PRECOMPETITIVE ANXIETY EFFECT ON CONCENTRATION AND PERFORMANCE ON ELITE RHYTHMIC GYMNASTS

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Research article

Abstract

The multidimensional conceptualization of competitive anxiety incorporating cognitive and somatic components has provided a clearer understanding of how athletes respond to competitive stressors (see Jones, 1995; Woodman and Hardy, 2001 for a review). Thus, in competition, some athletes anxiety tend to dissipate their attention resources and to identify threats to stimuli that disrupt the running of the race. In addition, each athlete has suffered a break in concentration followed by a decline in performance and loss of confidence. So, the purpose of the present study was to examine the relationship between competitive anxiety, concentration and performance of gymnastics athletes at different time of assessment.. Data for this study were collected from 6 competitive female rhythmic gymnasts in the highest national team (age 14.8 ± 1.3 years, weight 77.5 ± 7.1 kg, height 180.8 ± 5.6 cm). Descriptive statistics revealed that the scores of cognitive anxiety increased from 15.83 ± 1.835 in the training condition to 19.67 ± 2.160 for the competition condition. Regarding somatic anxiety has increased from 15.50 ± 1.517 to 19.67 ±, 816 during the competition condition. In contrast, the average self-confidence has diminished from 21.00 ± 1.414 to 17.50 ± 1.871 during the competition .Accordingly, the importance of collecting information on how anxiety changes during the course of a competition appears fundamental to improving the predictive value of theories that seek to explain how such anxiety may influence athletic performance.

Keywords: anxiety, competition, concentration, rhythmic gymnastics.

INTRODUCTION

Anxiety, particularly pre competition anxiety, has been an important focus of research in sport and performance psychology (e.g. Jones & Hardy, 1990; Martens, Burton, Vealey, Bump & Smith, 1990). The influence of emotional states on the activity of the athlete and the performance, as competitive emotions emerge as one of the main factors likely to influence performance. The stressful nature of elite sport, and the competitive environment surrounding it, places many demands on participating athletes (Jones & Swain, 1995).

An athlete's emotional state may affect the outcome of the competition by influencing performance both during training and while competing (Bulter, 1996). The examination of athlete's behavioral and emotional responses to such stressors has developed into a focal area of sport psychology with many researchers interested in assessing anxiety responses of athletes to competitive events (Woodman & Hardy, 2001). Accordingly, the multidimensional conceptualization of competitive anxiety and the development of the competitive state anxiety inventory-2 (CSAI-2); Martens et al. (1990) have been identified as major developments within the field. Research in clinical and training condition anxiety literature has separated the state anxiety into cognitive and somatic components (Borkovec, 1976; Davidson & Schwartz, 1976; Liebert & Morris, 1967). Cognitive anxiety refers to negative expectations and cognitive concern about performance, the consequences of failure, negative self-evaluation, evaluation of one's ability relative to others, the inability to concentrate, and disrupted attention. Somatic anxiety refers to one's perception of the affective physiological elements of anxiety, generated from an increase of autonomic arousal and unpleasant feelings such as nervousness, tension and upset. The current multidimensional approach to competitive state anxiety has emerged through the work of Martens et al. (1990) and their development of the Competitive State Anxiety Inventory-2 (CSAI-2) which measures cognitive anxiety, somatic anxiety, and self-confidence.

The multidimensional conceptualization of competitive anxiety incorporating cognitive and somatic components has provided a clearer understanding of how athletes respond to competitive stressors (see Jones, 1995; Woodman and Hardy, 2001 for a review). However, scales designed to assess the construct, such as the Competitive State Anxiety Inventory-2 (CSAI-2) (Martens et al., 1990) and Sport Anxiety Scale (SAS) (Martens et al., 1990), like many other traditional anxiety instruments, measure the "intensity" of cognitive and perceived physiological symptoms that are purported to signify the presence of anxiety. The subsequent adoption of modified directional versions of the CSAI-2 (Jones & Swain, 1992) and SAS (Hanton & Connaughton, 2002) to investigate symptom interpretation has lead to considerable attention in the sport psychology literature.

