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PRE-COMPETITION AND TRAINING ANXIETY AMONG ATHLETES PRACTISING GYMNASTIC DISCIPLINES

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- A. Study design/planning
- B. Data collection/entry
- C. Data analysis/statistics
- D. Data interpretation
- E. Preparation of manuscript
- F. Literature analysis/search
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Abstract:

Introduction: The gymnastic disciplines abound in difficult and risky technical elements. Excessive anxiety is a factor which can have a destructive effect on the athlete both at the stage of motor learning, as well as when performing during competitions. Anxiety is a natural human emotion, but whether it has positive or negative influence on an individual's performance clearly depends upon its level.

Aim of the study: The study aimed to determine the level of anxiety (as state, cognitive anxiety and somatic anxiety) among male and female gymnasts in situations before starting competitions and before training when mastering new, difficult elements. The following research questions were formulated:

- Does the level of anxiety in the participants during learning new elements differ from the level of anxiety before starting to compete?
- Does the level of somatic anxiety in the gymnasts during learning new elements differ from the level of anxiety before starting to compete?
- Does the level of cognitive anxiety in the gymnasts during learning new elements differ from the level of anxiety before starting to compete?
- What is the level of trait anxiety characteristic of the participating gymnasts?

Material and method: Twenty eight people were assessed (14 women and 14 men) who professionally practice gymnastic disciplines. The average age of respondents was 18 years. All subjects were competing at championship level and had been practicing their sport for a minimum of 10 years. The Spielberger's self-evaluation questionnaire (State-Trait-Anxiety Inventory, STAI) and the Smith's, Smoll's, Schutz's Reaction to Competing Questionnaire (The Sport Anxiety Scale, SAS), as adapted to Polish by Krawczyński, were used in the research.

Results: By adopting the criterion of statistical difference $p \leq 0.05$ it was proven that there are statistically significant differences between the level of anxiety before training and before competition: state anxiety ($p=0.033$), somatic anxiety ($p=0.004$), and cognitive anxiety – attentions disorders ($p=0.011$). When analysing the average values of the participants, it was noted that they are characterised by an average trait anxiety level.

Conclusion: The participating athletes who train in gymnastic disciplines are characterised by an average level of trait anxiety. The gymnasts experience stronger anxiety before competition than during a demanding training session.

Introduction

Gymnastic disciplines are demanding in terms of both the physical and mental preparation of the athletes. The gymnasts are constantly exposed to anxiety-generating situations both when mastering new, demanding elements and during their performance at competitions. Gymnasts often, therefore, have to contend with anxiety when practising their sport.

Anxiety has been defined in various ways. According to Weinberg and Gould, anxiety is a negative emotional state, combined with a “feeling of nervousness, concern and tension related with the physical agitation” [1]. Fear is associated with anticipating a danger which comes from outside or from inside of the organism [2]. Meanwhile, Seligman *et al* view anxiety as a feeling of general uncertainty about an unspecified risk [3]. Anxiety has cognitive and somatic components and may be either a trait or a state [4]. It is a physiological response (on the physiological level, anxiety includes somatic responses such as accelerated heart rate, increased perspiration, etc.), behavioural responses (a reduced capacity to act or to cope with daily duties or difficulties) and psychological responses (a subjective, individual state of concern and distress; it is associated with bad humour, concerns for the future, anticipating future threats) [5, 6]. Too high level of anxiety has a destructive impact on human functioning. This also applies to an athlete’s effectiveness whether during training or competition.

Martnes [7] observed a relationship between cognitive anxiety, somatic anxiety, self-confidence and performance. In his opinion, cognitive anxiety negatively affects an athlete’s performance. Somatic anxiety (also understood as perception of one’s own physiological arousal) may be useful, but only up to a certain level. When it becomes too intense, it also negatively affects performance. Similar observations have been made by Chamberlain and Hale [8], noting that the intensity of cognitive anxiety shows a negative, linear relationship with performance, whereas the intensity of somatic anxiety displays a curvilinear relationship with performance. Cognitive anxiety itself was defined as negative expectations, worries and concerns about oneself, the situation at hand and its potential consequences. An individual experiences concerns, doubts, unpredictable threatening, negative thoughts, fear of failure, and a decline in self-confidence and concentration [9]. The highest levels of both somatic and cognitive anxiety in an athlete are observed immediately before competing. However, somatic anxiety decreases in the moment of starting competition, whereas cognitive anxiety persists until the end of competition. Therefore, it is considered that mistakes made during competition are the consequence of cognitive rather than somatic anxiety [1].

