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Cognitive Flexibility and Sports Anxiety Among Turkish Sports High School Students: A Cross-sectional Study

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Abstract

The present study aimed to examine the cognitive flexibility and sports anxiety levels of students in a sports high school in Turkey according to the sports branch in which they were trained. The study sample comprised 240 athletes (male n=138; female n=102) from a sports high school in Osmaniye province, Turkey. Each athlete's cognitive flexibility and sports anxiety levels were examined using the Cognitive Flexibility Scale (CFS) and Sports Anxiety Scale (SAS-2), respectively. Descriptive statistics, nonparametric hypothesis tests (Mann-Whitney U and Kruskal-Wallis H tests), and correlation analysis (Spearman's Rank Difference Correlation Coefficient) were used for data analyses. One finding of the study was that there was no positive or negative association between student athletes' cognitive flexibility skills and sports anxiety levels. Second finding was student athletes' cognitive flexibility levels were statistically significantly different in terms of gender and branch of sports ($p<0.05$). The cognitive flexibility levels of female athletes were higher than those of male athletes. The mean value of the cognitive flexibility level was lowest in football players and highest in basketball players. One important finding of the study was that the sports anxiety levels of student athletes increased progressively as the school year increase from 1st grade to 4th grade. The sports anxiety is an important factor that negatively affects athletes' performance, especially in the adolescent athletes. Thus, it is crucial to develop new strategies to reduce sports anxiety among adolescent student athletes and increase their mental health.
Keywords: Cognitive flexibility, High school, Student, Sport anxiety

Spor Lisesi Öğrencilerinin Bilişsel Esneklik ve Spor Kaygı Düzeylerinin İncelenmesi: Kesitsel Bir Çalışma

Öz

Bu çalışmada, spor liselerinde öğrenim gören öğrencilerin bilişsel esneklik ve spor kaygı düzeylerinin eğitim gördükleri spor branşlarına göre incelenmesi amaçlanmıştır. Araştırmaya Osmaniye ili spor lisesi öğrencilerinden 138 erkek ve 102 kadın öğrenci olmak üzere toplamda 240 öğrenci katılmıştır. Çalışmada öğrencilerin bilişsel esneklik düzeylerinin belirlenmesi amacıyla Bilişsel Esneklik Ölçeği ve spor kaygı düzeylerinin belirlenmesi amacıyla Spor Kaygı Ölçeği kullanılmıştır. Verilerin istatistiksel analizi, tanımlayıcı istatistikler, parametrik olmayan hipotez testleri (Mann-Whitney U, Kruskal Wallis H testi) ve korelasyon analizleri (Spearman'ın Sıra Fark Korelasyon Katsayısı) ile gerçekleştirilmiştir. Çalışmanın bulgularından ilki olarak, öğrencilerin bilişsel esneklik becerileri ile spor kaygı düzeyleri arasında pozitif ya da negatif bir ilişki bulunmamıştır. İkinci bulgu olarak, öğrencilerin bilişsel esneklik düzeyleri cinsiyet ve spor branşı değişkenlerine göre istatistiksel olarak anlamlı farklık göstermektedir. Kız öğrencilerin bilişsel esneklik düzeyleri erkek öğrencilerde göre daha yüksektir. Bilişsel esneklik düzeyi ortalaması futbolcularda en düşük, basketbolcularda en yüksektir. Çalışmanın önemli bulgularından biri, öğrencilerin spor kaygı düzeyleri sınıf arttıkça 1. sınıftan 4. sınıfa doğru kademeli olarak artmaktadır. Spor kaygısı, özellikle ergenlik çağındaki sporcularda spor performansını olumsuz etkileyen önemli faktörlerden biridir. Bu nedenle özellikle ergenlik çağındaki sporcularda spor kaygısını azaltmak ve ruhsal sağlıklarını iyileştirmek için yeni stratejiler geliştirmek oldukça önemlidir.
Anahtar kelimeler: Bilişsel esneklik, Lise, Öğrenci, Sporda kaygı

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INTRODUCTION

Anxiety is one of the important factors that negatively impacts students' success and anxiety disorders are highly prevalent among adolescents and children during their development stage (Rabner et al., 2024). Studies have shown that, considering the worldwide student population, anxiety disorders account for 20% of total mental health problems (Kamberi et al., 2019).

