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The Relationship Between Anxiety and Performance: A Cognitive-Behavioral Perspective

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ABSTRACT

This paper examines the relationship between anxiety and performance from a cognitive-behavioral perspective. Previous research in the field has suggested that the majority of consultations conducted by sport psychologists are related to anxiety. Included is a discussion on the theoretical underpinnings of anxiety and how it relates to performance. Research conducted on the relationship between anxiety and performance is also discussed. A review of the cognitive-behavioral treatments that have been used for anxiety reduction and performance enhancement within the field of athletics is included. Suggestions for future research and practical considerations are listed in the conclusion.

Introduction

The ability to cope with pressure and anxiety is an integral part of sports, particularly among elite athletes (Hardy, Jones, & Gould, 1996; Orlick & Partington, 1988).

Researchers have reported that over 50 of consultations among athletes at an Olympic festival were related to stress or anxiety related problems (Murphy, 1988). A great deal of research has been conducted examining the relationship between anxiety and performance within the field of athletics. This paper will review the relevant research from a cognitive-behavioral perspective. Included is a discussion of the research findings of the relationship between the two constructs. In addition, the research that has examined the efficacy of cognitive-behavioral treatments is also discussed. Although a great deal of information has been generated, the results are limited due problems in the terminology used by researchers. Therefore, it is important to first examine the conceptualization of anxiety.

Theoretical Constructs of Anxiety

Previous research conducted relating to anxiety and performance in athletics has been difficult to synthesize for a variety of reasons including methodological flaws such as a lack of clear operational definitions and a clear theoretical construct. This section will establish operational definitions for the terms that will be used throughout the rest of this paper. In addition, it will provide an overview of the theories that have been used by researchers who have attempted to clarify the relationship between anxiety and performance in athletics.

The main problem that research on the relationship between anxiety and performance has encountered is that researchers have not adequately operationally defined the construct of anxiety. Instead, terms such as stress, anxiety, arousal and activation have been used interchangeably. For the purposes of this paper the following operational definitions will be used for the terms anxiety and stress. Stress is a state that results from the demands that are placed on the individual which require that person to engage in some coping behavior (Jones, 1990). Arousal can be considered to be a signal to the individual that he or she has entered a stressful state and is characterized by physiological signs (Hardy et al., 1996). Anxiety results when the individual doubts his or her ability to cope with the situation that causes him or her stress (Hardy et al., 1996). Another important point that needs to be clarified is the difference between state and trait anxiety (Spielberger, 1966). While state anxiety can be considered to be more situational in nature and is often associated with arousal of the autonomic nervous system, trait anxiety can be thought of as a world view that an individual uses when coping with situations in his or her environment (Spielberger, 1966). Trait anxiety influences performances in that individuals with high trait anxiety will attend more to information related to state anxiety (Hardy et al., 1996). Previous research outside of sport and exercise psychology has indicated that individuals with high trait anxiety who are state anxious attend to threat related information, while individuals with low trait anxiety who are state anxious will attend away from threat related information (MacLeod, 1990). Within the context of sports, those individuals who are low trait anxious and experience high state anxiety would find it facilitative to a peak performance; but, those individuals with who are high trait anxious and experience state anxiety will find it debilitating to athletic performance (Hardy et al., 1996).

One of the earliest models that attempted to explain the relationship between arousal and performance was the inverted-U hypothesis (Broadhurst, 1957; Hebb, 1955). It stated that as arousal increased performance would increase as well; but, if arousal became too great performance would deteriorate. In other words, as stress began to build an individual still felt confident in their ability to control it and performance would improve. However, once a stressor became so great that the individual started to doubt the ability to cope with, performance began to decline. Although this model gave some explanation as to why performances deteriorated when individuals felt stress, it did not account for the differences in the performance of athletes who are exposed to the same stressor.

