ANXIETY AS A TRAIT IN JUNIOR SPRINT ATHLETES

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Abstract: The study presents aspects related to the correlation between the practice of athletics at junior level and the manifestation of trait anxiety. It is known that stress and competition anxiety are major problems faced by a large proportion of competitive athletes. The aim of the study is to investigate anxiety as a trait in junior athletes according to performance and type of sprint events (100 m flat - female and male outdoor, and 60 m hurdles female and 60 m hurdles male indoor, respectively). Sixty adolescents, aged between 14 and 19 years participated in the study and the inclusion criterion was a minimum of 3 years of competitive experience. The study was based on EMAS-T and SAS-T questionnaires, that measure different types/facets of trait anxiety. Statistical processing of the data revealed that there was no statistically significant relationship between physical danger anxiety, separation anxiety, anxiety in new situation, respectively anxiety in socially evaluative circumstances, and sports performance (athletes' personal record), in the case of the four speed events. Data analysis revealed, also, significant differences (Mann-Whitney test was used) in terms of perceived anxiety, between athletes. Female athletes practicing 100m flat have significantly higher anxiety in new conditions than 60m hurdlers. The observed differences were discussed.
Keywords: *track and field, sprint, trait anxiety, personal best.*

Introduction

In order to improve their sporting performance, athletes and coaches should pay attention to their emotions, feelings, in addition to the technical, theoretical and physical training. Stress and competition anxiety are major problems faced by a large proportion of competitive athletes. It is the distress and performance anxiety that athletes experience before a competition, which can negatively influence sports results (Predoiu et al., 2021).

In the last years, society has undergone obvious bio-psycho-motor transformations and we believe that these changes have also occurred in athletics, being an individual sport and especially in speed events, the transformations starting from children to adults who reach the level of high performance. In order to correctly approach the training of juniors in athletics, the coach must know the peculiarities of the periods of growth, and the effects of physical exercise on the organism, so that he/she can select the content of the training process according to these peculiarities. Morphological and functional indices represent the biological background for the development of motor skills and the formation of motor skills and abilities. Their level conditions athletes in both performance and leisure activities (Ivan et al., 2022). The level of anaerobic capacity and increased muscle strength influence running speed at this age. Utilizing one's genetic potential requires constant work with speed based on the idea of addressing aspects of training simultaneously throughout the year (Stoica, 2010).

In competitive sports, the influence of psychological factors on athletes is especially evident when athletes compete. Athletes' achievements cannot be separated from the athletes' appearance in competition, the mental factor being essential (Thelwell et al., 2017).

Studies focused on the psychological skills that have the greatest impact on athletes and how these variables affect sports performances (Potts et al., 2019). Sport is an environment that generates stress and anxiety, the pressure felt by athletes being both physical and psychological. A key factor during competitions is pressure from the public; the public can have a positive

influence if the cheers and shouts are in favour of the athlete/ team, and not the other way around (Lienhart et al., 2020).

Among the factors that can cause distress and anxiety in competitive sport are (Boyd et al., 2002; Predoiu, 2021): personality characteristics, such as perfectionism and self-sufficiency; type of task – tasks that are perceived to be more difficult or involve increased pressure, such as performing in front of a large audience, may increase an athlete's stress and anxiety level; level of social support from coach, peers, sport psychologist, or family can reduce the athlete's stress level; health status and level of fatigue – poor health or increased levels of fatigue can increase the athlete's stress level; environmental factors, such as temperature, weather conditions or noise levels; pressure from coach or parents – high expectations and pressure to perform well from coach or parents can increase athletes' stress and anxiety levels; lack of self-confidence can lead to high levels of anxiety and distress in sport; history of injuries which can have a negative impact on the athlete's stress and may manifest as fear of re-injury; level of experience in sport – less experienced athletes may be more susceptible to competition-related stress than more experienced athletes; coping strategies – the way athlete manages emotions and stress. All these variables can cause athletes to react negatively, which can lead to a decrease in athletic ability, athletes being unable to show their best game. Coaches and sports psychologists need to be aware of these aspects, stress and anxiety management programs being essential for athletes' professional development. For example, "pro-health behaviors, that is, training in martial arts and winter swimming, lowers external stress, intrapsychic stress, and emotional tension" (Görner et al., 2023); specialists can be attentive to these aspects, between stress and anxiety being a relationship of mutual influence (perceived stress predicts anxiety - Firouzeh & Turkan, 2022).