Previous studies have reported that anxiety is related with factors such as gender, academic achievement, grade and sport participation. For instance, in their study Mahroon et al. (2018) reported that anxiety symptoms among medical students were associated with gender, grade and academic performance. In another study, Gao et al. (2020) concluded that anxiety was a serious issue among female college students. According to the results of the study conducted by Asfaw et al. (2021) female students living off-campus experienced higher levels of anxiety. In terms of academic achievement, in a recent study conducted by Neyazi et al. (2024) the results indicated that academic achievement was highly correlated with anxiety and anxiety symptoms were higher in female students. In terms of sport participation, Xiao et al. (2022) reported that participating in sports was negatively associated with anxiety and depression among Chinese adolescent students.

Cognitive flexibility refers to a person's awareness of the existence of options and alternatives in any situation, their willingness to be flexible and adapt to the situation, and their self-efficacy or belief that they have the ability to be flexible (Jiatong et al., 2021; Martin & Rubin, 1995). Cognitive flexibility have been studied in different contexts by researchers and numerous instruments have been developed to measure flexibility such as Cognitive Flexibility Scale (CFS) (Martin & Rubin, 1995), Behaviour Rating Inventory of Executive Function (BRIEF) (Gioia et al., 2002; Roth et al., 2013), Cognitive Flexibility Inventory (CFI) (Dennis & Vander Wal, 2010), Acceptance and Action Questionnaire–II (Bond et al., 2011) and The Flexibility Scale (FS) (Strang et al., 2017). Cognitive flexibility includes a person's tendency to adapt. If an individual can develop flexibility when faced with difficult situations and identify different options, he or she can overcome many of the difficulties in life; however, if that individual always tries to solve problems in the same way and does not consider different solutions, he or she cannot adapt to the flow of life (Toksöz & Kolburan, 2018).

In educational context, cognitive flexibility is an important psychological factor that plays a crucial role in students' academic achievement. Students with higher levels of cognitive flexibility tend to adapt diverse learning environments more easily, be more creative and be resilient when they encounter difficulties in their studies by developing new strategies (Nakhostin-Khayyat et al., 2024). Cognitive flexibility of students has been investigated in relation with different constructs. For instance, in their study with elementary school students examining the individual contributions of cognitive flexibility, inhibition and working memory to science problem solving performance, Schäfer et al. (2024) reported that cognitive flexibility is one of the main components of successful science problem solving. Similarly, the results of a recent cross-cultural study performed by Zheng et al. (2024) among 378087 adolescent students from 57 different countries investigating the relationship between cognitive flexibility and academic performance demonstrated that cognitive flexibility is positively associated with

academic performance. Another study conducted by Güner and Gökçe (2021) among elementary, middle and high school students have reported that cognitive flexibility had positive impact on math achievement.

Some researchers also investigated cognitive flexibility and anxiety constructs together. For instance, in their study, Toren et al. (2000) reported that children with anxiety disorders had lower cognitive flexibility compared to 14 age-matched control group. Similarly, Yu et al. (2020) in their study conducted among 447 Chinese university students reported that higher scores of anxiety was associated with lower scores of cognitive flexibility. The results of another study conducted by Kırca et al. (2024) among undergraduate university students demonstrated that cognitive flexibility acts as partial mediator on the relationship between fear of negative evaluation and interaction anxiety. They also suggested that improving cognitive flexibility skills of university students may prevent development of interaction anxiety.

From the sports point of view, some researchers also investigated cognitive flexibility and anxiety levels of students in terms of physical activity, sports participation and exercise. For instance, the results of the study by Ishihara et al. (2017) demonstrated that longer play of tennis in children and adolescents were associated with higher levels of cognitive flexibility. Ángel Latorre-Román et al. (2021) in their study among 114 students with ages ranging from 8 to 12 have reported that, after a 10-week active recess programme with physical exercise, the students in experiment group experienced significant improvement in cognitive flexibility. They also suggested that physical exercise may be a proper tool to improve student's cognitive flexibility. Additionally, Xiao et al. (2022) reported that engaging in sport participation was negatively associated with anxiety and depression among Chinese adolescents. Similarly, Li et al. (2024) reported that physical activity had negative association with social anxiety. They also suggest that physical activity may help students increase their psychological resilience, thus resulting a decrease in the social anxiety.