Researchers attempted to account for the differences in the performances of individuals through the concept of individualized zones of optimal functioning or IZOFs (Hanin, 1980, 1986). According to this theory, each individual has an optimal level of pre-performance anxiety which results in peak performances. However, if the pre-performance anxiety lies outside the area of the IZOF, whether too high or too low, then performance will deteriorate (Hanin, 1980, 1986). IZOFs can be determined by repeatedly measuring anxiety and performance or through athlete's recall of anxiety levels prior to peak performances. Indeed, researchers found that IZOFs are better predictors of performance than the inverted U- hypothesis (Turner & Raglin, 1991). Although this is a better model than the inverted-U hypothesis, it still fails to explain the factors that account for the individual differences in performance among athletes.

The differences observed between successful and unsuccessful athletes may be the result of their cognitive interpretation of their anxiety states. According to reversal theory (Apter, 1982) arousal is interpreted differently depending on their present state. In telic states athletes are focused on a goal and thus interpret their arousal as anxiety. However, in paratelic states performers are focused on their behavior and therefore interpret their arousal as excitement. Individuals can flip from one state to another quickly and therefore change their interpretation of the arousal that they experience which in turn affects their performance (Hardy et al., 1996). This theory attempts to incorporate both physiological and cognitive factors in its explanation of the relationship between performance and anxiety but fails to explain their relationship with performance adequately.

Multidimensional anxiety theory expanded on reversal theory's inclusion of cognitive and physiological factors (Burton, 1988). In this model, cognitive anxiety (the central tenet of which is concerned with the consequences of failure) has been found to have a negative linear relationship with performance (Burton, 1988). Self-confidence (a separate cognitive component) has been found to have a positive linear relationship with performance (Burton, 1988). Finally, somatic anxiety (physiological symptoms) has been found to have an inverted-U shaped relationship with performance (Burton, 1988). Although this model incorporates many elements of anxiety, it still treats them as separate entities. The next model that arose looked at the interaction between two of these three factors.

The catastrophe model of anxiety and performance looks at the interactive effects of physiological arousal and cognitive anxiety upon performance (Fazey & Hardy, 1988; Hardy, 1990). Physiological arousal can influence performance as a result of the individual's interpretation of their physiological symptoms. According to the model as cognitive anxiety increases it will be beneficial to performance at low levels of physiological arousal but a detrimental effect at high levels of physiological arousal (Hardy et al., 1996). Furthermore, when cognitive anxiety is at a low level, changes in physiological arousal have little effect upon performance. However, as cognitive anxiety increases physiological arousal can have either a positive or negative effect on performance depending on how much arousal there is (Hardy et al., 1996). Once physiological arousal levels are too high there is a steep drop in performance which can

only be reversed by a reduction in physiological arousal (Hardy et al., 1996). Although the model fails to include a self-confidence variable, its interactive approach seems to be the best explanation for observed behavior.

Now that we have a good understanding of the interaction of these variables, the question still remains, how do you operationalize these constructs? Two scales have been developed for this purpose. The Competitive State Anxiety Inventory - 2 (CSAI - 2) developed Martens, Burton, Vealey, Bump, and Smith (1990) seems to be the most widely used. It consists of three subscales: cognitive anxiety (fear of anxiety and negative expectations), somatic anxiety (perceptions of physiological arousal) and self-confidence. Although self-confidence is not included in the catastrophe model, it has been found to be a separate entity from cognitive anxiety and will be discussed later in this paper. The Sport Anxiety Scale (SAS) was developed by Smith, Smoll, and Ptacek (1990). It measures trait cognitive anxiety, somatic anxiety, and concentration disruption. Although it is not used as often, it is still a reliable instrument that also fits within the catastrophe model of anxiety and performance. Use of either of these scales by researchers would be a step in the right direction towards creating appropriate operational definitions. Let us now turn our attention to the research conducted on the relationship between anxiety and performance.

Effects of Anxiety in Athletics

A great deal of research has been devoted to the effect of anxiety on sports performance. Researchers have found that competitive state anxiety is higher for amateur athletes in individual sports compared with athletes in team sports (Simon & Martens, 1977). In addition, participants in individual non-contact sports have been found to report lower levels of state anxiety than participants in individual contact sports (Lowe & McGrath, 1971). This section will review this research from the perspective of the theoretical models discussed above.

