m.vassos@student.rmit.edu.au

If you have any queries regarding the questionnaire or the research, please contact me on m.vassos@student.rmit.edu.au

Regards
Maria Vassos

*Please answer the following questions:*

**1.** In the last two months, did you experience any **medical *injuries*** that were due to training or playing your sport? By injury, I mean an injury that you required medical attention beyond taping or icing, for example: hamstring strain, broken bone, bruising etc. **(Please bold the appropriate response)**

(1) Yes

(2) No

**2.** If you answered **Yes** to Question 1, can you provide a description of each of the injuries that you had in the past 2 months? **Please type your responses directly into the table below**

Next to each injury, please rate the **severity** of the injury on the following scale:

**1** = Recovered within a 1-2 days
**2** = Recovered within a week
**3** = Recovered within 2-3 weeks
**4** = Recovered within a month
**5** = Recovered within 2-3 months
**6** = Recovered within 4-6 months
**7** = Took more than 6 months to recover

Also, next to the severity rating, please rate ***how much training and playing time you lost*** because of the injury on the following scale:

**1** = None
**2** = 1-2 days
**3** = 1 week
**4** = 2-3 weeks
**5** = 1 month
**6** = 2-3 months
**7** = 4-6 months
**8** = More than 6 months

| INJURIES | SEVERITY | TIME MISSED |
|---|---|---|
| 1. | | |
| 2. | | |
| 3. | | |
| 4. | | |
| 5. | | |
| 6. | | |
| 7. | | |

**Thank you for your participation!**

# Appendix I – Extracts from Published Articles that Describe the Bootstrapping Approach when Estimating Mediation

MacKinnon, Fairchild and Fritz (2007, p. 595) provide the following definitional information regarding mediation:

> *'Mediation in its simplest form represents the addition of a third variable to this X → Y relation, whereby X causes the mediator, M, and M causes Y, so X → M → Y... with **a** representing the relation of X to M, **b** representing the relation of M to Y adjusted for X, and **c'** the relation of X to Y adjusted for M... there is a direct effect relating X to Y and a mediated effect by which X indirectly affects Y through M.'*

Preacher and Hayes (2004, p. 718) provide the following mathematical definition for the indirect effect:

> *'The **indirect effect** of X on Y in this situation is defined as the product of the X → M path (**a**) and the M → Y path (**b**), or **ab**.'*

The term mediation and indirect effect are used interchangeably. However, an important distinction needs to be made between the two. This was discussed by Preacher and Hayes (2004, p. 719):

> *'A mediated effect is usually thought of as the special case of indirect effects when there is only one intervening variable. However, a conclusion that a mediation effect is present implies that the total effect X →Y was present initially. There is no such assumption in the assessment of indirect effects. It is quite possible to find that an indirect effect is significant even when there is no*

*evidence for a significant total effect. Whether or not the effect also represents mediation should be judged through examination of the total effect.'*

Preacher and Hayes (2008, p. 880) highlighted a common issue with other approaches to estimating mediation, especially those approaches that assume normality:

*'Methodologists have taken issue with the use of the standard normal distribution for deriving a p value for the indirect effect, since the sampling distribution of **ab** is normal only in large samples.'*

The bootstrapping approach is discussed in details by Mallinckrodt, Abraham, Wei, and Russell (2006, p. 373):

*'Bootstrap methods are particularly useful for examining sampling distributions. These approaches treat the collected research sample as a "population reservoir" from which a large number of random samples are drawn with continuous replacement such that the probability of selection for any given case remains equal over every random draw. Assuming a research sample of size N, selection with replacement of Case 007 as the first member of a bootstrap sample does not influence the probability of drawing Case 007 on any subsequent draw (i.e., the selection probability remains 1/N). Thus, a given bootstrap sample will omit some members of the original sample and include other cases multiple times. Sampling with replacement makes it possible to draw a very large number of unique samples from the population reservoir of size N. In practice, one typically draws as many as 10,000 –20,000 bootstrap samples and calculates a given parameter for each sample.'*

Preacher and Hayes (2004, p. 721) discuss bootstrapping as an alternative approach to estimating mediation/indirect effects:

> *'An alternative approach is to bootstrap the sampling distribution of **ab** and derive a confidence interval with the empirically derived bootstrapped sampling distribution. Bootstrapping is a nonparametric approach to effect-size estimation and hypothesis testing that makes no assumptions about the shape of the distributions of the variables or the sampling distribution of the statistic... It also produces a test that is not based on large-sample theory, meaning it can be applied to small samples with more confidence. The macros provide a bootstrap estimate of the indirect effect **ab**, an estimated standard error, and both 95% and 99% confidence intervals for population value of ab. The bootstrapping is accomplished by taking a large number of samples of size n (where n is the original sample size) from the data, sampling with replacement, and computing the indirect effect, **ab**, in each sample. Assume for the sake of illustration that 1,000 bootstrap samples have been requested. The point estimate of **ab** is simply the mean **ab** computed over the 1,000 samples, and the estimated standard error is the standard deviation of the 1,000 **ab** estimates. To derive the 95% confidence interval, the elements of the vector of 1,000 estimates of **ab** are sorted from low to high. The lower limit of the confidence interval is defined as the 25th score in this sorted distribution, and the upper limit is defined as the 976th score in the distribution. Using the same logic, the upper and lower bounds of a 99% confidence interval correspond to the 5th and 996th scores in the sorted distribution of 1,000 estimates, respectively.'*

Preacher and Hayes (2008, p. 883) discuss bias-corrected confidence intervals:

> *'Unlike regular CIs, percentile bootstrap CIs can be asymmetrical because they are based on an empirical estimation of the sampling distribution of the indirect effect, rather than on an assumption that the sampling distribution is normal. The sampling distribution of* ***ab*** *is skewed relative to a normal distribution (unless a = b = 0), and hence the confidence limits should not be equidistant from the point estimate...the forced symmetry of ordinary CIs results in estimation inaccuracies and problems with Type I errors and power when used in hypothesis testing. Percentile bootstrap CIs can be improved by an adjustment to the percentile values of the sorted distribution of bootstrap estimates used for determining the bounds of the interval.'*