Cognitive flexibility and anxiety are two important factors closely linked with student's academic achievement and mental health development. However, despite the significant amount of progress in the cognitive flexibility and anxiety literature, the research of these two constructs in educational context, particularly focusing on adolescent students remains limited. Moreover, to the best of our knowledge no previous research, particularly in Türkiye, have been done considering both constructs together in physical education and sports teaching context among adolescent students. Therefore, to fill this gap in the research of cognitive flexibility and anxiety, in present study we aimed to assess the cognitive flexibility and anxiety levels of sport high school students.

Our goal is to investigate;

1) Whether cognitive flexibility and anxiety levels of sports high school students differ based on their gender.
2) Whether cognitive flexibility and anxiety levels of sports high school students differ based on their grade.
3) Whether cognitive flexibility and anxiety levels of sports high school students differ based

on their fear of injury.
4) If mastered sport branch have impact on students' cognitive flexibility skills and anxiety levels.
5) To what extend cognitive flexibility is associated with anxiety among sports high school students.

MATERIALS AND METHODS

Research Model

The present study's model was organized based on descriptive and relational survey and comparison models, which are among the quantitative research types. The main purpose of this model is to reveal the change in two or more variables related to each other. A preliminary literature review was conducted and previous studies discussing the relevant subjects were examined.

Study Population

The study population comprised of 240 volunteer students (male n = 138; female n = 102) from Samet Aybaba Sports High School in Osmaniye province of Turkey. No sampling selection method was used and all the students volunteered to participate in the study with a basic knowledge of the instruments are included. The study was conducted during the fall semester of 2024–25 academic year.

Data Collection Tools

Personal Information Form (PIF): PIF was developed by the researchers and included gender, grade, sports age, fear of injury, and sports branch as the independent variables.

Cognitive Flexibility Scale (CFS): The CFS scale was used to measure the cognitive flexibility levels of students. The scale is originally developed by Martin and Rubin (1995) and adapted to Turkish by Çelikkaleli (2014). The scale consists of 12 items rated on 6-point Likert-type scale ranging from in which responses range from 1 (strongly disagree), to 6 (strongly agree). In present study we used Cronbach alpha statistics to examine the internal consistency of the CFS scale and the Cronbach's alpha was 0.816.

Sports Anxiety Scale-2 (SAS-2): In present study we used SAS-2 scale to measure the anxiety levels of students. The scale was originally developed by Smith et al. (2006) for the measurement of multidimensional sport performance anxiety both in children and adults. The Turkish adaptation of SAS-2 was conducted by Karadağ and Aşçı (2020). SAS-2 scale consists of three subdimensions of sport performance anxiety named respectively as; somatic trait anxiety, worry and concentration disruption. The items of scale are rated on 4-point Likert type scale ranging from 1 (Not at all) to 4 (Very much). In present study we used Cronbach alpha statistics to examine the internal consistency of the SAS-2 scale and the Cronbach's alpha was 0.837.

Ethical Approval

Approvals to conduct the present study were obtained from the Osmaniye Korkut Ata University Ethics Committee (Number: E.202808) and the Ministry of National Education (Application No: MEB.TT.2024.007154).

Data Collection

A written consent form was obtained from the parents of the athletes who agreed to participate in the study, and the participating athletes were informed about the importance and purpose of the study. Data were collected by the researcher in face-to-face interviews in a classroom environment outside of class hours and in the presence of the teacher in charge.

Data Analyses

The data were analysed using SPSS 26.0 (IBM Corp., Armonk, NY, USA). The study was conducted using data obtained from the 240 athletes in the study; any missing data from the dataset were excluded. The Kolmogorov Smirnov test was used to determine whether the data were normally distributed. Additionally, histograms and Q-Q plots were analysed in order to check the normality of the data. The Kolmogorov Smirnov test indicated that the data did not meet the assumption of normal distribution; therefore, nonparametric tests (i.e., Mann-Whitney U and Kruskal-Wallis H test) were used. Significant differences in multiple groups were investigated using Dunn-Bonferroni post hoc test. A p-value < 0.05 was accepted as a significance level. The Spearman Rank Correlation test was conducted for correlation analyses.

FINDINGS

The data obtained from SAS-2 and CFS were not normally distributed. The athletes' cognitive flexibility level was above average (M = 42.60), somatic trait anxiety levels were average (M = 9.00), anxiety levels were average (M = 10.08), concentration disruption levels were below average (M = 7.66), and total anxiety levels were below average (M = 26.75).