Cognitive anxiety has been found to exert a powerful influence on performance. This statement holds true regardless of the individual's skill level. Participants in a collegiate softball tournament were put into one of two conditions: high situation criticality or low. While somatic anxiety did not differ in the two situations, those athletes in the high criticality condition had significantly higher levels of cognitive-anxiety (Krane, Joyce, & Rafeld, 1994). Clearly the cognitive interpretation an individual gives to a situation exerts an effect. Researchers have found that athletes that are successful interpret arousal to be facilitative. Research conducted with an elite group of swimmers found that anxiety intensity levels were higher in subjects who interpreted their anxiety as debilitating than those who reported it as being facilitative (Jones, Hanton, & Swain, 1994). This has been found to be true of gymnasts (Jones, Swain, & Hardy, 1993) as well as basketball players (Swain & Jones, 1996). Gould, Petrichkoff, and Weinberg (1984) have reported that the strongest predictor of cognitive anxiety was years of experience such that the more experience an individual had the lower the level of cognitive anxiety. This was supported by research conducted with a group of tennis players. Advanced subjects (individuals who had been participating in the sport for an

extended period of time) reported more facilitative interpretations of their anxiety than novices (Perry & Williams, 1998). Similar results have been observed among a group of elite swimmers (Jones, Hanton, & Swain, 1994). Perhaps this is due to previous experience with arousal and how to cope. This conclusion is supported by the research of Jones, Swain, and Cale (1990) found that cognitive anxiety was best predicted by an evaluation of previous performances, individual's perception of preparedness, and goal setting.

The amount of self-confidence that an individual possesses has been found to differ among elite and novice athletes. Research with a group of tennis players indicated that the advanced players had significantly higher levels of self-confidence (Perry & Williams, 1998). This has been found to be true of gymnasts (Bejek & Hagyet, 1996) as well as swimmers (Jones, Hanton, & Swain, 1994). The predictors of self-confidence identified by research are perception of preparedness, and external conditions (Jones, Swain, & Cale, 1990). Other researchers have found that the strongest predictor of self-confidence has been found to be the amount of ability that an individual believed he or she had (Gould, Petrchlikoff, & Weinberg, 1984). This makes sense given an individual's previous experience in a given situation. Self-confidence has been found to account for a greater proportion of variance in performance than cognitive or somatic anxiety (Hardy, 1996). This suggests that the most powerful quality that elite performers possess is a high level of self-confidence which may act as a protective factor from cognitive anxiety.

Although the research conducted focusing on cognitive anxiety and self-confidence provides some insight into their effect on athletic performance, the interaction of these variables in conjunction with somatic anxiety provides a better understanding of the true effects. Among a group of 91 athletes ranging in age from 14 - 36 years old who participated in soccer, swimming, and track and field, those individuals with higher scores on self-confidence and lower scores on cognitive anxiety and somatic anxiety perceived their overall anxiety levels as more facilitative of athletic performance (Wiggins & Brustad, 1996). Research conducted comparing athletes competing in team sports (basketball) with those competing in individual sports (track and field) has found that subjects competing in individual sports report significantly lower self-confidence and higher somatic anxiety than team sport athletes (Kirby & Liu, 1999). This is supported by research that has been conducted with figure skaters as well. Martin and Hall's (1997) research demonstrated that skaters experienced greater cognitive and somatic anxiety prior to an individual competitive event than prior to a team competition. Perhaps this is due to a diffusion of responsibility that occurs in the team framework but not in an individual framework. Important gender differences have also been found by researchers focusing on the relationship between cognitive anxiety, self-confidence, and somatic anxiety. Females had lower self-confidence and higher somatic anxiety scores than males on the CSAI-2 (Thuot, Kavouras, & Kenefick., 1998). This research also focused on the location of an athletic event as well, finding that away games resulted in increased somatic anxiety and lower self-confidence. Finally, Thuot et al. (1998) found that adolescents, regardless of gender, experienced significantly higher levels of cognitive and somatic anxiety and lower levels of self-confidence as the ability of opponents increased. This is partially supported by research that has focused on the determinants of anxiety as

well as gender. Among males, cognitive and somatic anxiety was more strongly affected by their perception of opponent's ability and probability of winning (Jones, Swain, & Cale, 1991). Female's cognitive anxiety and self-confidence is determined by readiness to perform and the importance they personally placed on doing well (Jones, Swain, & Cale, 1991). These gender differences are indicative of the need to develop interventions that are tailored to individual needs and the importance of considering all factors when developing an intervention.