Concentration is the mental quality to focus on the task at hand while ignoring distractions. The capacity to concentrate is widely regarded by athletes, coaches and sports psychologists as one of the keys to successful performance in sport. Coaches have long been concerned with how concentration or attention levels among athletes can be improved and maintained and how distractions can be avoided. Common distractions appear to be anxiety, skill errors and mistakes, fatigue, weather, public announcements, opposition players, 'sledging' and negative thoughts. However, sometimes in competition, some athletes anxiety tend to dissipate their attention resources and to identify threats to stimuli that disrupt the running of the race. In addition, each athlete has suffered a break in concentration followed by a decline in performance and loss of confidence. Peper, E. & Schmid, A.B (1993) define the concentration as "the ability to focus attention on the task at hand, and, therefore, not be distracted or affected by internal or external stimuli not appropriate. From these definitions concentration appears as a process by which the attention athlete needs to use all the necessary information leading to the achievement of its better performance while focusing his attention on the task he is expected to achieve without submitted under the disruptive effect of external factors that can prevent achieving adequate performance. The purpose of the present study was to examine the relationship between pre competitive anxiety, concentration and performance in rhythmic gymnastics athletes at different time of assessment.

METHODS

Participants

Six female rhythmic gymnasts in the highest national team (age 14.8 ± 1.3 years, body mass 77.5 ± 7.1 kg, height 180.8 ± 5.6 cm) voluntarily participated in this study. All subjects had been competing for at least 10 years and had previous experience in the execution of the maces' exercise. Before starting the experiment, we took parental consent's gymnasts. They were therefore given detailed instructions to perform maces' exercise accurately and efficiently. All were in training for competition at the time of data collection. Participants noted their current performance and their ranking during the international tournaments. Gymnasts were informed that data were to be collected at two stages during which the gymnasts were evaluated during a training condition and a simulated competition condition. No information about the purposes of the study was given to the participants until after they completed the experiment.

Procedures

The experiment included two conditions followed by a final debriefing. Information was obtained from the same group of gymnasts by comparing two different situations:

a) Baseline Training Condition (TC);

b) Competition condition (CC).

In each condition, the data from the psychological and physical variables were obtained 30 min. before the gymnastic trial.

Familiarization phase: This phase consisted to familiarize participants with the experimental material and inform them about the experiment. This condition was treated as a control day in which the participants performed a maces' exercise. Since anxiety quickly escalated immediately prior to the competition (Gould, Petlichkoff & Weinberg, 1984) and pre-experimental interview indicated that the gymnasts prepare themselves psychologically just few days prior the competition , the two conditions were separated each other by one week ,and the first assessment of anxiety was used as control measure of the stress level. They were also asked to avoid high-intensity physical training for 24 h before simulated competition condition.   This aimed to prevent the influence of residual fatigue from interfering with the test performance.   Then, psychological items used in the study were presented and explained to participants.   After receiving these instructions, the participants were assured that both their answers to the psychological items and their data would remain confidential.

Experimental phase: The athletes completed the Competitive State Anxiety Inventory-2 just prior to the warm-up phase, approximately half hour before the competition. Then, participants started a standardized warming-up. Then, participants completed the general and specific warm-up conditions. Before the technical assessment, subjects performed a concentration test .Next, participants received a specific instruction-delivered according the assigned condition, and they were asked to achieve as best they can maces' exercise.

During each phase, the same researchers were present throughout the tests. The two conditions were conducted at the same time of the day for each subject to ensure that there are no diurnal variations, and under standardized environmental conditions (24 ± 1°C and 43 ± 2% relative humidity). Sport doctors were available to intervene in case of problems. No medical problem appeared during the study.

Final debriefing: Participants were debriefed about the goal of the study once all experimental conditions were finished. Moreover, participants received their own performance of each test performed during the study.