Table 1. Descriptive statistics for the scales

Sub-scales	Cronbach's α	X	S	Kurtosis	Skewness
Cognitive flexibility	.816	42.60	10.95	.100	-.486
Somatic trait anxiety	.688	9.00	2.72	1.946	1.205
Worry	.796	10.08	3.27	.711	.853
Concentration disruption	.662	7.66	2.13	.756	.866
Total anxiety	.837	26.75	6.55	.747	.893

The examination of CFS and SAS-2 scores of the athletes based on the gender variable revealed no statistically significant difference between the subdimensions of SAS-2 and total scores ($p>0.05$) (Table 2). When the cognitive flexibility scores of the athletes were analysed according to the gender variable, a statistically significant difference ($p<0.05$) was found. The mean cognitive flexibility scores of male student athletes were higher than female student athletes.

Table 2. Comparison of student athletes' anxiety and cognitive flexibility levels by gender

Sub-scales	Gender	N	Mean	Total	*U*	p
Cognitive flexibility	Male	138	108.74	15006.50	5415.500	**.002***
	Female	102	136.41	13913.50		
Somatic trait anxiety	Male	138	115.54	15944.00	6353.000	.193
	Female	102	127.22	12976.00		
Worry	Male	138	121.54	16772.50	6894.500	.786
	Female	102	119.09	12147.50		
Concentration disruption	Male	138	124.03	17116.00	6551.00	.354
	Female	102	115.73	11804.00		
Total anxiety	Male	138	119.94	16551.50	6960.500	.884
	Female	102	121.26	12368.50		

***p<0.05**

Table 3 compares sports anxiety and cognitive flexibility according to sports branches. As indicated in the table, there was no statistically significant difference among all subdimensions of SAS-2 ($p>0.05$); however, there was a statistically significant difference ($p<0.05$) in cognitive flexibility levels. The result of the post hoc test to determine from which group the difference originated showed that it was from the football-basketball group. The mean cognitive flexibility scores of student athletes in basketball branch were significantly higher than student athletes in football branch.

Table 3. Comparison of student athletes' sport anxiety and cognitive flexibility levels by sport branch

Sub-scales	Sport Branch	N	Mean	χ^2	S	p	Post-hoc
Cognitive flexibility	Volleyball	32	126.56	17.898	6	**.006***	Football-Basketball
	Basketball	31	146.42				
	Handball	30	133.08				
	Tennis	31	128.27				
	Football	48	94.38				
	Taekwondo	36	132.46				
	Athletics	32	95.23				
Somatic trait anxiety	Volleyball	32	103.02	11.918	6	.064	
	Basketball	31	152.26				
	Handball	30	122.17				
	Tennis	31	129.23				
	Football	48	122.19				
	Taekwondo	36	114.29				
	Athletics	32	101.66				
Worry	Volleyball	32	106.83	4.669	6	.587	
	Basketball	31	139.55				
	Handball	30	126.02				
	Tennis	31	127.58				
	Football	48	115.19				
	Taekwondo	36	116.82				
	Athletics	32	115.80				

Table 3 Continue. Comparison of student athletes' sport anxiety and cognitive flexibility levels by sport branch

Sub-scales	Sport Branch	N	Mean Rank	χ^2	S	p	Post-hoc
Concentration disruption	Volleyball	32	122.00	10.818	6	.094	
	Basketball	31	141.24				
	Handball	30	125.22				
	Tennis	31	132.08				
	Football	48	121.22				
	Taekwondo	36	114.19				
	Athletics	32	89.28				
Total anxiety	Volleyball	32	108.05	11.734	6	.068	
	Basketball	31	150.35				
	Handball	30	126.70				
	Tennis	31	132.61				
	Football	48	119.00				
	Taekwondo	36	111.60				
	Athletics	32	98.75				

***p<0.05**

There was a statistically significant difference among all subdimensions of SAS-2 and CFS according to grade level ($p<0.05$) (Table 4). The post hoc test revealed that the difference was in the 1st-3rd, 1st-4th, and 1st-2nd grade groups in the subdimensions of somatic trait anxiety, worry, concentration disruption, and total anxiety; however, there was no statistically significant difference in cognitive flexibility levels based on grade level ($p>0.05$).

