COMPETITIVE STATE ANXIETY AND PERFORMANCE IN YOUNG MALE ARTISTIC GYMNASTS

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Original article

Abstract

The purpose of this study was to investigate the competitive state anxiety and self-confidence on artistic gymnasts participating in the Greek national competition. 84 gymnasts, aged 9 – 11 years, completed the Competitive State Anxiety Inventory-2, one hour before the competition. The gymnasts, based on the total score they have received in all-around competition were divided into high and low performance, responded to the three subscales: Cognitive Anxiety, Somatic Anxiety, and Self-confidence. Results showed that there was significant difference in Self-confidence between high performance and low performance gymnasts. However, no significant differences were found in cognitive anxiety and somatic anxiety in these gymnasts. The Pearson coefficient revealed statistically significant between cognitive and somatic anxiety. The regression analysis failed to reveal any significant predictor of performance in these young male artistic gymnasts. The findings of the study underline the importance of examining competitive state anxiety and self-confidence in young male artistic gymnasts, mainly developing strategies to improve self-confidence to enable the athletes to better prepare for forthcoming competitions.

Keywords: *anxiety, self-confidence, performance, gymnastics.*

INTRODUCTION

The anxiety occurs in athletes prior to the competition due to the concerns related to the competition and expresses the interpretation of psychological arousal (Hardy, Jones & Gould, 1996). As Abdoli (2008) reported, anxiety is the negative state accompanied by feelings of nervousness, discomfort and uneasiness that are along with somatic activity or motivation. In these cases, there is a decrease in performance relative to the amount of training experienced by athletes (Weinberg & Gould, 1995). Subsequently, state anxiety that is one dimension of anxiety, is generally regarded as an unpleasant emotional reaction related to stressful situations, in which the arousal component is one inherent element

(Woodman & Hardy, 2011) and described as varying from moment-to-moment and fluctuating proportionately to the perceived threat in a situation (Spielberger, 1966). Various theoretical models have been developed to describe the anxiety for sport competitions (Craft, Magyar, Becker & Feltz, 2003). The Yerkes and Dodson theoretical model, based on the inverted-U hypothesis, stated that there is a curvilinear relationship between physiological arousal and performance (Yerkes & Dodson, 1908). Lower levels of performance occur when levels of arousal are too high or too low, while higher levels of performance are observed with moderate levels of arousal (Craft et al, 2003). The other theoretical models are the catastrophe model (Hardy, Jones & Gould, 1996), the zones of optimal functioning (Hanin, 1986), and the multidimensional anxiety theory (Martens, Vealey & Burton, 1990). Martens and colleagues (Martens, Vealey, Burton, Bump, and Smith, 1990) developed the Competitive State Anxiety Inventory-2 (CSAI-2) to measure the intensity of performers' cognitive and somatic responses, and also self-confidence. Martens, Vealey and Burton (1990) believe that cognitive anxiety is the cognitive dimension of anxiety and is created by the negative expectations of the individual for performance and success while somatic state anxiety is the result of activation of the autonomic nervous system and is the natural dimension of anxiety.

Martens and colleagues (1990) suggested that both lower and higher levels of somatic anxiety would be detrimental to performance. In multidimensional anxiety theory Hardy, Woodman and Carrington. (2004) support the negative linear relation between cognitive components with fulfillment because it deals with results of defeat while the somatic component has reverse U relation with fulfillment. One of the characteristics that distinguish high-level athletes and/or successful athletes is self-confidence, which is a key feature that states whether athletes believe in themselves and their strengths and whether they can achieve their goals (Vealey, 1986). Self-confidence that states the occasional or transient confidence of a person in his ability to successfully perform a desired task (Psychountaki, 1998) has been shown to protect athletes from the effects of stressful thoughts during competition (Hanton, Mellalieu & Hall, 2004). Furthermore, as Roberts et al. (2004) stated Self-confidence has linear direction with fulfillment, because it is in contrast with cognitive anxiety.

