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Research Article

Gender Related Differences in Overuse Injuries, Quality of Sleep, Psychoemotional State of Young 12-14 Years Old Tennis Players Before the European Tennis Tournament

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Abstract

Purpose: To examine differences between girls and boys in physical condition, sleep quality, psychoemotional state of young 12-14 years old tennis players before the European tennis tournament.

Objectives: 1. To compare physical condition of 12 - 14 year - old young tennis players before European tennis tournament. 2. To compare quality of sleep of 12 - 14 year - old young tennis players before European tennis tournament. 3. To determine psychoemotional state of 12 - 14 year - old young tennis players before European tennis tournament.

Methods: Overuse Injury Questionnaire (OSTRC) - designed to assess knee, lower back and shoulder joint problems. Athlete Sleep Screening Questionnaire (ASSQ) - designed to assess the quality of sleep, Sports Anxiety Scale - 2 - designed to assess anxiety of young athletes.

Keywords: Young Tennis Players; Quality of Sleep; Psycho-Emotional State

Introduction

Zhang and Mao [1] claim that tennis is an intense and continuous sport that involves continuous explosive movements. During the competition, tennis players must maintain a good physical and psychological condition, and prevention is an important factor in order to maintain the optimal condition of a tennis player. Vitale., *et al*. [2] state that insomnia or insufficient sleep hours can affect the performance, functional indicators and psycho-emotional state of young tennis players. Turner., *et al*. [3] found that the quality of sleep affects the psycho-emotional state of tennis players and has influence on overuse injuries. According to Kolman., *et al*. [4] assessment of physical characteristics, anxiety and sleep quality in young tennis players can contribute to the successful development of young tennis players, and recommendations are made to assist in the application of preventive measures. Novak and Cirkovic [5] claims that the preparation of tennis players alone involves long-term activities that require a lot of physical and psychological effort. For the most part, even young tennis players are expected to be in optimal physical and psychological condition for many tournaments. Because there is not much time to prepare and there are many tournaments, it is important to conduct research to analyze the physical and emotional indicators of young tennis players and make recommendations. According to Duffield., *et al*. [6] studies related to young tennis players are extremely important and useful, because in the case of severe emotional disorders it is important to identify such disorders as early as possible in order to avoid overtraining. In a study by Novak and Cirkovic [5], it was shown that emotions have a significant impact on an athlete's performance. Most research has assessed anxiety, and mood states differ from specific emotions in that they are much more persistent and less intense than feelings, but are assumed to have significant effects on athletic performance. There is also a lack of research

that analyzes the effect of sleep quality and psycho-emotional state on overuse injuries in young tennis players. In this study, physical condition was measured by using the Overuse Injury Questionnaire (OSTRC), psycho-emotional status was measured by using the Sports Anxiety Scale - 2, and sleep quality was measured by using the Athlete Sleep Screening Questionnaire (ASSQ).

Materials and Methods

According to Clarsen, Myklebust and Bahr [7] Overuse Injury Questionnaire (OSTRC) - this questionnaire helps to identify knee, lower back and shoulder overuse injuries in athletes. This questionnaire was created by interviewing athletes and team doctors in various sports to determine the important consequences of overuse injuries. This questionnaire contains four questions each for the knee, lumbar back and shoulder areas. First part of Questionnaire about knee problems consists of these questions: have you had any difficulties participating in normal training and competition due to knee problems during the past week; to what extent have you reduced you training volume due to knee problems during the past week; to what extent have knee problems affected your performance during the past week; to what extent have you experienced knee pain related to your sport during the past week. Second part of Questionnaire about lower back problems consists of these questions: have you had any difficulties participating in normal training and competition due to lower back problems during the past week; to what extent have you reduced you training volume due to lower back problems during the past week; to what extent have lower back problems affected your performance during the past week; to what extent have you experienced lower back pain related to your sport during the past week. Third part of Questionnaire about shoulder problems consists of these questions: have you had any difficulties participating in normal training and competition due to shoulder problems during the past week; to what extent have you reduced you training volume due to shoulder problems during the past week; to what extent have shoulder problems affected your performance during the past week; to what extent have you experienced shoulder pain related to your sport during the past week. According to Clarsen, Myklebust and Bahr [7] responses to each of the four questions shown above are allocated a numerical value from 0 to 25, and these are summed in order to calculate a severity score from 0 to 100 for each overuse problem. The answers to each question are assigned a value. For each category: knee, lumbar back and shoulder, answers to questions 1 and 4 can be scored from 0 to 25, the first answer is 0, the second is 8, the third is 17, and the fourth is 25, while answers to questions 2 and 3 can also be scored from 0 to 25, the first answer is worth 0, the second is 6, the third is 13, the fourth is 19 and the fifth is 25. There are four questions in each category and the maximum possible score for all questions is 100. In this study, evaluating for overuse injuries, the means, standard deviations, and statistical significance of the responses of girls and boys were compared. In order to compare statistical significance in this study between girls and boys, i.e. unpaired T-test was used between two groups. According to Bakker and Wicherts [8] an unpaired t-test is used to compare the means of two unrelated groups of samples. It is sometimes called an independent t-test or independent samples t-test. An unpaired two-samples t-test has a null hypothesis that the means of the two samples are the same.