The level of perceived fear depends upon many variables including individual psychological characteristics and the specific situation with which the person must deal. When analysing sources of fear, one should focus on both situational and subjective factors [1]. Thereby we may distinguish anxiety as a trait, which is related with subjective factors and treated as a permanent disposition to react with anxiety to situations perceived as risky. When studying gymnastics athletes, Raglin noticed that the way anxiety itself is perceived affects its intensity, and consequently a gymnast’s success or failure [10]. People with a high level of trait anxiety are cautious towards threatening stimuli, whereas people with a low intensity of a trait anxiety focus on avoiding risk [11]. In addition to trait anxiety, we may also distinguish state anxiety which rises in athletes immediately before competing or when performing difficult skills during a training session. One’s level of state anxiety is variable, dependent upon the specific situation.

Study aim and methods

The aim of the study was to determine the level of anxiety (as state, cognitive and somatic) of male and female gymnasts in pre-performance situations (concerning competitions with high ranking) and during training sessions when mastering new, difficult elements in gymnastic disciplines.

The following research questions were posed:

1. What level of trait anxiety characterises the tested athletes?
2. Does the level of anxiety in the participants during learning new elements differ from the level of anxiety before starting to compete?
3. Does the level of somatic anxiety in the gymnasts during learning new elements differ from the level of anxiety before starting to compete?
4. Does the level of cognitive anxiety in the gymnasts during mastering new elements differ from the level of anxiety before starting to compete?
5. Does the gender of a participant influence the level or type of anxiety?

Study group

The respondents were informed about the purpose of the study, and each of them voluntarily joined the study. Twenty eight individuals were assessed, 14 women and 14 men, competitors in gymnastic disciplines. The men were competitors of sport gymnastics and acrobatics, while the women practised artistic gymnastics, sport gymnastics and acrobatic sports. All the participating athletes were of championship level and had practised the sport for a minimum of 10 years. The average age of respondents was 18 years. The study group included

athletes training in the following sports clubs: AZS AWF Kraków, TS Wisła Kraków, CWZS Zawisza Bydgoszcz, KG Radlin, MKS “Kusy” Szczecin, PTG Sokół Kraków, MKS Gdańsk. Assessments were conducted once before competitions and once during a training session (in a pre-competition period, during which athletes master new elements, and when the respondents had been familiarised with their training objectives).

Research tools

The following tools were used in the study:
Self-evaluation questionnaire – The State-Trait Anxiety Inventory by C.D. Spielberg, STAI (adapted to Polish by J. Strealu, M. Tysarczyk and K. Wrześniewski) [12] used for assessing state anxiety (situational) and trait anxiety (considered a permanent characteristic of personality).
Reaction to Competing by Smith, Smoll, Schutze, adapted to Polish by Krawczyński [13], which is used to assess anxiety as a trait, describing somatic anxiety, worrying (a component of cognitive anxiety) and attention disorders (also an element of cognitive anxiety).

Statistical analyses

The following statistical techniques were used: means and standard deviations (used to describe quantitative data), Student’s *t*-test (used to assess the relationship between dichotomous qualitative and quantitative variables) for independent samples and dependent samples.

Results

Descriptive analyses were first conducted on the results obtained immediately preceding training from all the participants, in order to examine the different forms of anxiety, i.e. state, cognitive (incessant worrying and attention disorders), and somatic.
The results presented in Table 1 show that the mean value of the respondents for state anxiety was $\bar{x} = 43.36$, with standard deviation (SD) = 7.33 (indicating variability of values within the group). The maximum value observed here was max=58, whilst the minimum was min=31.
In the case of somatic anxiety during training, the mean obtained was $\bar{x} = 19.78$ with SD=4.92, maximum value was max =32 and minimum min=10.