In artistic gymnastics (AG), athletes may feel stressed by performance requirements, (Cottyn, De Clercq, Pannier, Crombez & Lenoir 2006), and the subjective scoring system according to the rules of FIG (2016). During the competition, athletes are possessed by different emotions that may affect their performance (Williams & Krane, 2001). Data by Jones, Swain, and Hardy's. (1993) compared female artistic gymnasts who were divided into good and poor performance groups based on their beam competition scores and found that the more successful gymnasts experienced greater facilitative interpretations of their cognitive and somatic anxiety symptoms than their less successful counterparts. In another study, Pineda-Espejel, Lopez-Walle, Rodriguez, Villanueav and Gurrola. (2013) investigated the pre-competitive anxiety and self-confidence in 60 male and female artistic gymnasts during Pan American Games and found a linear correlation between cognitive and somatic anxiety and that self-confidence was negatively correlated with the intensity of cognitive anxiety.

Other studies indicate that the status of athletes and their future performance can be influenced by various psychological features (McNamara, Button & Collins. 2010) such as anxiety, and self-confidence, motivation (Durnad-Bush & Salmela, 2001; Gould et al, 2002). Status anxiety expresses the subjective feelings of fear,

nervousness and anxiety of the person in a transient, transient state (Martens, Burton, Nealey, Bump & Smith, 1983) and is distinguished in cognitive and somatic. There is a lack of scientific data concerning the psychological characteristics that predispose the outcome of the competition of young male gymnasts, especially in 9 - 11 years, noting that this age is considered by experts to be crucial for the future development of athletes (Smolefski & Gaverdofski, 1999). Furthermore, the fact that boys are less attentive and more agitated (Steindl et al, 2006) is another factor that may be affect the psychological characteristics of sport performance. However, there is lack of scientific data concerning the competitive state anxiety and self-confidence of young gymnasts. So, the aim of the present study was to investigate the competitive state anxiety and self-confidence of young male artistic gymnasts in Greece. More specifically, differences were examined between male artistic gymnasts with high and low scores. In addition, inter-correlations among the three CSAI-2 subscales and performance, and prediction of the gymnast's performance score from the three subscales, were examined. It was hypothesized that gymnast with higher performances score would have lower mean Cognitive and Somatic Anxiety and higher mean Self-confidence compared to gymnasts with lower mean performance scores.

METHODS

84 competitive young male artistic gymnasts, ages 9 – 11 years (M = 9.66 yr., SD = 0.71) belonging on different clubs affiliated with the Greek Gymnastics Federation were participated in the present study. Their training and competitive experience ranged from 3 to 6 and 3 to 4 years, respectively. According to the technical guidelines of the Greek Gymnastic Federation, gymnasts may compete from very young ages in official national competition. This result to acquire competitive experience from the age of 8 years old which lead these gymnasts to be prepared their selves in a better way for the following competition. Sixteen of the gymnasts did not compete in all of the apparatus (floor exercise, pommel horse, rings, vaulting, parallel bars, and high bar) and their data were therefore excluded for further statistical analysis.

All participants belong on the same age category group and were competed in the same routines according to the Hellenic Federation of Gymnastics. These routines were evaluated based on the Code of Points of Federation International Gymnastics – FIG (2016). The points earned, according to the criteria used by the judges and the scoring system of the code of point used by the IGF, provided solid evidence of their performance. Accordingly, performance was separated, using the split half method (Scordilis, Douka, Spartali & Koutsouki, 2004; Takei & Dunn, 1996), in the high performance and low performance groups. The goal was to examine the differences of the two performance groups in cognitive anxiety, somatic anxiety and self-confidence.