Clearly, anxiety exerts a variety of effects on athletic performance. These effects vary based on sport, gender and level of experience. In order to facilitate peak performances by athletes, sport psychologists must consider the three different facets of anxiety: cognitive anxiety, somatic anxiety, and self-confidence. Given the research that indicates that successful athletes who interpret their anxiety as being facilitative is characterized by high scores on self-confidence and low scores on somatic and cognitive anxiety, sport psychologist should work towards achieving this ideal state among their clients. Let us now turn our attention to the variety of treatments that are available for the treatment of anxiety within the athletic context.

Cognitive-Behavioral Treatments in Athletics

The research cited so far in this paper clearly indicates that it is important for athletes to be able to control their anxiety if they are to produce peak performances at important times. A large discrepancy between performance in practice and in competition is indicative that the athlete is having a hard time achieving an appropriate level of arousal or may over aroused (Butler, 1996). Advances in the field of anxiety reduction in general have transferred over into athletics. Research in the field has identified the following strategies used by elite performers to control their anxiety: goal setting; though control strategies such as positive thinking and cognitive restructuring; relaxation techniques such as diaphragmatic breathing, imagery, and progressive muscle relaxation; and focusing on the task at hand (Gould, Eckland, & Jackson, 1993; Jones & Hardy, 1990; Orlick & Partington, 1988). This section will review research that has been conducted on applied treatments for anxiety reduction within the sporting context. Specific interventions and therapeutic considerations will also be discussed in this section.

In the past, researchers have examined the effectiveness of cognitive-behavioral interventions with a variety of athletes. The treatment modalities that have been used have had considerable variability in content and in format. Early research in the field was based on work for anxiety reduction in clinical settings. Research conducted with two female collegiate basketball players who received training in relaxation, imagery, and cognitive restructuring had significant improvements in concentration problems and in-game anxiety (Meyers, Schleser, & Okwumabua, 1982). The authors concluded that the interventions improved performance by reducing anxiety and improving self-esteem (Meyers, Schleser, & Okwumabua, 1982). Later research continued to demonstrate the efficacy of cognitive-behavioral interventions in improving athletic performance. One study used the cognitive-behavioral interventions mentioned above in 7 weekly 2-hour group sessions. The results indicated that in comparison to the no treatment control

group, the treatment group showed decreases in anxiety (Holm, Beckwith, Ehde, & Tinius, 1996). Another study using a multiple baseline design demonstrated that after a cognitive-behavioral intervention there was a significant decrease in cognitive and somatic anxiety as well as an increase in self-confidence (Savoy, 1997). However, the improvement in self-confidence may have been due to the individualized nature of the treatment provided. This is supported by other research conducted with collegiate basketball players who were treated in either a group or a combination group/individualized program. Although there was a decrease in cognitive and somatic anxiety for all athletes, only those subjects who participated in the individualized program had improved scores on self-confidence (Savoy & Beitel, 1997). This indicates that an individualized treatment program may be most beneficial for athletes who are having difficulties with self-confidence, but that treatment of cognitive and somatic anxiety can take place in a group format. Some research has suggested that any intervention regardless of content was beneficial in reducing anxiety. Tennis players in one of four interventions (imagery, relaxation, relaxation and imagery, and concentration) showed significant reductions in somatic and cognitive anxiety and an improvement in self-confidence (Terry, Coakley, & Karageorghis, 1995). If the researchers would have included a no-treatment control group, then their results might have shown some differences among the groups; but, this study still indicates that cognitive-behavioral interventions are effective for the purposes of performance enhancement. However, research conducted with field hockey players has concluded that anxiety reduction techniques that are directed at the individual's dominant anxiety type (cognitive or somatic) is more effective (Maynard & Cotton, 1993). It is therefore necessary to assess athlete's needs before instituting interventions. None the less, the above research demonstrates the effectiveness of cognitive-behavioral interventions. We now turn our attention to the specific techniques that generally comprise these treatments: relaxation, cognitive imagery, and restructuring.