Table 4. Comparison of student athletes' sports anxiety and cognitive flexibility levels by grade

Sub-scales	Grade	N	Mean Rank	χ^2	S	p	Post hoc
Cognitive flexibility	1	58	118.21	3.241	3	.356	
	2	77	110.88				
	3	63	131.22				
	4	42	125.21				
Somatic trait anxiety	1	58	89.92	18.591	3	**.000***	1-2
	2	77	121.48				1-3
	3	63	130.40				1-4
	4	42	146.07				
Worry	1	58	93.62	13.352	3	**.004***	1-3
	2	77	124.54				
	3	63	138.37				
	4	42	123.42				
Concentration disruption	1	58	95.96	14.853	3	**.002***	1-2
	2	77	118.99				1-3
	3	63	126.37				1-4
	4	42	148.35				
Total anxiety	1	58	85.13	21.532	3	**.000***	1-2
	2	77	124.37				1-3
	3	63	135.45				1-4
	4	42	139.82				

***p<0.05**

When the cognitive flexibility and sports anxiety scores of the athletes were examined based on the fear of injury, a statistically significant difference was observed in the subdimension of sports anxiety "anxiety" and "total anxiety" scores ($p<0.05$) (Table 5). When the athletes' cognitive flexibility scores and the subdimensions of sports "somatic anxiety" and "impaired concentration" were analysed based on the fear-of-injury variable, no statistically significant difference ($p>0.05$) was found.

Table 5. Comparison of student athletes' sports anxiety and cognitive flexibility levels based on fear of injury

Sub-scales	Fear of injury	N	Mean	Sum of	*U*	p
Cognitive flexibility	Yes	149	123.87	18456.50	6277.500	.336
	No	91	114.98	10463.50		
Somatic trait anxiety	Yes	149	117.19	17462.00	6287.000	.341
	No	91	125.91	11458.00		
Worry	Yes	149	112.51	16764.50	5589.500	**.022***
	No	91	133.58	12155.50		
Concentration disruption	Yes	149	115.18	17162.00	5987.000	.124
	No	91	129.21	11758.00		
Total anxiety	Yes	149	112.20	16717.50	5542.500	**.018***
	No	91	134.09	12202.50		

***p<0.05**

As Table 6 shows, significant positive and negative correlations were found between cognitive flexibility and gender (r=.-198, p=.002), cognitive flexibility and sports branch (r=-165, p=010), somatic trait anxiety and worry (r=.473, p=.000), somatic trait anxiety and concentration disruption (r=.402, p=.000), somatic trait anxiety and total anxiety (r=.763, p=.000), somatic trait anxiety and grade (r=.268, p=.000), worry and concentration disruption (r=.443, p=.000), worry and total anxiety (r=858, p=.000), worry and grade (r=.180, p=.005), worry and fear of sports injury (r=.148, p=.022), concentration disruption and total anxiety (r=.719, p=.000), concentration disruption and grade (r=.242, p=.000), concentration disruption and sports branch (r=.-160, p=.013), total anxiety and grade (r=.274, p=.000), total anxiety and fear of sports injury (r=.154, p=.017), grade and sports age (r=.310, p=.000), and gender and sports branch (r=.206, p=.001). No significant relationship was found between cognitive flexibility and all SAS-2 subdimensions.

Table 6. Results of Spearman Correlation analysis for cognitive flexibility and anxiety

		Cognitive flexibility	**Somatic trait anxiety**	**Worry**	**Concentration disruption**	**Total anxiety**	**Grade**	**Gender**	**Sports branch**	**Sports age**	**Sports injury**
Cognitive flexibility	Correlation	1									
	Sig. (2-tailed)	.									
Somatic trait anxiety	Correlation	-.011	1								
	Sig. (2-tailed)	.868	.								
Worry	Correlation	.049	**.473****	1							
	Sig. (2-tailed)	.446	.000	.							
Concentration disruption	Correlation	-.069	**.402****	**.443****	1						
	Sig. (2-tailed)	.284	.000	.000	.						
Total anxiety	Correlation	-.002	**.763****	**.858****	**.719****	1					
	Sig. (2-tailed)	.979	.000	.000	.000	.					
Grade	Correlation	.073	**.268****	**.180****	**.242****	**.274****	1				
	Sig. (2-tailed)	.263	.000	.005	.000	.000	.				
Gender	Correlation	**-.198****	-.084	.018	.060	-.009	.059	1			
	Sig. (2-tailed)	.002	.194	.787	.355	.884	.361	.			
Sports branch	Correlation	**-.165***	-.084	-.034	**-.160***	-.118	.069	**.206****	1		
	Sig. (2-tailed)	.010	.196	.597	.013	.067	.290	.001	.		
Sports age	Correlation	.022	.038	-.076	-.026	-.017	**.310****	.022	.077	1	
	Sig. (2-tailed)	.733	.556	.238	.693	.790	.000	.738	.234	.	
Fear of injury	Correlation	-.062	.062	**.148***	.099	**.154***	.093	-.093	-.104	-.095	1
	Sig. (2-tailed)	.337	.342	.022	.124	.017	.149	.153	.108	.140	.