According to Zhang., *et al*. [9] the Athlete Sleep Screening Questionnaire (ASSQ) was developed by Samuels., *et al*. [10] and Bender., *et al*. [11]. With the help of this test, sleep disorders are assessed, according to the test results it can be determined the questions in the questionnaire are related to sleep time, sleep satisfaction and the presence/absence of insomnia symptoms. A "Sleep Severity Score" (SDS) is determined based on the answers. This questionnaire is included in the International Olympic Committee mental health assessment protocol. This questionnaire is suitable for identifying sleep disorders in athletes and helping to overcome them by providing recommendations based on the results obtained.at there are no sleep difficulties, mild sleep disorders, moderate sleep disorders and severe sleep disorders. Bender., *et al*. [11] claim that the SDS score is the main score of the questionnaire, based on the following five analyzed items: sleep quantity, sleep quality, sleep latency, sleep disturbances, and use of medication for insomnia. The higher the SDS score, the worse the sleep. the questionnaire also asks about modifiable elements of sleep, such as breathing disorders, sleep during travel, and sleep chronotype (morning, intermediate, or evening), but these modifiable factors are not included in the calculation of the SDS score. A secondary scoring system is developed to analyze these factors. Other questions on the questionnaire are designed to provide strategies for optimizing sleep and include questions about caffeine consumption, use of electronics before sleep, and sleep frequency, but are not included in the calculation of the SDS score. According to Zhang., *et al*. [12] calculation of the SDS score consists of five questions about how many hours the athlete actually sleeps per night, how satisfied or dissatisfied the athlete is with his sleep quality, how long it takes to fall asleep each night, how often the athlete has sleep problems, and how often the athlete uses, does not use, prescription or over-the-counter sleep aids medicines. The SDS score is calculated on an 18-point scale and is used to classify

athletes into 4 different categories of sleep difficulty: no sleep disturbance with an SDS of 0-4, mild sleep disturbance with an SDS of 5-7, moderate sleep difficulty with an SDS of 8-10 and severe sleep disorder when SDS is between 11-17. According to Zhang., *et al*. [12] chronotype scoring also has a scale related to chronotype. In order to calculate the c hronotype scores, four questions are presented related to: sleep rhythm, when a person feels best when he wakes up; when does one feel best when going to sleep; whether the person feels alert in the first half hour after waking up; whether a person considers himself a morning or evening person. After evaluating the answers to these questions and calculating the total score, the interpretation of the results is as follows: if up to 5 points are collected, the person is of the evening chronotype, if 5 is of the intermediate chronotype and if above 5 points, the person is of the morning chronotype. Questions identifying disordered breathing include questions about snoring and sleep apnea. If the athlete answered yes to both questions, it can be assumed that the person has potentially sleep-disordered breathing. Other questions about sleep frequency, caffeine consumption, and use of electronics before bed are used only to provide strategies and are not included in SDS score calculation and chronotyping. A cross-table Chi-squared ($\chi 2$) or Fisher's exact test were used where appropriate to assess the SDS category differences of gender.