Performance sport is a highly competitive and demanding activity that requires both physical and strong psychological skills. Athletes' performance is determined by a multitude of factors, including training, nutrition and rest, but also psychological factors such as motivation and stress. In competitive sport, anxiety can be triggered by the pressure of competition, the desire to perform well, the expectations of coaches or the public, or by various personal and social problems. For example, rumination and self-blame make persons vulnerable to experience of stress (Mineva, 2023). And prolonged stress and anxiety can lead to negative effects on athletes' mental and physical health. One of the most common response of junior athletes (and not only) to perceived threats is anxiety, a result to stressful or unfamiliar circumstances (Predoiu, 2016). Therefore, tools for screening athletes' risk of anxiety should be used routinely by specialists, which will allow "early detection of symptoms and initiation of therapeutic measures" (Kulpa et al., 2023).

Anxiety is characterized by physiological symptoms, behavioral symptoms and cognitive/ mental symptoms, such as worries (Kashdan et al., 2014). The current research investigates trait anxiety (A-trait) in four circumstances: socially evaluative situations, in dangerous conditions, in new/ unusual and separation situations. Social anxiety refers to humiliation and negative evaluation from others in social settings (e.g., in sports field) and avoidance of frightening situations (Macher et al., 2013). For athletes, success is the ultimate goal, as well as performance in a socially valued situation. Sports competitions imply social evaluation (from coach, public, mass-media), the existence of physically dangerous situations, the presence of muscle pain (and not only), dealing with new and unusual circumstances (that athletes may face), as well as separation, for a certain period of time, from loved ones, as competitions are constantly held in other cities or countries.

Anxiety (e.g., at low or high intensity) could be interpreted in distinct ways by athletes during competitions. Literature discuss about debilitative or facilitative anxiety (Hanton et al., 2004), the optimal anxiety zone being,

therefore, different from one athlete to another.

Purpose

The aim of our study is to investigate anxiety as a trait in junior athletes according to performance and type of sprint events (100 m flat - female and male outdoor, female 60 m hurdles and male 60 m hurdles indoor, respectively).

Objectives

- Identifying the level of athletes' anxiety – of physical danger, in new, unusual situations, in social evaluation circumstances, and in the case of separation from close ones;
- Knowing the differences between athletes (in terms of trait anxiety), taking into consideration the specificity of the speed events;
- Highlighting the associations between athletes' sports performances and A-trait scores.

Research questions

1) What are the differences between athletes in terms of trait anxiety, taking into consideration the type of sprint events they participate in (100m flat - women and men outdoor, respectively 60m hurdles women and 60m hurdles men indoor)?

2) Which is the relationship between athletic performance and the level of A-trait in junior athletes?

Materials and method

Participants

The study involved 60 participants aged 14 to 19 years: juniors 3 (14 and 15 years - 20 athletes), juniors 2 (16 and 17 years - 20 athletes), and juniors 1 (18 and 19 years - 20 athletes), including 30 male athletes (15 athletes in the 100m flat and 15 athletes in the 60m hurdles), and 30 female athletes (15 athletes in the 100m flat and 15 athletes in the 60m hurdles). The inclusion criterion was a minimum of 3 years competitive experience.

Instruments

EMAS (*Endler Multidimensional Anxiety Scales*) is a set of easy-to-administer scales that measure different types of anxiety: Emas-S, which measures anxiety as a state; Emas-T and SAS-T, which measures anxiety as a trait; Emas-P, which measures anxiety as a perception.

For the current research EMAS-T and SAS-T were used, more exactly four facets of trait anxiety: in social evaluative situations, in physically dangerous conditions, in new/ ambiguous circumstances, and in separation situations. The EMAS-SAS scales are an extension of the EMAS scales (see Endler & Flett, 2002) – in the present study we used the scale measuring separation anxiety. EMAS is calibrated for the Romanian population being part of the computerized platform CAS^{++}, developed by Cognitrom.

There are 15 items for each subscale/facet of A-trait. Participants have to answer on a scale from 1 to 5, where 1 means "Not at all", and 5 = "Very much". Item examples: "I'm upset", "I look forward to these situations", "I trust myself", etc., participants having to respond taking into consideration the instructions provided. Instructions for social evaluation anxiety: *Imagine being in a situation where you are evaluated, judged, observed by other people, in sport activity*. Raw scores are transformed into T-scores (age and gender differences being eliminated), where 40-60 T-scores represent an average level of anxiety (below 40 T-scores represents low anxiety).

Procedure

The research was carried out between January and April 2023. The questionnaire was administered online through the Google forms platform. All ethical principles were ensured: informed consent was obtained from all participants (parents in the case of minor participants), they had the possibility to withdraw from the scientific study at any time, their data were treated strictly confidential, anonymity was ensured.