Measures

The Competitive State Anxiety Inventory-2 (CSAI-2) (Martens et al., 1990) was used as the measure of competitive anxiety. Participants rated their anxiety responses over the multidimensional

constructs of cognitive anxiety (CA), somatic anxiety (SA) and self-confidence (SC) through a total of 27 items 9 for each subscale (cognitive anxiety, somatic anxiety and self-confidence). Symptom intensity levels were rated on a scale ranging from 1 ('not at all') to 4 ('very much so'). Each item was rated on a 4-point type scale, producing a score ranging from a low 9 to a high 36 for each subscale. Internal consistency scores (Cronbach's alpha coefficients) for the intensity scales have been reported to be acceptable range 0.79 to 0.90 (Martens et al., 1990). A value of 0.85 was reported for the current study.

Concentration test (CR): The concentration was measured using the "Grid training condition concentration" of Harris and Harris (1984). The exercise is performed by checking of consecutive numbers in a grid. The grid has 10 rows and 10 columns, with each box in -the grid containing a number from 0 to 99. The greater the number of consecutive numbers marked within a one-minute period, the greater the concentration level of the subject. Harris and Harris (1894), report that athletes with high concentration skill score in the high twenties and even the low thirties. Typical scores are in the range of half those numbers. A number of training conditioning variations can be performed with this exercise.

Performance evaluation (PERF): Two international judges were asked to evaluate the gymnasts' performance by referring to the Code of Points FIG (2009). Video analysis was established with a Sony video camera (DCR PC 105E, 1 megapixel CCD, 50 fps).

Heart rate (HR): During the training and competition condition participants were asked to wear the elastic electrode belt (placed with conductive gel), attached by the researcher. The participants were asked to remain quiet, without speaking or making any movements for 10 minutes in a supine position. The HR data were obtained by using Polar Team System (PE3000 Polar Electro Oy, Kompella) on the resting

position and during the exercise which was placed and set to start by the researcher.

Statistical analysis

Data are reported as mean ± standard deviation (SD). The distributions' normalities, estimated by the Kolmogorov-Smirnov test, varied between variables. Therefore, we used the non-parametric Wilcoxon Rank-sum test was applied to compare pair-wise the two phases of the study. Spearman correlation analysis was performed to check any relations between the training conditions and variables. The results were considered significantly different when the probability was less than or equal to 0.05 (P ≤ 0.05). Statistical analyses were performed using the software package SPSS version 13.0 (SPSS Inc., Chicago, IL, USA).

RESULTS

Table 1 shows all the descriptive kinetics and kinematic variables. These were compared between the two conditions and presented in table 2.

Table 1. *Descriptive statistics for training and competition.*

Training condition	Mean	SD
CA	18.83	1.60
SA	19.50	1.22
SC	20.33	2.33
CR	7.50	2.51
HR	178.83	5.77
PERF	7.45	0.54
TE	89.59	0.85
Competition Condition		
CA	23.50	2.58
SA	24.17	1.60
SC	16.17	1.72
CR	3.00	2.75
HR	184.00	3.22
PERF	7.11	0.52
TE	91.34	1.95

- (CA) cognitive anxiety; (SA) somatic anxiety; (SC) self-confidence; (CR) concentration; (PERF) performance; (HR) heart rate; (TE) time of exercise.

Table 2. *Comparative statistics training versus competition conditions.*

Variables	Wilcoxon Rank-sum Test	
	Z	Sig.
CA	-2.226	0.026*
SA	-2.226	0.026*
SC	-2.264	0.024*
CR	-2.251	0.024*
HR	-2.207	0.027*
PERF	-2.232	0.026*
TE	-2.201	0.028*

* Significant at *P* < 0.05.
- (CA) cognitive anxiety; (SA) somatic anxiety; (SC) self-confidence; (CR) concentration; (PERF) performance; (HR) heart rate; (TE) time of exercise.