According to Smith., *et al*. [13] Sports Anxiety Scale - 2 is a 15-item questionnaire that assesses the competitive trait anxiety experienced by athletes before or during competition. The scale includes these three factors: somatic anxiety, worry and concentration disruption. Participants rate each item related to the statement "Before or while I compete in sports" (e.g., "my body feels tense"; "I worry that I will not play my best"; "it is hard to focus on what I am supposed to do") on a four-point Likert scale ranging from one (not at all) to four (very much). The score for each subscale is calculated as the mean of the scores of subscale items and varies from one to four, with a low score indicating a less intense form of that type of competitive anxiety and a high score indicating a high probability of exhibiting that type of anxiety. Scoring is easily accomplished by summing scores for items. According to Ramis., *et al*. [14] The Sport Anxiety Scale -2 measures individual differences in Somatic Anxiety and in two classes of cognitive anxiety, Worry and Concentration Disruption. Both exploratory and confirmatory factor analyses supported these dimensions in several different athlete samples. The total score ranges from 0-60. The following guidelines are recommended for the interpretation of scores: 0-9, normal or no anxiety; 10-18, mild to moderate anxiety; 19-29, moderate to severe anxiety; and 30-60, severe anxiety.

All analyses were performed using IBM SPSS Statistics 24.0 for Windows.

Research ethics

The research was approved by Cyprus Tennis Federation. Study participants confirmed their participation by verbal consent of the parents. First of all, parents were asked for permission. The following ethical principles were observed during the research: benevolence, anonymity, the right to receive accurate information, explaining the purpose of the research to the subjects and providing answers to the questions that arose.

Subjects selection and their selection criteria.

Selection criteria

- Young Tennis players;
- Young tennis players who will participate in the European Tennis Tournament;
- Young tennis players without chronic or acute conditions.

Results

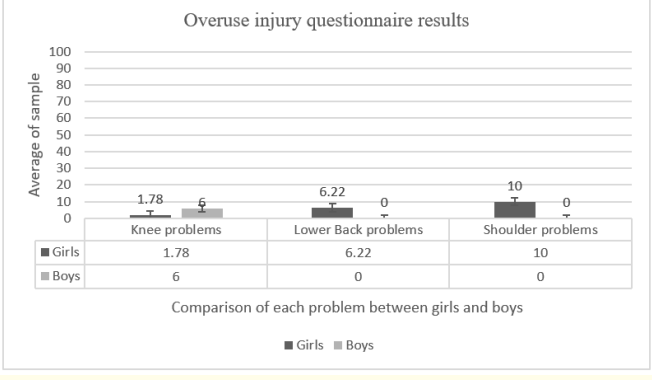

Figure 1: Gender related differences in overuse injury according to Overuse Injury Questionnaire.

Statistical difference < 0.05 *.

Based on the research data, it was found that the average of girls' knee problems is 1.78 ± 5.33, and the average of boys' knee problems is 6 ± 6.63. After calculating the statistical significance

between the groups, it was found that p = 0.22, which is > 0.05, according data the obtained difference is not statistically significant. From the research data, we can see that boys have more problems related to the knee area, but it is statistically insignificant compared to girls.

Based on the research data, it was found that the average of girls' lower back problems is 6.22 ± 12.34, and the average of boys' lower back problems is 0 ± 0.00. After calculating the statistical significance between the groups, it was found that p = 0.29, which is > 0.05, according data the obtained difference is not statistically significant. From the research data, we can see that girls have more problems related to the lower back area, but it is statistically insignificant compared to boys. Based on the research data, it was found that the average of girls' shoulder problems is 10 ± 28.28, and the average of boys' shoulder problems is 0 ± 0.00. After calculating the statistical significance between the groups, it was found that p = 0.45, which is > 0.05, according data the obtained difference is not statistically significant. From the research data, we can see that girls have more problems related to the shoulder area, but it is statistically insignificant compared to boys (table 1). To sum up, we can say that after analyzing the research data and comparing the knee, lumbar back and shoulder area problems of girls and boys, no statistical significance was observed between the groups.