The present study was concerned with pre-competitive state anxiety of gymnasts and for this reason the CSAI-2 for children questionnaire (Martens, et al., 1990), modified by the laboratory of athletic psychology and motor behavior (Kakkos & Zervas, 1993; Stavrou & Zervas, 2005), was used. A standardized administration procedure was used, following similar studies in the past (Tsopani, et al, 2011). The questionnaires were given one hour before the start of the competition (including the time for warm-up). There was a briefing from the coaches first and their permission was requested. An explanation was given to the athletes, who responded accordingly. The primary researcher was present during the data collection and provided clarifications to

the respondents. The administration process lasted 5-10 minutes approximately.

The questionnaire (CSAI-2) incorporates 15 questions in which the participants evaluated on a 4-point scale the extent of their agreement using anchors of 1: Not at all and 4: Very much so (see appendix A). This questionnaire is used in sports to examine the three subclasses of cognitive anxiety, somatic anxiety and self-confidence. Each of the three subscales incorporates 5 questions; higher scores indicate greater Cognitive and Somatic anxiety or Self-confidence (Martens, et al, 1990).

The Statistical Package for the Social Sciences (Norusis, 1993) was used for the analysis. The sample was separated into two groups (Hardy, Woodman, & Carrington, 2004; Skordilis, Douka, Spartali & Koutsouki, 2004; Takei & Dunn, 1996) according to the median split of their respective all-around competition scores, as either high or low. Accordingly, the multivariate and Univariate differences were examined with Bonferroni adjustments between high-and low-score groups, on the three CSAI-2 subscales (Cognitive Anxiety, Somatic Anxiety, and Self-Confidence). Further, the intercorrelation matrix was examined to detect sources of multicollinearity among the three independent variables. The independent variables were the three CSAI-2 subscales scores, whereas the dependent variable was the score that received during competition by the judge panel (FIG, 2016).

RESULTS

The responses for all gymnasts on the three CSAI-2 subscales and their respective gymnastics scores are presented in table 1.

Table 1
Means and standard deviations for all gymnasts on CSAI-2 subscales of Cognitive Anxiety, Somatic Anxiety, and Self Confidence and by gymnastics scores (n = 68).

Variable	M	SD	n
Gymnastic score	43.74	9.73	68
CSAI-2			
Cognitive Anxiety	2.03	0.49	68
Somatic Anxiety	2.02	0.77	68
Self-Confidence	3.07	0.54	68
CSAI-2 High scoring			
Cognitive Anxiety	2.12	0.47	34
Somatic Anxiety	1.91	0.70	34
Self-Confidence	3.23	0.29	34
CSAI-2 Low scoring			
Cognitive Anxiety	1.96	0.52	34
Somatic Anxiety	2.13	0.84	34
Self-Confidence	2.92	0.68	34

Table 2
Intercorrelation matrix of athletes' gymnastics scores and responses to CDAI-2 subscales of Cognitive anxiety, Somatic anxiety, and Self-confidence (n = 68).

Variable	1	2	3	4
1. Gymnastics score	1.000	-.038	-.165	.223
2. Cognitive anxiety	-.038	1.000	.363**	.138
3. Somatic anxiety	-.165	.363**	1.000	.069
4. Self-confidence	.223	.138	.069	1.000

The multivariate analysis revealed a significant main effect for the high and low scoring groups (Λ =.854, $F_{(3,64)}$ = 3.654, p = .017, η^2 = .143) on the three subscales. The univariate follow up analysis with Bonferroni adjustments showed no significant differences between the two groups on Cognitive Anxiety ($F_{(1,60)}$ = 1.497, p = .226, η^2 = .022) and Somatic Anxiety ($F_{(1,60)}$ = 1.491, p = .226, η^2 = .022). However, significant univariate findings were evident for Self-Confidence ($F_{(1,60)}$ = 6.052, p = .017, η^2 = .084) and the high scoring performance group had a significant higher mean Self-Confidence than the low performance group. The Pearson coefficient did not reveal any significant inter-correlations between performance score and the responses in the three subscales. Therefore, no multiple regression analysis was conducted and the overall inter-correlation matrix is presented in table 2.