Wilcoxon Rank-sum Test demonstrated that the two conditions had different effect on the psychological and physical variables. The scores of cognitive anxiety (CA) are increased in the competition condition: (CCΔCT = 19.87% with *P* < 0.05). Similarly, the somatic anxiety (SA) has increased during the competition condition: (CCΔCT = 19.32% with *P* < 0.05). Moreover, the self-confidence (SC) was decreased in competition with respect to training condition: (CCΔCT = -20.46% with *P* < 0.05) and the same was observed for the

concentration (CR): (CCΔCT = -60.00% with *P* < 0.05), (figure 1).
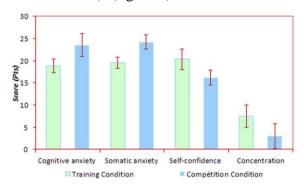

Figure 1.

With regards of the physical data, the heart rate (HR) was increased in the competition with respect to training condition: (CCΔCT = 2.81% with *P* < 0.05). Also, the time of exercise (TE) was increased in the competition condition: (CCΔCT = 1.92% with *P* < 0.05). Moreover, the performance (PERF) was decreased in competition with respect to training condition: (CCΔCT = -4.47% with *P* < 0.05).

Table 3 present the correlation of the psychological and physical data and performance of gymnast's in training and competition condition.

Table 3. *Correlation in the training and competition conditions.*

		CA	SA	SC	CR
Training condition	HR	0.716	0.501	-0.866*	-0.896*
	PERF	-0.970**	-0.461	0.742	0.955**
	TE	-0.559	-0.926**	0.853*	0.618
Competition Condition	HR	0.897*	0.893*	-0.676	-0.794
	PERF	-0.794	-0.739	0.75	0.956**
	TE	0.232	-0.213	0.348	-0.029

* Significant at *P* < 0.05; ** Significant at *P* < 0.01
- (CA) cognitive anxiety; (SA) somatic anxiety; (SC) self-confidence; (CR) concentration; (PERF) performance; (HR) heart rate; (TE) time of exercise.

Correlation between the psychological and physical variables in all condition showed a significant relation at ($P<0.01$), between the performance (PERF) and concentration.

DISCUSSION

The purpose of the present study was to examine the relationship between precompetitive anxiety, concentration and gymnast' performance at two times of assessment. The interest findings of this study were that gymnasts showed greater precompetitive somatic and cognitive anxiety levels in CC than in TC, whereas self-confidence and concentration scores were decreased.

Comparing the scores of cognitive and somatic anxiety according to previous study, our finding was in line with what Esfahani and Gheze Soflu (2010) reported. So, they found that female volleyball players had higher mean scores in cognitive anxiety 21.86 and somatic anxiety 19.38 subscales. As well, Pineda-Espejel, López-Walle, Rodríguez, Villanueva and Gurrola (2013) showed that Women exhibited significantly higher somatic anxiety levels than men. Furthermore, we noted that gymnast reveal higher cognitive anxiety and lower self-confidence in CC. Accordingly, the results obtained by Vosloo, Ostrow and Watson (2009), were similar to our findings. They reported that the swimmers women exhibited higher levels of somatic anxiety and lower levels of self-confidence than the men. This negative relationship has been empirically demonstrated by the findings of Craft, Magyar, Becker, and Feltz (2003) and Besharat and Pourbohlool (2011). Whereas, Pineda-Espejel et al. (2013) showed that gymnasts exhibited higher self-confidence and lower cognitive anxiety in the competitive situation.

As for the effect the type of sport has on anxiety, Martens, Vealey, and Burton (1990) propose that athletes in individual sports who are subjectively judged in competition exhibit more intense symptoms of cognitive anxiety and lower self-

confidence. Peares (2007) reported that activity level (professional or amateur); type of sport (individual or group-based) as well as activity history and experience are of important and effective factors influencing pre-competition anxiety (Peares, 2007). Gualberto and Wiggins (2008) believes that those athletes who experience higher levels of competitive anxiety would experience early burnout in their sport field and this factor causes stress due to expressing bad performance by the athlete.