Relaxation is one method that has been discussed in the literature for reducing both cognitive and somatic anxiety. It is important since it can reduce the individual; Hardy, Jones, & Gould, 1996). These two strategies have been used successfully in the treatment of clinical populations. While a discussion of the procedures used in these two treatments is beyond the scope of this paper, they are still an important component of any anxiety reduction intervention for the purposes of performance enhancement. Butler (1996) also notes that at times athletes have a hard time reducing their arousal levels once a competition has ended. Use of progressive muscle relaxation is recommended for this purpose and may be beneficial for athletes who have difficulty sleeping the night before a big competition (Butler, 1996). Although both of these interventions are beneficial for the purposes of anxiety reduction previous experience indicates that they initially work best when used in conjunction with imagery focusing on relaxation. As the athlete begins to master these techniques the relaxing imagery can be dropped off.

Imagery and mental rehearsal of tasks is also beneficial for the individual seeking to improve athletic performance. It provides familiarity with the task at hand and also provides positive feedback of their imagined performance (Hardy et al., 1996). This intervention has been proven to be effective with collegiate athletes in all sports. Results

of research indicate that individuals who were in the imagery intervention had significantly greater increases in sport performance and sport competition anxiety than did the delayed-training control group (Lohr & Scogin, 1998). Little is known about how imagery functions. However, researchers have identified visual imagery ability and motivational arousal imagery as predictors of cognitive state anxiety (Vadocz, Hall, & Moritz, 1997). Visual imagery ability was also predictive of somatic state anxiety and motivational mastery imagery was predictive of self-confidence (Vadocz, Hall, & Moritz, 1997). The researchers also found that imagery ability was significantly related to imagery use such that as ability increased so did use (Vadocz, Hall, & Moritz, 1997). Butler (1996) identified the following components as being important to a successful imagery routine:

- Selection of a skill to be imagined. Visualization should be preceded by relaxation. Visualization should also be as realistic as possible incorporating the use of all senses and the venue of the athletic competition.
- The technique to be imagined should be brought into focus. An internal perspective (as if they are viewing it through their eyes not the eyes of a camera on them performing the skill) is necessary. In addition, an attempt to feel the movement is effective in enhancing the imagery exercise.
- Practice the skill in "real time," there is no need to speed up or slow the skill down. Inclusion of coaches in the development of an imagery routine is important since it incorporates their technical skill and helps to minimize the perception of psychologists as a threat by coaches.

Butler (1996) concludes that imagery is an important component of an athlete's pre-competition regimen if they are to be successful.

Cognitive restructuring is an important component of treatment since it allows individuals to have a different interpretation of the activation states they are experiencing and thus reduce cognitive anxiety. It can be beneficial for de-emphasizing the importance of competitions which will allow an athlete's true ability to come through.

According to multidimensional anxiety theory, elite performers will have peak performances as cognitive anxiety decreases and self-confidence increases. This suggests that an appropriate intervention might be to de-emphasize the importance of competitions and try to achieve an intermediate level of somatic anxiety (Hardy et al., 1996). Goal setting is another important part of cognitive restructuring as well. It is important not to set goals that are too overwhelming for individuals since this in turn may result in increases in state anxiety (Jones, Swain, & Cale, 1990) which in turn may result in impaired performance. Instead, it is recommended that a series of smaller goals be set for individuals that break the task down into its component parts (Orlick, 1986).