	Total	**Gender**	
		Girls	**Boys**
	Mean (95%CI)	**Mean (95%CI)**	**Mean (95%CI)**
Age	13.07 (12.75 - 13.40)	13.11 (12.72 – 13.50)	13 (12.39 – 13.61)
Sleep Difficulty Score (SDS)	2.43 (1.52 – 3.34)	2.55 (1.19 – 3.90)	2.2 (1.25 – 3.16)
	n (%)	n (%)	n (%)
Nocturnal Sleep Duration			
5-6 h	0 (0)	0 (0)	0 (0)
6-7 h	1 (7.145)	1 (11.115)	0 (0)
7-8 h	5 (35.71)	3 (33.33)	2 (40)
8-9 h	7 (50)	4 (44.44)	3 (60)
More than 9 h	1 (7.145)	1 (11.115)	0 (0)
Sleep Satisfaction			
Very satisfied	6 (42.86)	4 (44.45)	2 (40)11
Somewhat satisfied	8 (57.14)	5 (55.55)	3 (60)
Neither satisfied nor dissatisfied	0 (0)	0 (0)	0 (0)
Somewhat dissatisfied	0 (0)	0 (0)	0 (0)
Very dissatisfied	0 (0)	0 (0)	0 (0)
Time to Fall Asleep			
15 min or less	11 (78.57)	7 (77.77)	4 (80)
16-30 min	3 (21.43)	2 (22.23)	1 (20)
31-60 min	0 (0)	0 (0)	0 (0)
Longer than 60 min	0 (0)	0 (0)	0 (0)
Having trouble Staying Asleep			
None	12 (85.71)	7 (77.77)	5 (100)
1-2 times per week	2 (14.29)	2 (22.23)	0 (0)
3-4 times per week	0 (0)	0 (0)	0 (0)
5-7 days per week	0 (0)	0 (0)	0 (0)

Use of sleep – inducing medications			
None	14 (100)	9 (100)	5 (100)
Once or twice per week	0 (0)	0 (0)	0 (0)
Three or four times per week	0 (0)	0 (0)	0 (0)
Five or seven times per week	0 (0)	0 (0)	0 (0)
Chronotype			
Morning and Intermediate type	12 (85.71)	8 (88.88)	4 (80)
Evening type	2 (14.29)	1 (11.12)	1 (20)

Table 1: Participants' demographics and sleep characteristics.

Based on the research data, we can say that a total of 14 respondents (n = 14) participated in the research, of which 9 (64.2%) were girls and 5 (35.8%) were boys. Table 1 shows the age and sleep characteristics of the respondents. The age of the respondents who took part in the study ranged from 12 to 14 years. The average age of girls is 13.11, and that of boys is 13. From the obtained results, we can see that the total Sleep Difficulty Score (SDS) of all respondents is 2.43, while that of girls is 2.55, and that of boys is 2.2, the difference between girls and boys is statistically insignificant, $p > 0.05$. By chronotype, 85.71 percent all respondents are morning and intermediate type and 14.29 percent. is evening type. Meanwhile, comparing girls with boys, 88.88 percent of girls and 80 percent boys are morning and intermediate type, the difference is statistically insignificant $p > 0.05$. Comparing the evening type between girls and boys, it was found that 11.12 percent girls are evening type and 20 percent boys are evening type, the difference is statistically insignificant $p > 0.05$. According to the obtained SDS results of girls and boys, no statistically significant.

	Total	**Gender**	
		Girls	**Boys**
	n (%)	**n (%)**	**n (%)**
Number of naps per week			
None	8 (57.14)	5 (55.55)	3 (60)
Once or twice	2 (14.29)	2 (22.22)	0 (0)
Three or four times	4 (28.57)	2 (22.22)	2 (40)
Five to seven times	0 (0)	0 (0)	0 (0)
Consumption of caffeinated products per day			
Less than 1 per day	11 (78.57)	7 (77.77)	4 (80)
1-2 per day	2 (14.28)	2 (22.23)	0 (0)
3 - 4 per day	1 (7.15)	0 (0)	1 (20)
5 or more per day	0 (0)	0 (0)	0 (0)
Use of electronic devices within 1 hour of going to bed per week			
Not at all	0 (0)	0 (0)	0 (0)
1-3 times per week	0 (0)	0 (0)	0 (0)
4-6 times per week	4 (28.57)	4 (44.45)	0 (0)
Every day	10 (71.43)	5 (55.55)	5 (100)

Table 2: Participants' use of caffeine, electronic and naps patterns.