Quasi-experimental design

The dependent variables are the athletes' values on the four facets of anxiety (physical danger, new, unusual situations, social evaluation and separation). The variable playing the role of the independent variable is the membership of the junior athletes in one of the groups formed (athletes participating in the sprint event - 100m flat female and male,

respectively in the 60m hurdles - female and male).

Results

Table 1. Descriptive statistics – 100 m flat male (A-trait)

Variable	Min	Max	Range	Mean T-scores	Std. deviation	Std. error	Coef. of variation
Anxiety of social evaluation	40	64	24	48.53	9.51	2.45	0.19
Anxiety of psyhical danger	35	57	22	42.86	9.02	2.32	0.21
Anxiety of new situations	47	81	34	59.86	15.17	3.91	0.25
Anxiety of separation	31	56	25	41.26	11.62	3.00	0.28

In terms of social evaluation anxiety, the arithmetic mean is 48.53 (representing an average level according to the standard) and the standard deviation is 9.51. With regard to anxiety in physically dangerous circumstances, the arithmetic mean is 42.86 (representing a slightly below average level), and the standard deviation is 9.02. For anxiety in new, unusual conditions the arithmetic mean is 59.86 (the level of anxiety being slightly above average), and the standard deviation is 15.17. When it comes to separation anxiety, the arithmetic mean is 41.26 meaning a slightly below average score.

Data in Table 1 emphasizes that male athletes participating in the 100m flat event scored slightly below average for both physical danger anxiety and separation anxiety, average for social evaluation anxiety and slightly above average for anxiety in new circumstances.

Table 2. Descriptive statistics – 100 m flat female (A-trait)

Variable	Min	Max	Range	Mean T-scores	Std. deviation	Std. error	Coef. of variation
Anxiety of social evaluation	42	64	22	53.2	10.42	2.69	0.19
Anxiety of psyhical danger	36	59	23	47.8	9.57	2.47	0.20
Anxiety of new situations	47	81	34	68.2	14.51	3.74	0.21
Anxiety of separation	25	50	25	41.73	10.75	2.77	0.25

Female athletes participating in the 100m flat event had a slightly below average level of separation anxiety, an average level of social evaluation anxiety, in physically dangerous conditions, and a high score for trait anxiety in new situations (Table 2).

Table 3. Descriptive statistics – 60 m hurdles male

Variable	Min	Max	Range	Mean T-scores	Std. deviation	Std. error	Coef. of variation
Anxiety of social evaluation	41	68	27	49.8	9.77	2.52	0.19
Anxiety of psyhical danger	36	57	21	44.13	8.73	2.25	0.19
Anxiety of new situations	47	80	33	62.13	13.95	3.60	0.22
Anxiety of separation	31	56	25	43.66	11.06	2.85	0.25

One can see that male athletes in the 60m hurdles scored slightly below average for both physical danger anxiety and separation anxiety, average for social evaluation anxiety and high for anxiety in new, unfamiliar situations (Table 3).

Table 4. Descriptive statistics – 60 m hurdles female

Variable	Min	Max	Range	Mean T-scores	Std. deviation	Std. error	Coef. of variation
Anxiety of social evaluation	42	65	23	49.2	7.92	2.04	0.16
Anxiety of psyhical danger	36	57	21	43.6	8.14	2.10	0.18
Anxiety of new situations	47	81	34	61.33	13.32	3.44	0.21
Anxiety of separation	25	50	25	37.6	10.88	2.81	0.28

Female athletes who practice the 60m hurdles have a low score for separation anxiety (Table 4), a slightly below average score for physical danger anxiety, a medium level of anxiety in social evaluation circumstances, and a high level of trait anxiety in new or unusual situations.

Using the Mann-Whitney U test, we verified whether there were significant differences between the athletes according to the type of sprint events in which they participated (groups were compared two by two): 100m flat - female (N = 15) and male (N = 15), and 60m hurdles female (N = 15) and 60m hurdles male (N = 15), respectively. Note that the data analysis revealed only one significant difference in terms of anxiety as a trait. In the Table below (Table 5) we capture the most important differences between athletes, with the alpha threshold being less than 0.05 (for anxiety in new/unusual situations), or closest to this value.

Table 5. Mann-Whitney test - anxiety in new, unusual situations

Anxiety in new or unusual situations	U	Z	p
100m flat female vs. 60 m hurdles male	64	1.99	0.046
100m flat female vs. 60 m hurdles female	67	1.86	0.061

Female athletes practicing 100m flat have significantly higher anxiety in new conditions than 60m hurdlers ($M_{100m\ flat\ female}$ = 68.2, $M_{60m\ hurdles\ male}$ = 62.13). Effect size index is r = 0.36, meaning a moderate to strong difference between groups (Predoiu, 2020).