Although relaxation, imagery, and cognitive interventions are each beneficial for the purposes of anxiety reduction in athletics, they are far more powerful when used in conjunction with one another. Butler (1996) suggests a mnemonic device called PRESSURE who have a hard time coping in competitions that incorporates all three phases of intervention. The word can be broken down as follows:

- **Prepare** - Athletes must psychologically prepare for what they will face during the competition.
- **Relax** - Diaphragmatic breathing exercises, may be necessary prior to competition in order to prevent over arousal which would result in a deterioration in performance.
- **Externalize** - This involves the belief that problems are not within yourself. This can be of assistance when athletes feel that there are too many demands that are being put upon them.
- **Stay Positive** - Acknowledgement of the importance that individuals should have confidence in their abilities.
- **Single Minded** - Stay focused on the task at hand. This can be used both in training and competition.
- **Unite** - Particularly useful within the framework of teams sports, this component encourages athletes to consider what roles others will fulfill and the importance of working together as a team throughout the competition.
- **Re-evaluate** - How important is this event in the real world?
- **Extend yourself** - Give your best performance every time no matter how important, or unimportant, the competition is.

Use of this mnemonic device is warranted with individuals that have problems with the three components of athletic anxiety: cognitive, somatic, and self-confidence.

Even the amount of cognitive effort that is used by an individual to use these strategies as an effect on performance. Gould et al., (1993) reported that the differences between medal winners and non-medal winners at an Olympic wrestling competition was the degree to which the individuals used these interventions automatically such that winners were more likely to use the interventions automatically. Most elite level performers have already found ways of achieving the activation state that is necessary for the sport. One of the things that makes athletics so fascinating is the number of different demands that are placed on an individual throughout a competition. It is therefore unlikely that any one intervention will ever be able to be of benefit for everyone. Thorough assessment of the athlete's needs is therefore recommended.

Conclusion

The above research indicates that anxiety has a considerable impact on performance. Early research was limited due to a lack of clear operational definitions for the construct of anxiety. The development of the catastrophe model provides future researchers with a theoretical framework for better understanding the relationship between cognitive anxiety and somatic anxiety and their effect on performance. Furthermore, we now have the tools for better understanding the components of anxiety in the athletic context. The development of the CSAI-2 and the SAS allows researchers to reliably measure the following constructs: cognitive anxiety, somatic anxiety, self-confidence, and concentration disruption. Furthermore, the development and increased popularity of multiple baseline research designs provide a method for examining anxiety reduction interventions through cognitive-behavioral interventions with small sample sizes.

Today's managed care environment has led to the development of manualized treatments for many anxiety disorders in clinical populations. Future researchers should focus on the development of manualized treatments within the athletic environment. However, this should be done with a consideration for the athlete's needs if our interventions as sport psychologists are to have their maximum impact.

Although anxiety can have a considerable impact on performance, it is important to consider other components of an athlete's functioning as well. The mental health model of Performance (Morgan, 1985) does this by using the Profile of Mood States (McNair, Lorr, & Droppelman, 1971). According to the model, peak performances are achieved by individuals who poses psychological states with high levels of vigour and low levels of tension, depression, anger, fatigue, and confusion. This is typically called the iceberg profile and is one method for differentiating between successful and unsuccessful performers. Although some research has indicated that this profile can not be used to differentiate between successful and non-successful athletes, evidence from Terry's meta analysis (1995) indicates that there is some validity to this profile if the sample is homogenous in ability and the sport they participate in. It is therefore necessary to consider all aspects of an individual's psychological functioning if sport psychology interventions are to have a maximum impact.