The mean value of the participating gymnasts before training in terms of the cognitive anxiety component of incessant worrying was $\bar{x} = 16.00$, with SD=4.35. The highest value that was obtained here was max=25, while the lowest was min=8.
For the second element of cognitive anxiety, attention disorders, during training, the mean value of the respondents was $\bar{x} = 10$, with SD=2.34. The highest value observed here was max= 16, and the lowest min=7.
Descriptive analyses were next performed on the results gathered from all participants, in order to examine the different forms of anxiety immediately before competing.
As can be seen from the results presented in Table 2, the mean value of the gymnasts on the state anxiety scale taken directly before competing was $\bar{x} = 46.25$, with standard deviation SD=7.43 (indicating that the gymnasts vary in terms of state anxiety). The highest result here was max=60, while the lowest result was min=34.
For somatic anxiety assessed just before competition, the mean obtained was $\bar{x} = 21.96$ with standard deviation SD=4.23, maximum value max=31 and minimum value min=13.
The mean value of the respondents before competition for the cognitive anxiety component of incessant worrying was $\bar{x} = 16.61$, with standard deviation SD=3.99. The highest value was max=24, and the lowest min=8.
In terms of the second component of cognitive anxiety, attention disorders, just before competing, the mean value was $\bar{x} = 11.18$, with SD=2.61. The highest value observed was max=19, and the lowest value min=6.
The Student’s *t*-test was used to determine whether there were statistically significant differences between the values gathered during training and before competition, where the criterion for significant difference was set at $p \leq 0.05$. In terms of state anxiety, which rises in athletes in both training and competition contexts, the differences were statistically significant: $p = 0.033$. Also as regards somatic anxiety in gymnasts during training and before competitions, a statistically significant difference was observed, $p = 0.004$. At the same time, when considering the Sten values for state anxiety [12], it is

Table 1. Descriptive statistics for the individual types of anxiety during training (all respondents together)

	N	Mean \bar{x}	Standard deviation SD	Minimum	Maximum
State anxiety	28	43.36	7.33	31.00	58.00
Somatic anxiety	28	19.78	4.92	10.00	32.00
Incessant worrying	28	16.00	4.35	8.00	25.00
Attention disorders	28	10.00	2.34	7.00	16.00

Table 2. Descriptive statistics for the individual types of anxiety before competing (all respondents together)

	N	Mean \bar{x}	Standard deviation SD	Minimum	Maximum
State anxiety	28	46.25	7.43	34.00	60.00
Somatic anxiety	28	21.96	4.23	13.00	31.00
Incessant worrying	28	16.61	3.99	8.00	24.00
Attention disorders	28	11.18	2.61	6.00	19.00

Table 3. Descriptive statistics for state anxiety during training (women and men)

State anxiety - training	N	Mean \bar{x}	Standard deviation SD	Minimum	Maximum
Women	14	47.28	5.82	39.00	58.00
Men	14	39.43	6.66	31.00	56.00

Table 4. Descriptive statistics for trait anxiety – tested together and gender breakdown

Trait anxiety	N	Mean \bar{x}	Standard deviation SD	Minimum	Maximum
Women	14	47.28	5.82	39.00	58.00
Men	14	39.43	6.66	27.00	56.00
Together	28	40.21	7.9	27	58

worth noting that the respondents' state anxiety before training (5-6 Sten) was slightly lower than before competition (6-7 Sten).

There was no statistical significance found between cognitive anxiety – “incessant worrying” before training and before competitions: $p = 0.094$. However, there were statistically significant differences found between cognitive anxiety – “attention disorders” before training and competing: $p = 0.011$.

The results for state anxiety during training were analysed for gender differences. The mean value of state anxiety in the female gymnasts was $\bar{x} = 47.28$ with standard deviation $SD = 5.82$, minimum value $\min = 39$ and maximum value $\max = 58$. Meanwhile, the mean value for males was lower in comparison, with $\bar{x} = 39.43$. Variability within the male gymnasts was bigger than among the females, with $SD = 6.66$. The minimum value was $\min = 31$, and the maximum was $\max = 56$ (Table 3).