The results showed as well that there is a significant correlation between concentration and performance in both conditions. Hence, the higher levels of anxiety were associated with less of concentration and performance during the CC. The effect of anxiety on concentration supported previous research conducted by Hatfield and Hillman (2001), quality performance associated with elite competition is typified by efficient attentional functioning. Shinke and Costa (2001) who investigated the causes of failure in athletes and reasons of weak performance in important competitions reported that lack of experience in these competitions and lack of concentration and sufficient self- confidence are of the most important factors which decrease performance and create unusual behaviors and states in athletes (Shinke & Costa, 2001). When athletes, even elite ones, experience increased anxiety, they often perform less than optimally. Processing efficiency theory (PET) provides an explanation of how heightened levels of anxiety may affect attention and subsequent motor performance. Sport psychology researchers have postulated that excessive anxiety disrupts attentional functioning, and numerous investigations of this hypothesis have offered unequivocal support for their contention (Janelle, 2002). However, others researches contend that the influence of difference effect of anxiety and performance has been proposed to describe how cognitive anxiety, self-confidence and somatic anxiety interact to influence performance (Gould & Krane, 1992; Fazey

& Hardy, 1988; Hardy, 1990). The results of various researches indicate that different factors are involved in pre-competition anxiety. Miyamoto, Morya, Bertolassi, and Ranvaud (2007). and McNally (2002) believe that competitive anxiety and stress in important competitions as well as delicate performances performed with numerous audiences weaken the performance (Hanton, & Connaughton, 2002 : McNally, 2002). The results of findings of Pigozzi, Spataro, Alabiso, Parisi, and Rizzo (2004) confirmed that an athlete's skill level is an important factor in controlling his/her competitive stresses and he believes that elite athletes who are able to control their competitive anxiety through mental skills (such as imagination, feeling control), have good motivation and self-confidence, but amateur athletes with high anxiety experience weak performance in competitions (Pigozzi et al. 2004). One possible alternate explanation for our results is that our gymnasts did not follow any mental and psychological preparation by a specialist or coach before the competition.

Once the difference of stress level was confirmed, the next step was to analyze the change in the physical variables between two conditions. Then, exercise's time and heart rate were increased while performance was decreased on CC compared to TC. Therefore, the findings indicated that anxiety influenced on HR and time's control of the exercise .This timeout requires gymnasts to end their sequence without music which influenced accordingly on their performance. This decrease is due to negative effect of anxiety which disrupts gymnast in the control of maces and result in gymnast's penalty. Accordingly, several studies focused on abnormalities of HR and anxiety disorders (Friedman, 2007) while this study assessed the relationship of HR to precompetitive state anxiety. From a psychophysiological point of view, authors like Lane, Adock & Burnett (1992) and Berntson et al. (1997) agrees that heart rate is sensitive to changes in emotional state. Accordingly, the significant decrease of the HR in the competition condition is related to

the inhibition of the parasympathetic activity in stress situations, in our case, under the impact of the competitive situation. In agreement with other authors, a predominance of sympathetic activity over parasympathetic activity is expected to be found in stress situations like sports competitions (Iellamo, Pigozzi, Spataro, Lucini, & Pagani, 2004; Kamath et al., 1991).

CONCLUSION

In summary, this study emphasizes the importance of examining the effect of competitive anxiety on the concentration and the performance evidenced through two different time of assessment. So, the interest findings of this study was that somatic and cognitive anxiety increase during the CC compared to TC However the self-confidence and concentration were decreased. Concerning the physical data, the heart rate (HR) and time exercise were increased while the performance was decreased in the competition compared to training condition. Accordingly, the importance of collecting information on how anxiety changes during the competition appears fundamental to explain how such anxiety may influence athletic performance. As well, it seems that the lack of mental preparation would have negative effects on athletes' performance and also would modify and increase their anxiety before competition. As a result, we recommend that the coaches should keep up related strategies in training sessions in order to control and modify the tension and anxiety before competition in a planned and regular method.

REFERENCES

Berntson, G. G., Bigger, JR, J. T., Eckberg, D. L., Grossman, P., Kaufman, P.G., Malik, M., et al. (1997). Heart rate variability: Origins, methods and interpretative caveats. *Psychophysiology,* 34, 623-648.

Besharat, M. A. & Pourbohlood, S. (2011). Moderating effects of self-confidence and sport self-efficacy on the relationship between competitive anxiety and sport performance. *Psychology*, 2, 760-765.