DISCUSION

The present study intended to examine the competitive state anxiety and Self-confidence on young male artistic gymnasts ages 9 – 11 years old participating in the Greek national competition. The aim of this study was to extend the scientific data concerning the relationship between competitive state anxiety, Self-confidence, and gymnastics performance (score) of male artistic gymnasts. The results revealed that there were no significant differences between high score and low score groups concerning the Cognitive Anxiety and Somatic Anxiety**.** This finding reinforces previous data of Tsopani, Dallas and Scordilis (2011), and those of Bejek and Hagtvet (1996) who examined female rhythmic gymnasts and female gymnasts, respectively. In addition, verify findings by Hanton and Jones (1997) who reported non-statistically significant differences between high- and low-level athletes on cognitive and somatic anxiety. In terms of cognitive anxiety and gymnastics score the absence of statistically significant intercorrelation support partially previous data (Burton, 1988; Gould, et al, 1984; Martens, et al, 1990) who stated a negative linear relation between Cognitive Anxiety and performance but are in contrast with those of Tsopani, et al. (2011). Nevertheless, it must be emphasized the significant intercorrelation between cognitive and somatic anxiety which means that performance of young male artistic gymnasts seems to be affected by these anxiety subscales.

With respect to Self-Confidence a significant difference between high and low scoring groups was found as higher self-confidence was associated with higher performance (Kais & Raudsepp, 2004). This finding is in congruence with those of Tsopani and colleagues. (2011) who reported significant differences in Self-Confidence between finalists (high performance group) and non-finalist (lower performance group) of female rhythmic

gymnasts and those of Bejek and Hagtvet. (1996) who found a significant difference in Self-Confidence between elite and non-elite athletes. In addition, our results verify data by Vealy who considered that self-confidence is an important factor that distinguish high-level athletes and/or successful athletes (Vealey, 1986). The no statistical correlation between self-confidence and somatic anxiety confirm previous data of Pineda-Espejel and colleagues. (2013) who found that self-confidence did not correlate statistically significantly with somatic anxiety. However, opposed to the other studies (Jones, Swain, and Hardy, 1993; Kais & Raudsepp, 2004; Tsopani, et al, 2011). It is hypothesized that Self-Confidence has a positive linear relation with athletic performance upon the multidimensional anxiety theory of Martens et al. (1990). The fact that Self-Confidence did not significantly correlate with gymnastics score is in line with findings by Cottyn et al. (2006) who revealed no statistically significant intercorrelation between self-confidence and gymnastics score. However, results of the present study are in contrast to those of previous studies (Jones et al, 1993; Tsopani et al, 2011) who revealed a statistical significant intercorrelation between self-confidence and performance score, and those of Kais and Raudsepp. (2004) who reported a significant negative intercorrelation between Cognitive anxiety and Self-confidence.

The present study failed to support any significant predictor of performance a finding that opposed of Tsopani et al. (2011) data who examined female rhythmic gymnasts. However, results of the present study should be applied with some caution. First, the competitive state anxiety was evaluated with a paper-and-pencil questionnaire, without retrospective assessment of relevant attributes, such as heart rate (Cottyn et al, 2006). Second, anxiety was measured one hour prior to competition. Finally, only young male artistic gymnasts were assessed, ages 9 to 11 years, and the results may not be generalized to other age groups or on female gymnasts or other sports (e.g., team sports; Stavrou, et al, 2006). Further research is required to refer to other individual sports with male athletes of the same age in order to form a wider database with competitive state anxiety norms or to evaluate pre-competitive anxiety by heart rate monitoring during the various phases of the warm-up prior to competition. The results of our work are practical in terms of pre-competitive mental preparation strategies of male artistic gymnasts. Sport psychologists should take into account that cognitive and physical anxiety does not always seem to adversely affect performance. In addition, Jones et al. (1993) has shown that cognitive techniques that include redefinition of stress symptoms as complications and facilities can be as effective as trying to reduce symptom intensity through various relaxation strategies.