***p<0.05, **p<0.01**

DISCUSSION and CONCLUSION

In this study we aimed to examine if cognitive flexibility and anxiety levels of sports high school athlete students differ in terms of sociodemographic variables such as gender, grade, fear of injury and sports branch. Additionally, we investigate if cognitive flexibility is associated with sports performance anxiety dimensions among the athlete students. The examination of the student athletes' cognitive flexibility levels based on gender showed a significant difference, and the data found that the female athletes had higher cognitive flexibility scores. Similar results were reported in a recent study by Kovačević et al. (2024) where female youth water polo players had higher cognitive flexibility than male youth water polo players. Unlike the results of the present study, Kuloğlu and Orhan (2021) have reported that the cognitive flexibility scores of male athletes who were preparing for a university exam were higher than those of the female athletes. Additionally, some researchers found no significant difference between cognitive flexibility and gender (Aslan et al., 2021; Bayram et al., 2021 Menteş et al., 2019; Wu et al., 2024) The difference between the findings of the present study related to cognitive flexibility scores based on gender and the aforementioned results from the literature is most likely due to the use of different scales in determining cognitive flexibility levels, differences in the age groups of the samples, and cultural differences. There was no significant difference among all SAS-2 subdimensions in terms of gender. Similar results have been reported by previous studies (Bingöl et al., 2012; Ramis et al., 2015; Rawat et al., 2023; Tomczak et al., 2022). These data support the results of the present study. In their study based on gender in different sport types, Correia and Rosado (2019) found that female athletes had higher levels of somatic trait anxiety and concentration disruption. This result does not overlap with that of the present study. Thus, regarding our first research goal, "*cognitive flexibility and anxiety levels of sports high school students differ based on their gender",* the results indicated that student athletes' cognitive flexibility levels significantly differed based on gender and anxiety levels across all subdimensions did not differ based on gender.

A significant difference was found in athletes' cognitive flexibility based on the comparisons in terms of their sports branches, and the post hoc test revealed that this significant difference was in the football-basketball group. When the mean cognitive flexibility scores of the athletes were examined, the basketball group had the highest, and the football group had the lowest scores. Within this context, it can be argued that the basketball players can manage their cognitive flexibility skills better than those involved in other sports. Aslan (2018) has found that athletes in a team sport had better cognitive flexibility than those who compete as individuals and attributed this to the fact that team athletes encounter more unexpected situations in team sports than those in individual sports. The present study found no significant differences in athletes' sports anxiety levels when comparing athletes based on sports branches. Thus, regarding our fourth research goal "*mastered sport branch has impact on students' cognitive flexibility skills and anxiety levels"* the results indicated that, while student athletes' anxiety levels did not differ based on sports branch, cognitive flexibility levels significantly differed based on sports branch and the students in basketball branch had the highest cognitive flexibility.

The results of the present study also found that although the cognitive flexibility levels of the athletes were not significantly different based on grade level, there was a significant difference among all SAS-2 subdimensions. The post hoc test conducted determined that the difference was in the 1st-3rd, 1st-4th, and 1st-2nd grade groups in all subdimensions. In addition, the first-grade students had the lowest mean anxiety scores of all athletes. This result indicates that the sports anxiety of the athletes was lower in their first year of the sports high school and that the anxiety increased over time. This increase in anxiety according to grade level can be attributed to when the athletes understand the main purpose of a sports school and their responsibilities as athletes. Regarding our second research goal, "*cognitive flexibility and anxiety levels of sports high school students differ based on their grade"*, the results indicated that while student athletes' cognitive flexibility levels did not significantly differ based on grade, the anxiety levels of students significantly differed based on grade and among student athletes, total anxiety significantly increase from 1st grade to 4th grade. Fear of injury, which is one of the determinants of sports anxiety, is considered as demoralization, loss of time, suffering, and financial loss (Ergün, 2006).