References

- Apter, M. J. (1982). The Experience of Motivation: The theory of Psychological Reversal, Academic Press, London.
- Bejek, K., & Hagtvet, K. A. (1996). The content of pre-competitive state anxiety in top and lower level of female gymnasts. Anxiety, Stress and Coping: An International Journal, 9, 19-31.
- Broadhurst, P. L. (1957). Emotionality and the Yerkes-Dodson law. Journal of Experimental Psychology, 54, 345-352.
- Burton, D. (1988). Do anxious swimmers swim slower? Reexamining the elusive anxiety-performance relationship. Journal of Sport Psychology, 10, 45-61.
- Butler (1996). Sport Psychology In Action. Butterworth-Heinemann: Oxford, England.
- Fazey, J. A., & Hardy, L. (1988). The Inverted-U Hypotheses: A Catastrophe for Sport Psychology. British Association of Sport Sciences Monograph No. 1 National Coaching Foundation, Leeds.
- Gould, D., Ecklund, R. C., & Jackson, S. A. (1993). Coping strategies used by U.S. Olympic Wrestlers. Research Quarterly for Exercise and Sport, 64, 83-93.
- Gould, D. Petchlikoff, L., & Weinberg, R. S. (1984). Antecedents of, temporal changes in, and relationships between the CSAI-2 sub components. Journal of Sport Psychology, 6, 289-304.
- Hanin, Y. L. (1980) A study of anxiety in sport. In W. F. Straub (Ed.), Sport Psychology: An Analysis of Athletic Behavior, Movement Publications, Ithaca, NY 236-249.
- Hanin, Y. L. (1986). State Trait anxiety research on sports in the USSR. In C. D. Spielberger & R. Diaz (Eds.), Cross-Cultural Anxiety (Vol. 3), Hemisphere, Washington, D.C., 45-64.
- Hardy, L. (1990). A catastrophe model of anxiety and performance. In J. T. Jones & L. Hardy (Eds.), Stress and performance in Sport, Wiley, Chichester, 81-106.
- Hardy, L. (1996) A test of catastrophe models of anxiety and sports performance against multidimensional anxiety theory models using the method of dynamic differences. Anxiety, Stress and Coping: An International Journal, 9, 69-86.
- Hardy, L., Jones, G., & Gould, D. (1996). Understanding Psychological Preparation for Sport: Theory and Practice of Elite Performers. Wiley, Chichester.

- Hebb, D. O. (1955). Drives and the CNS (Conceptual Nervous System). Psychological Review, *62*, 243-254.
- Holm, J. E., Beckwith, B.E., Ehde, D. M., & Tinius, T. P. (1996). Cognitive-behavioral interventions for improving performance in competitive athletes: A controlled treatment outcome study. International Journal of Sport Psychology, *27*, 463-475.
- Jones, G. (1990) A cognitive perspective on the process underlying the relationship between stress and performance in sport. In G. Jones & L. Hardy (Eds.), Stress and Performance in Sport, Wiley, Chichester, 17-42.
- Jones, G., Hanton, S., & Swain, A. B. J. (1994). Intensity and interpretation of anxiety symptoms in elite and non-elite sports performers. Personal Individual Differences, *17*, 657-663.
- Jones, G., & Hardy, L. (1990). Stress in sport: Experiences of some elite performers. In G. Jones and L. Hardy (Eds.), Stress and Performance in Sport, Wiley, Chichester, 247-277.
- Jones, G., Swain, A. B. J., & Cale, A. (1990). Antecedents of multidimensional competitive state anxiety and self confidence in elite intercollegiate middle distance runners, The Sport Psychologist, *4*, 107-118.
- Jones, G., Swain, A. B. J., & Cale, A. (1991). Gender differences in pre competition temporal patterning and antecedents of anxiety and self confidence, Journal of Sport and Exercise Psychology, *13*, 1-15.
- Jones, G., Swain, A. B. J., & Hardy, L. (1993). Intensity and direction dimensions of competitive state anxiety and relationships with performance. Journal of Sport Sciences, *11*, 525-532.
- Kirby, R. J., & Liu, J. (1999) Precompetition anxiety in Chinese athletes. Perceptual and Motor Skills, *88*, 297-303
- Krane, V., Joyce, D., & Rafeld, J. (1994). Competitive anxiety, situation criticality, and softball performance. Sport Psychologist, *8*, 58-72.
- Lohr, B. A. & Scogin, F. (1998) Effects of self-administered visuo-motor behavioral rehearsal on sport performance of collegiate athletes. Journal of Sport Behavior, *21*, 206-218.
- Lowe, R. & McGrath, J. E. (1971). Stress arousal and performance: Some findings calling for a new theory. Project Report, AF 1161-67, AFOSR.
- MacLeod, C. (1990). Mood disorders and cognition. In M. W. Eysenck (Ed.), Cognitive Psychology: An International Review. Wiley, Chichester.