CONCLUSIONS

The findings of the study underline the importance of examining competitive state anxiety and self-confidence in young male artistic gymnasts, mainly developing strategies to improve self-confidence to enable the athletes to better prepare for forthcoming competitions.

REFERENCES

Abdoli, B. 2006. Psychical-social principles of physical exercise and sports, Bamdad book, pp. 71-91.

Bejek, K. & Hagtvet, K. (1996). The content of pre-competitive state anxiety in top and lower level of female gymnasts. *Anxiety, Stress, and Coping*, *9,* 19-31.

Burton, D. (1988). Do anxious swimmers swim slower? Reexamining the elusive anxiety-performance relationship.

Journal of Sport & Exercise Psychology, *10*, 45-61.

Cottyn, J., De Clerqo, D., Pannier, J-L., Crombez, G., & Lenoir, M. (2006). The measurement of competitive anxiety during balance beam performance in gymnasts, *Journal of Sport Science*, *24,* 157-164.

Craft, L.L., Magyar, T.M., Becker, B.J., & Feltz, D.L. (2003). The Relationship Between The Competitive State Anxiety İnventory-2 And Sport Performance: A Meta-Analysis. *Journal of Sport & Exercise Psychology*, *25*(1), 44-65.

Durand-Bush, N., & Salmela, J. H. (2001). Becoming a world or Olympic Champion: A process rather than an end result. In A. Papaioannou, M. Goudas, & Y. Theodorakis (Eds.), *In the dawn of the new millennium: 10th World Congress of Sport Psychology* (Vol. 2, pp. 300-302). Skiathos, Greece: Christodoulidi.

Federation International of Gymnastics. (2016). *Technical committee of rhythmic gymnastics: the code of points.* Lucerne, Switzerland: Raeber.

Gould, D., Dieffenbach, K., & Moffatt, A. (2002). Psychological characteristics and their development in Olympic champions. *Journal of Applied Sport Psychology*, *14,* 172-294.

Hanin, Y.L. (1986). State-trait anxiety research on sports in the USSR. In C.D. Spielberg & R. Diaz (Eds.), *Cross-Cultural anxiety*. Washington, DC: Hemisphere. Pp. 45-56.

Hanton, S. & Jones, G. (1997). Antecedents of competitive state anxiety as a function of skill level. *Psychological Reports, 81*, 1139-1147.

Hanton, S., Mellalieu, S.D., & Hall, R. (2004). Self-confidence and anxiety interpretation: A qualitative investigation. *Psychology of Sport and Exercise*, *5*(4), 477-495.

Hardy, L., Jones, G., and Gould, D. (1996). Understanding phschological preparation in sport: theory and practice of elite performers. Chishester, UK: Wiley.

Hardy, L., Woodman, T., & Carrington, S. (2004). Is self-confidence a bias factor in higher-order catastrophe models? An exploratory analysis. *Journal of Sport and Exercise Psychology, 26*, 359-368.

Jones, G., Swain, A.B.J., & Hardy, L. (1993). Intensity and direction dimensions of competitive state anxiety and relationships with performance. *Journal of Sports Sciences*, 11, 533-542.

Kakkos, V. & Zervas, Y. (20013). Competitive worries and self-confidence as predictors of the precompetitive-emotional state. In *Proceedings of the 8th Worlth Congress of Sport Psychology* (pp. 855-859). Lisbon, Portugal.

Kais, K., & Raudsepp, L. (2004). Cognitive and somatic anxiety and self-confidence in athletic performance of beach volleyball. *Perceptual and Motor Skills*, *98*, 439-449.

Martens, R., Burton, D., Nealey, R.S., Bump, L.A., & Smith, D.E. (1983). Development and validation of the Competitive State Anxiety Inventory II (SCAI-II). In RE. Martens, R.S. Vealey & D. Burton (Eds.), *Competitive Anxiety in Sport* (pp. 117-173). Champaign, IL: Human Kinetics.