Although the difference is not statistically significant we point out that female 100m flat athletes have a higher anxiety level in new situations, compared to female 60m hurdlers ($M_{100m\ flat\ female}$ = 68.2 , $M_{60m\ hurdles\ female}$ = 61.3).

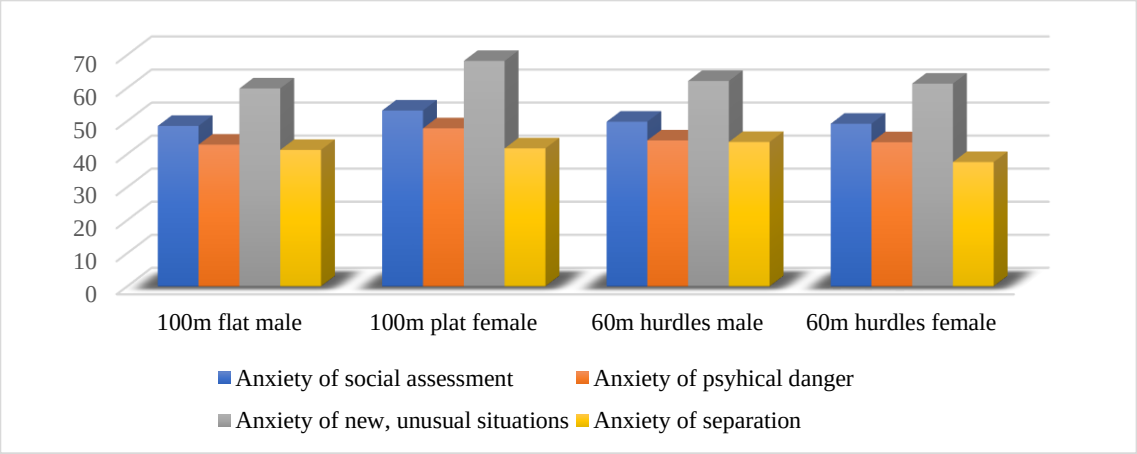

Figure 1. Anxiety levels according to the type of speed event

It can be seen in figure above (figure 1) that the social evaluation anxiety is slightly higher for 100m flat female athletes. As far as the physical danger anxiety score is concerned, it is also slightly higher for the female athletes in the sprint event - 100m flat (compared to the other sprint events). For the women's 100m flat event the highest level of anxiety in new, unusual situations was recorded (compared to the other speed events). For separation anxiety a higher score was recorded for boys in the speed event - 60m hurdles, and the lowest value was observed for girls in the speed event - 60m hurdles.

Next, we set out to examine the extent to which athletes' sports performance (personal best) correlates with anxiety levels, separately, for each speed event.

Due to the small sample of participants for each age group (14-15 years, 16-17 years and 18-19 years, respectively), a single group of adolescent athletes was formed (N = 15) for each type of event: male 100m flat, female 100m flat, male 60m hurdles and female 60m hurdles, respectively.

Table 6. Correlation between sports performance (personal best) and trait anxiety - male 100m flat athletes

Spearman Correlation		Sport performance (personal best)
Anxiety of social evaluation	Spearman's rho	0.022
	p-value	0.937
Anxiety of psyhical danger	Spearman's rho	0.022
	p-value	0.936
Anxiety of new situations	Spearman's rho	0.064
	p-value	0.818
Anxiety of separation	Spearman's rho	0.064
	p-value	0.818

We note in Table 6 that there is no significant correlation between the investigated facets of anxiety and sport performance - personal record ($p > 0.05$), in male 100m flat athletes.

Table 7. Correlation between sports performance and anxiety - women's 100m flat

Spearman Correlation		Sport performance (personal best)
Anxiety of social evaluation	Spearman's rho	-0.011
	p-value	0.968
Anxiety of psyhical danger	Spearman's rho	0.013
	p-value	0.962
Anxiety of new situations	Spearman's rho	-0.049
	p-value	0.859
Anxiety of separation	Spearman’s rho	-0.049
	p-value	0.859

We highlight in Table 7 that there is no significant relationship between A-trait and sport performance - personal best ($p > 0.05$), in women's 100m flat.

Table 8. Correlation between sports performance and anxiety - men's 60m hurdles

Spearman Correlation		Sport performance (personal best)
Anxiety of social evaluation	Spearman's rho	-0.187
	p-value	0.503
Anxiety of psyhical danger	Spearman's rho	-0.244
	p-value	0.379
Anxiety of new situations	Spearman's rho	-0.252
	p-value	0.364
Anxiety of separation	Spearman's rho	-0.252
	p-value	0.364

Data in Table 8 emphasize no significant correlation between anxiety level and athletes’ personal best ($p > 0.05$), in men's 60m hurdles.