Borkovec, T. D. (1967). Physiological and cognitive processus in the regulation of anxiety. In G.E. Schwartz & D. Shapiro (Eds). *Consciousness and self regulation: Advances in research (Vol. 1).* New York: Plenum.

Bulter, R. J. (1996). *Sports psychology in action.* Oxford, UK: Butterworth-Heinemann.

Burton, D. (1988). Do anxious swimmers swim slower? Reexamining the elusive anxiety-performance relationship. *Journal of Sport and Exercise Psychology*, 10, 45-61.

Craft, L., Magyar, T., Becker, B. & Feltz, D. (2003). The relationship between the Competitive State Anxiety Inventory-2 and sport performance: A meta-analysis. *Journal of Sport and Exercise Psychology*, 25, 44-65.

Davidson, R. J., & Schwartz, G. E. (1976). The psychobiology of relaxation and related states. A multiprocess theory. In D.E. Mostofsky (Ed.). *Behavior Control and Modification of Physiological Activity.* Prentice-Hall, Englewood Cliffs, N.J.

Eric, T., & Kring, J. (1996). Anxiety and self-confidance in relation to individual and team sport. *Psi J. Undergraduate Res.*, 1*(1-2)*: 33-35.

Esfahani, N., & Gheze Soflu, H. (2010).The Comparison of Pre-Competition Anxiety and State Anger between Female and Male Volleyball Players .*World Journal of Sport Sciences,* 3(4): 237-242.

Fazey, J. & Hardy, L. (1988). The Inverted-U Hypothesis: Catastrophe for Sport Psychology. *British Association of Sports Sciences Monograph No. 1.* Leeds: The National Coaching Foundation.

Fédération Internationale de Gymnastique, FIG. (2009). *Code of points, Rhytmic Gymnastics.* F.I.G (Eds.), Switzerland. http://www.fig-gymnastics.com

Friedman, B. H. (2007). An autonomic flexibility-neurovisceral integration model of anxiety and cardiac vagal tone. *Biological Psychology*, 74, 185-199.

Gould, D., & Krane, V. (1992). The arousal-athletic performance relationship: Current status and future directions. InT. Horn (Ed.), *Advances in sport psychology* (pp. 119-141). Champaign, IL: Human Kinetics.

Gould, D., Petlichkoff, L., & Weinberg, R. (1984). Antecedents of, temporal changes in, and relationships between CSAI-2 subcomponents. *Journal of Sport Psychology*, 6, 289-304.

Gould, D., Petlichkoff, L., & Weinberg, R. S. (1984). Antecedents of, temporal changes in, and relationships between CSAI-2 subcomponents. *Journal of Sport Psychology*, 6, 289- 304.

Gualberto, C. J., & Wiggins, M. S. (2008). Direction and intensity of trait anxiety as predictors of burn out among collegiate athletes. *Journal of Sport Psychology*. Murray State University.

Hanton, S., & Connaughton, D. (2002). Perceived control of anxiety and its relationship to self-confidence and performance. *Research Quarterly for Exercise and Sport,* 73, 87–97.

Hanton, S., Jones, G., & Mullen, R. (2000). Intensity and direction of competitive state anxiety as interpreted by rugby players and rifle shooters. *Perceptual and Motor Skills,* 90, 513-521.

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 training condition 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.

Harris, D.V., and Harris, B.L. (1984). *The athlete's guide to sport psychology: mental skills for physical people.* Champaign, IL: Leisure Press.

Iellamo, F., Pigozzi, F., Spataro, A., Lucini, D., & Pagani, M. (2004). Twave and heart rate variability changes to assess training in world-class athletes. *Medicine and Science in Sports and Exercise*, 36, 1342-1346.

Janelle, C. M. (2002). Anxiety, arousal and visual attention: A mechanistic account of performance variability. *Journal of Sports Sciences,* 20, 237–251.

Jones, G., & Hardy, L. (1990). *Stress and performance in sport.* Chichester, UK: Wiley (Eds.), (pp. 81-106).