Martens, R., Burton, D., Vealey, R. S., Bump, L., and Smith, D. E. (1990). Development and validation of the Competitive State Anxiety Inventory-2 (CSAI-2). In R. Martens, R.S. Vealey, and D. Burton (Eds.), *Competitive anxiety in sport* (pp. 117-213). Champaign, IL: Human Kinetics.

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

McNamara, A., Button, A., & Collins, D. (2010). The role of psychological characteristics in facilitating the pathway to elite performance. *The Sport Psychologist*, *24*, 52-73.

Norusis, M.J. (1993). *SpPSS for Windows: advanced statistics release* 6.0. Chicago, IL: SPSS.

Pineda-Espejel, A., Lopez-Walle, J., Rodriguez, J.T., Villanueav, M.M., & Gurrola, O.S. (2013). Pre-Competitive Anxiety and Self-Confidence in Pan American Gymnasts. *Science if Gymnastics Journal*, *5*(1), 39-48.

Psychountaki, M. (1998). *Self-confidence: a conceptual model of studying the performance of young athletes.* (Unpublished Doctoral dissertation, Department of Physical education and Sport Science-National and Kapodistrian University of Athens).

Roberts, G., Covin, S., & Sinthial, P. (2004). Sports psychology education, Vaez Mussavi and Masoumech Shojaee, Roshed, pp. 114-126.

Skordilis, E.K., Douka, A., Spartali, I., & Koutsouki, D. (2004). Depth perception of elementary school students with qualitatively evidenced locomotor impairments. *Perceptual and Motor Skills*, *99*, 501-518.

Smolefski, B. M., & Gaverdofski, G. K. (1999). *Sportivnaia Gimnastika*. Kiev: Olympic Literature.

Spielberger, C. D. (1966). Theory and research on anxiety. In C. D. Spielberger (Ed.), *Anxiety and behavior* (pp. 3-20). New York: Academic Press.

Staurou, N. & Zarvas, Y. (2005). Examining the flow theory with reference to the multidimensional anxiety theory and sport performance. *Proceedings of the 11th International Congress of Sport Psychology*, Sydney, Australia.

Stavrou, N., Psychountaki, M., & Zervas, Y. (2006). Intensity and direction dimensions of competitive state anxiety: a time-to-event approach. *Perceptual and Motor Skills*, *103*, 91-98.

Steindl, R., Kunz, K., Schrott-Fischer, A., & Scholtz, A.W. (2006). Effect of age and sex on maturation of sensory systems and balance control. *Developmental Medicine and Child Neurology, 48*(6), 477-482.

Takei, Y. & Dunn, HJ.H. (1996). A comparison of techniques used by elite gymnasts in performing the basket-to-handstand mount. *Journal of Sport Sciences*, *14*, 269-279.

Tsopani, D., Dallas, G., & Skordilis, E. (2011), Competitive state anxiety and performance in young male artistic gymnasts. *Perceptual and Motor Skills*, *112*(2), 549-560.

Vealey, R. (1986). Conceptualization of sport-confidence and competitive orientation: preliminary investigation and instrument development. *Journal of Sport Psychology*, *8*, 221-246.

Williams, J., & Krane, V. (2001). Psychological characteristics of peak performance. In J.M. Williams (Eds). *Applied Sport Psychology. Personal growth to peak performance* (4th ED., PP. 162-178). Mountain View, CA: May-field.

Weinberg, R.S., & Gould, D. (1995). Arousal, stress, and anxiety. In R.S. Weinberg & D. Gould (Eds.), *Foundations of sport and exercise psychology* (pp. 91-113). Champaign, IL: Human Kinetics.

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

Yerkes, R.M., & Dodson, J.D. (1908). The relation of strength of stimulus to rapidity of habit formation. *Journal of Comparative and Neurological Psychology*, *18*, 459-482.

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