The final analyses relate to trait anxiety, both for all the respondents tested together as well as with division into females and males separately (Table 4). The mean value for all the respondents was $\bar{x} = 40.21$ with standard deviation $SD = 7.9$, minimum value $\min = 27$ and maximum value $\max = 58$. As can be seen in data provided in Table 4, the mean value for trait anxiety was higher in the group of women $\bar{x} = 47.28$ than in the group of men $\bar{x} = 39.43$. However in case of the male gym-

nasts, there was a greater variation visible within the group – standard deviation $SD = 6.66$. It is worth mentioning that there were statistically significant differences shown between women and men in terms of trait anxiety, at $p = 0.033$.

Comparison was made between the gymnasts' mean trait anxiety value and the results (Sten standards) of a population of young Polish males and females [12]. It was observed that the mean value for all respondents of 5 Sten indicates average trait anxiety levels.

Discussion

Gymnastic disciplines are characterised by moments of spectacle resulting from a variety of skills and exercises presented by the competitors. At the same time we can observe continuous progression in these sports, leading to increased levels of difficulty of the technical elements and of whole routines. This, together with constant competition, continues to pose new challenges for the athletes. They are supposedly characterised by emotional resilience (as well as low levels of fear), in order to meet the demands of training and competition. In the present research, championship level competitors in gymnastic disciplines were characterised by, on average, an average level of anxiety as a trait (5 Sten). This result seems to be consistent with the nature of gymnastics.

tic disciplines. It is believable that individuals with high trait anxiety levels do not pursue gymnastics, even as far as first joining a gymnastics club.

Gymnastics is a wide-ranging, beautiful sport that fascinates and inspires the admiration of spectators. At the same time, however, it is a dangerous sports discipline which demands of the athletes very good both physical and mental preparation. The gymnasts perform structurally very complicated skills, which they often learn over many years. A high level of anxiety could have a negative impact both during the process of mastering new and difficult elements, as well as during their performance in competition. It is commonly acknowledged that gymnastics is a technical sport which is very complex in terms of coordination and with a complex motor structure. High trait anxiety levels are likely to seriously impede performance and, consequently, sporting achievement. Conversely, a relatively low trait anxiety level may be viewed as a psychological predisposition toward this discipline.

Furthermore, it was observed that the respondents experienced higher state anxiety levels before competing than during training, when learning new, difficult technical elements. This was also found to be true of somatic and cognitive anxiety in the form of attention disorders.

The pressure related with the public performance of a gymnastic skill, plus the need to compete with other gymnasts and, finally, the social judgement – judges, audience, rivals, coaches; the fear of negative assessment which the athletes may experience is clearly an anxiety inducing factor. In addition, there are external factors such as the conditions prevailing in the room where the gymnasts perform, e.g. excessively strong, blinding lighting. All these components may contribute

to an increase in anxiety immediately before competition. Many of these factors are not present during a training session. Hence, despite the necessity to perform difficult elements in training, the gymnasts feel more secure there than before a competition.

There were no statistically significant gender differences found in terms of individual types of anxiety before competing. Such relationships between cognitive and somatic anxiety before competing in sports gymnasts were noticed by Pineda-Espejel *et al* [14]. They concluded that female gymnasts are characterised by higher levels of anxiety before competition. Our research failed to replicate the finding, as did the reports of Hagan Jr *et al*. [15] and Aksoy *et al*. [16]. However, our research revealed gender differences in state anxiety during training. Therefore, training sessions are more anxiety inducing for women in comparison with men.

As can be seen, there is ambiguity where gender and anxiety are considered in athletes. Likely the very interpretation of the signals that indicate anxiety is of great importance. Therefore, how gymnasts interpret the signs of anxiety is critical [17], as is whether they are able to control their level of anxiety [18, 19]. As it is acknowledged, anxiety can negatively affect an athlete's performance [20] when it is too high or interpreted as destructive.

Conclusion

The athletes studied, who practice gymnastic disciplines at championship level, were characterised by average trait anxiety levels. They experienced greater anxiety before competing in comparison with a demanding training session.

Institutional Review Board Statement: The study was conducted in accordance with the Declaration of Helsinki, and approved by the Institutional Ethics Committee

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