Table 9. Correlation between sports performance and anxiety - women's 60m hurdles

Spearman Correlation		Sport performance (personal best)
Anxiety of social evaluation	Spearman's rho	-0.056
	p-value	0.841
Anxiety of psyhical danger	Spearman's rho	-0.105
	p-value	0.707
Anxiety of new situations	Spearman's rho	-0.088
	p-value	0.754
Anxiety of separation	Spearman's rho	-0.063
	p-value	0.822

Table 9 shows, also, that there is no significant association between A-trait and sports performance – women's 60m hurdles.

Discussion and conclusions

Based on the aim of our research to study anxiety as a trait in junior athletes according to the type of sprint event they practice (men's and women's 100m flat in outdoor events and men's and women's 60m hurdles in indoor events), the following conclusions emerged:

- Male athletes participating in the 100-meter flat event scored slightly below average for physical danger anxiety, separation anxiety, average for social evaluation anxiety, and slightly above average for anxiety in new conditions.
- Female athletes participating in the 100m flat event scored slightly below average on separation anxiety, average in the case of A-trait in social evaluation and physically dangerous circumstances, and high on anxiety in unusual, new situations.
- Athletes (male) in the 60m hurdles scored slightly below average for both physical danger anxiety and separation anxiety, average for social evaluation anxiety and high for A-trait in new, unusual situations.
- Athletes (female) in the 60m hurdles had a low score for separation anxiety, a slightly below average score for physical danger anxiety, a medium level for social evaluation anxiety, and a high level for anxiety in new situations.

Female athletes in the 100m flat have significantly higher scores for anxiety in new situations compared to athletes in the 60m hurdles. This difference can be explained by the fact that in the 100m flat events the number of participants is much higher, from the qualifying heats until the final heat (which can award the athlete a place on the podium). At the same time, the difference in results and securing a place on the podium is made by a smaller difference in the 100m flat event than in the 60m hurdles, by a few tenths of a second or even a tenth of a second.

The data analysis revealed that the social evaluation anxiety score is higher in the 100m flat athletes (compared to the other sprint events). As for the physical danger anxiety value, it is also slightly higher in the 100m flat athletes.

The women's 100m flat event had the highest level of anxiety in new, unusual situations, regarding separation anxiety a higher score was recorded by males in the 60m hurdles event, while the lowest value was observed for females in the 60m hurdles event.

A-trait (the same facets of trait anxiety) was previously investigated in athletes (e.g., in junior football players), the results showing a significant link between the values for anxiety in physically dangerous conditions and the junior footballers sports performance – "if trait anxiety in physically dangerous situations it's at a medium level and slightly below the average level, it can be related to a better performance" (Mitrache et al., 2014). Also, researchers found that an average level of A-trait in socially-evaluative conditions is associated to fast reactions of the junior football players in circumstances that require bi-segmental or multi-segmental responses (Cojocaru et al., 2015). Not least, anxiety in new, unusual situations was correlated with a decreased likelihood of severe injuries in athletes (Patenteu et al., 2023).

The extent to which the athletes' sports performance (personal best) correlates with the level of anxiety, separately, for each sprint event was, also, investigated by the current research. Statistical processing of the data revealed that there was no statistically significant relationship between physical danger anxiety, separation anxiety, anxiety in new situation, respectively in social evaluation circumstances, and sport performance (athletes' personal record), for the four speed events. It seems that anxiety, at least in athletics speed events, does not have a significant influence on sport performance (athletes' best time). However, a limitation of the research is the clustering of the athletes (juniors 1, 2 and 3) in a single group - per speed event (due to the small sample of participants). In the future, it is necessary for studies to separately address juniors 1, 2 and 3 regarding the relationship between athletes' sport performance and the level of anxiety as a trait. It's also worth pointing out that the athletes are all teenagers (from 14 to 19 years old), and EMAS norms (T-scores for anxiety)

are for the 14-20 age group. The self-report tool can be seen as a possible limit of the study (taking into consideration possible socially desirable responses – see Predoiu et al., 2022 for the dual-processing analysis).
Further studies need to focus, also, on other psychological variables (e.g., working memory, aggression, attentional focus, risk-taking behavior) that may significantly influence athletes' sport performance (personal record in sprint athletes).

Authors' Contribution

The last author have an equal contribution to the publication as the first author.

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