The present study has found a significant difference in the worry SAS-2 subdimension and in the total anxiety scores of the athletes according to the fear of injury. When the mean scores of the athletes were analysed, those who answered "no" to the fear of injury had higher worry and total anxiety scores related with their self-performance on sport than those who answered "yes". This result suggests that sports high school athletes are not very much concerned about the fear of injury and that they accept that sports injuries can be a normal part of the sport during practice or a match. This finding coincides with those of Yalçınkaya et al. (2020) and Tanyeri (2019). Regarding our third research goal, "*cognitive flexibility and anxiety levels of sports high school students differ based on their fear of injury"* the results indicated that while student athletes' cognitive flexibility levels did not significantly differ based on fear of injury, the anxiety levels of student athletes significantly differed in SAS-2 "worry" subdimension and in SAS-2 total anxiety based on fear of injury.

The results of the present study found no significant correlation between anxiety and cognitive flexibility in sports; however, there was a negative significant relationship between cognitive flexibility and sports branch, cognitive flexibility and gender, and concentration disruption and sports branch. In addition, the results of the present study found a significant positive relationship between somatic trait anxiety and grade level, worry and grade level, worry and fear of sports injury, concentration disruption and grade level, total anxiety and grade level, total anxiety and fear of sports injury, grade level and sports age, and gender and sports branch. Regarding our final research goal as "*to what extend cognitive flexibility is associated with anxiety among sports high school students." the* results showed no relationship between cognitive flexibility and anxiety levels of sports high school athletes. The cognitive flexibility of sports high school athletes was above average; however, their total anxiety was below average. The cognitive flexibility mean scores were highest in female athletes and lowest within the football branch. According to the grade level, the first-grade students had the lowest mean score in all subdimensions of SAS-2 and fourth-grade students had the highest. This result shows that athletes' anxiety levels increase as their grade level increases. When the scores of the athletes in the SAS-2 worry subdimension were analysed according to the fear of

injury, the worry scores of the athletes who answered "no" to the fear of injury were higher. This result suggests that sports high school athletes consider sports injuries in their sports field as normal. Lastly, there was no significant relationship between cognitive flexibility and sports anxiety scores of the athletes in the sports high school.

Sports high schools in Türkiye are important educational institutions, which act as qualified human resource in the field of physical education and sports. Sports high schools provide students basic knowledge and skills in the field of physical education and sports and discover talented athletes and direct them to sports at an early age, train moral and successful athletes within their sports branches. Since the middle adolescent stage falls within high school period which is one of the most important stages in adolescents' personal development, at this stage, protection of mental health is crucial for sports high students' healthy growth and success in their future life. Cognitive flexibility and anxiety are two important factors closely linked with mental health. In this study, we investigated the cognitive flexibility and anxiety levels of sports high school students. The findings of our study indicated that, cognitive flexibility levels of sports high school students were not significantly associated with anxiety levels. The female students had higher cognitive flexibility compared to male students. Finally, sports anxiety levels (somatic, worry and concentration disruption) of sports high school students increase progressively as the school year increase from 1st grade to 4th grade.

Practical Implications

Increasing level of anxiety in sports can affect sports success, so it is recommended for educational administratives to provide training programs and seminars for students in order to reduce the anxiety levels of sports high school students. Additionally, injuries in the sports fields and in sports competitions can be considered normal; however, training programs should be provided to these athletes to raise their awareness about injuries because serious injuries can prevent the athlete from competing in sports, cause pain and suffering, and lead to financial losses.

Limitations and Future Research

There are two major limitations of the present study. First, the participants of this study were limited to a single sports high school, thus the findings can not be generalized for all sports high schools in Türkiye. Second, since this research was designed as a cross-sectional study which the data was collected at a single point in time, it does not provide long term results as the cognitive flexibility levels of the students and prevalence of anxiety among the students may change overtime. Therefore, for the future, longitudinal studies are recommended in order to examine the cognitive flexibility and anxiety levels of the students and the relationship between cognitive flexibility and anxiety.

Conflicts of Interest: The authors declare that they have no conflicts of interest.

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