Jones, G., & Swain, A. (1992). Intensity and direction as dimensions of competitive state anxiety and relationships with competitiveness. *Perceptual and Motor Skills,* 74, 467-472.

Jones, G., & Swain, A. B. J. (1995). Predispositions to experience debilitative and facilitative anxiety in elite and non-elite performers. *The Sport Psychologist,* 9, 202–212.

Kamath, E. L., Fallen, E., Dixon, N., McCartney, G., Mishker, J. P., & Reilly, D. (1991). Clinical applications of heart rate variability power spectra. Annual International Conference of the *IEEE Engineering in Medicine and Biology Society,* 13, 656-657.

Liebert, R. M., & Morris, L. W. (1967). Cognitive and emotional components of training condition anxiety. *Psychological Reports*, 20, 975-978.

Martens, R., Burton. D., Vealey, R. S., Bump, L. A., & Smith, D. E. (1990). Development validation of the Competitive State Anxiety Inventory- 2. In R. Martens, R. S., Vealey & D. Burton (Eds.), *Competitive anxiety in sport* (pp. 117–190). Champaign, IL: Human Kinetics.

Martens, R., Vealey, R., & Burton, D. (1990). *Competitive anxiety in sport.* Champaign, IL, United States: Human Kinetics Publishers.

McNally, I. M. (2002). Contrasting Concepts of Competitive State-Anxiety in Sport. *J. Sport Psychol.*, 4: 2-4.

Miyamoto, N., Morya, E., Bertolassi, M., & Ranvaud, R. (2007). Penalty kicks and stress. *Journal of Sports Science and Medicine*, Suppl. 10.

Neil, R., Mellalieu, S.D., & Hanton, S. (2006). Psychological skills usage and the competitive anxiety response as a function of skill level in rugby union. *Journal of Sports Science and Medicine,* 5, 415-423.

Parfitt, G., & Pates, J. (1999). The effect of cognitive and somatic anxiety and self confidence on components of performance during competition. *Journal of Sports Science,* 17, 351-356.

Pears, D. (2007). Cognitive component of competitive state anxiety in semi professional soccer: A case study. *J. Sports Sci. Med. Suppl.*, 6(10): 153-154.

Peper, E., & Schmid, A. B. (1993). The use of electrodermal biofeedback for peak performance training. *Somatics*, 4(3), 16-18.

Pigozzi, F., Spataro, A., Alabiso, A., Parisi, A., & Rizzo, M. (2004). Role of exercise stress test in master athletes. *Br J. Sports Med.*, 39: 527-531.

Pineda-Espejel, A., López-Walle, J., Rodríguez, J. T., Villanueva, M.M., & Gurrola, O.C. (2013). Pre-competitive anxiety and self-confidence in pan American gymnasts. *Science of Gymnastics Journal*, 5(1): 39 – 48.

Shapiro, K L., & Lim, A. (1989). The impact of anxiety on visual attention to central and peripheral events. *Behavior, Research and Therapy,* 27, 345-351.

Shinke, R., & Costa, J. L. (2001). A plausible relationship between support infrastructure and major games performance. *Athletic insight*, 13: 2. Available On-Line at: http://www.athleticinsight.com/Vol3Iss2/SupportPDF.pdf

Smith, N.C., Bellamy, M., Collins, D. J., & Newell, D. (2001). A training condition of processing efficiency theory in a team sport context. *Journal of Sports Sciences*, 19, 321-332.

Swain, A. B. J., & Jones, G. (1993). Intensity and frequency dimensions of competitive state anxiety. *Journal of Sport Sciences,* 11, 533-542.

Vosloo, J., Ostrow, A., & Watson, J. C. (2009). The relationships between motivational climate, goal orientations, anxiety, and self-confidence among swimmers. *Journal of Sport Behavior*, 32(3): 376-393.

Woodman, T., & Hardy, L. (2001). Stress and anxiety. In R. Singer, H. A. Hausenblas, & C. M. Janelle (Eds.), *The handbook of sport psychology* (pp. 290–318). New York: Wiley.

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