- Martens, R., Burton, D., Vealey, R. S., Bump, L. A., and Smith, D. E. (1990). Development and Validation of the Competitive State Anxiety Inventory - 2. In R. Martens, R. S. Vealey & D. Burton (Eds.), Competitive Anxiety in Sport, Human Kinetics, Champaign, IL, 117-190.
- Martin, K. A., & Hall, C. R. (1997). Situational and intrapersonal moderators of sport competition state anxiety. Journal of Sport Behavior, 20, 435-446.
- Maynard, I. W., & Cotton, P. C. (1993). An investigation of two stress-management techniques in a field setting. Sport Psychologist, 7, 375-387.
- McNair, D. M., Lorr, M., & Droppelman, L. F. (1971). Profile of Mood States Manual, Educational and Industrial Testing Services, San Diego, CA.
- Meyers, A. W., Scheleser, R., & Okwumabua, T. M. (1982). A cognitive-behavioral intervention for improving basketball performance. Research Quarterly for Exercise and Sport, 53, 344-347.
- Morgan, W. P. (1985). Affective Beneficence of vigorous physical activity. Medicine and Science in Sport and Exercise, 17, 94-100.
- Murphy, S. M. (1988). The on-site provision of sport psychology services at the 1987 U.S. Olympic Festival. The Sport Psychologist, 2, 337-351.
- Orlick, T. (1986). Psyching for Sports. Human Kinetics, Champaign, IL.
- Orlick, T., & Partington, J. (1988). Mental links to excellence. The Sport Psychologist, 2, 105-130.
- Perry, J. D., & Williams, J. M., (1998) Relationship of intensity and direction of competitive trait anxiety to skill level and gender in tennis. Sport Psychologist, 12, 169-179.
- Savoy, C. (1997). Two individualized mental training programs for a team sport. International Journal of Sport Psychology, 28, 259-270.
- Savoy, C., & Beitel, P. (1997). The relative effect of a group and group/individualized program on state anxiety and state self-confidence. Journal of Sport Behavior, 20, 364-376.
- Simon, J. A., & Martens, R. (1977). S.C.A.T. as a predictor of A-states in varying competitive situations. In D. M. Landers & R. W. Christina (Eds.), Psychology of Motor Behaviour and Sport (Vol. 2), Human Kinetics, Champaign, IL, 146-156.
- Smith, R. E., Smoll, F. L., & Ptacek, J. T. (1990). Measurements and correlates of sport-specific cognitive and somatic trait anxiety. Anxiety Research, 2, 263-280.

Spielberger, C. S. (1966). Theory and research on anxiety. In C. S. Spielberger (Ed.), Anxiety and Behaviour, Academic Press, New York, 3-20.

Swain, A. B. J., & Jones, G. (1996). Explaining performance variance,: The relative contribution of intensity and direction dimensions of competitive state anxiety. Anxiety, Stress, and Coping: An International Journal, 9, 1-18.

Terry, P. (1995). The efficacy of mood state profiling with elite performers: A review and synthesis, The Sport Psychologist, 9, 309-324.

Terry, P., Coakley, L., & Karageorghis, C. (1995). Effects of intervention upon pre-competition state anxiety in elite junior tennis players: The relevance of the matching hypothesis. Perceptual and Motor Skills, 81, 287-296.

Thuot, S. M., Kavouras, S. A., & Kenefick, R. W. (1998). Effect of perceived ability, game location, and state anxiety on basketball performance. Journal of Sport Behavior, 21, 311-321

Turner, P. E., & Raglin, J. S. (1991). Anxiety and performance in track and field athletes: A comparison of ZOFR and inverted-U hypothesis. Medial Science in Sport and Exercise, 23, s119.

Vadocz, E. A., Hall, C. R., & Moritz, S. E. (1997). The relationship between competitive anxiety and imagery use. Journal of Applied Sport Psychology, 9, 241-253.

Wiggins, M. S., & Brustad, R. J. (1996). Perception of anxiety and expectations of performance. Perceptual and Motor Skills, 83, 1071-1074.