Based on the obtained research results, it was found that when evaluating the number of naps per week 57.14 percent of respondents do not have naps at all, while 14.29 percent of respondents take naps 1-2 times a week and 28.57 percent. respondents take naps 3-4 times a week. Comparing girls and boys, 55.55 percent of girls do not take naps at all, 22.22 percent of girls take naps 1-2 times a week and 22.22 percent of girls take naps 3-4 times a week. Meanwhile, 60 percent of boys take no naps a week and 40 percent of boys take naps 3-4 times a week. No statistically significant differences between genders were found ($p > 0.05$). When evaluating the consumption of caffeinated products per day, it was found that 78.57 percent of respondents use less than 1 caffeinated product per day, while 14.28 percent of respondents use 1-2 caffeinated products per day and 7.15 percent of respondents use 3-4 caffeinated products per day. Comparing girls and boys, it was found that 77.77 percent of girls use less than 1 per day, 22.23 percent of girls use 1-2 per day, while 80 percent of boys use less than 1 and 20 percent use 3-4 per day. No statistically significant differences between genders were found ($p > 0.05$) (table 2). When assessing use of electronic devices within 1 hour of going to bed per week, it was found that 71.43 percent of respondents use electronic devices every day, while 28.57 percent respondents 4-6 times per week. Comparing girls and boys, 44.45 percent. girls use electronic devices 4-6 times a week and 0 percent. boys, a statistically significant difference was obtained ($p < 0.05$). 55.55 percent of girls use electronic devices every day and 100 percent boys use electronic devices every day, a statistically significant difference between the sexes was obtained ($p < 0.05$). It was found that boys use electronical devices every day statistically significantly $p < 0.05$ compared to girls.

	None		Mild		Moderate		Severe		p-value (Cramer's V)
	n	%	n	%	n	%	n	%	
All Athletes	12	85.71%	2	14.29%	0	0%	0	0%	
Gender									0.729 (0.30)
Girls	7	50%	2	14.29%	0	0%	0	0%	
Boys	5	35.71%	0	0%	0	0%	0	0%	
Chronotype									0.639 (0.16)
Morning type	10	71.40%	2	14.3%	0	0%	0	0%	
Evening type	2	14.3%	0	0%	0	0%	0	0%	
Sleep disturbance when travelling									0.887 (0.21)
Have sleep disturbance	3	21.41%	0	0%	0	0%	0	0%	
No sleep disturbance	9	64.29%	2	14.3%	0	0%	0	0%	
Performance issue when travelling									<.0001 (0)
Have performance issue	0	0%	0	0%	0	0%	0	0%	
No performance issue	12	85.71%	2	14.29%	0	0%	0	0%	
Sleep – disordered breathing									0.639 (0.17)
Have sleep - disordered breathing	2	14.3%	0	0%	0	0%	0	0%	
No sleep – disordered breathing	10	71.40%	2	14.3%	0	0%	0	0%	

Table 3: SDS categories by gender, chronotype, sleep disturbance when travelling, performance issue when travelling and sleep-disordered breathing.

Based on research data, it was found that 85.71 percent of tennis players do not have any sleep problems and 14.29 have mild sleep disorder. Based on the results obtained from all respondents (100%), 50% of girls have none sleep problems and 14.29% of girls have mild sleep problems, while 35.71% of male respondents have none sleep problems.

No significant connections were found between SDS categories and sleep disturbance when traveling neither between sleep - disorder breathing. A statistically significant connection found between SDS categories and performance issue when travelling. No performance issue correlates with 1st SDS category (none sleep problems) (table 3).

Gender		
	Girls (n = 9)	**Boys (n = 5)**
Somatic anxiety	7 ± 1.22	8 ± 2.73
Worry	9.33 ± 3.71	8.8 ± 3.27
Concentration disruption	7.22 ± 1.86	6.4 ± 1.52

Table 4: Means and standard deviations of the three SAS-2 factors across gender.

Based on the research data, we can say that the average somatic anxiety in the research group of girls is 7 ± 1.22, and that of boys is 8 ± 2.73, the difference between girls and boys is statistically insignificant $p > 0.05$. Meanwhile, the mean of worry in the research group of girls is 9.33 ± 3.71, and that of boys is 8.8 ± 3.27, the difference is statistically insignificant, i.e. $p > 0.05$. The average concentration disruption in the research group of girls is 7.22 ± 1.86, and that of boys is 6.4 ± 1.52, the difference is statistically insignificant, $p > 0.05$. No statistically significant differences between genders were found (table 4).

According to research data, 6 out of 14 respondents experience normal anxiety before a tennis tournament, while 2 out of 14 respondents experience mild anxiety, 5 out of 14 respondents experience moderate anxiety and only 1 respondent experiences moderate/severe anxiety before a tennis tournament.

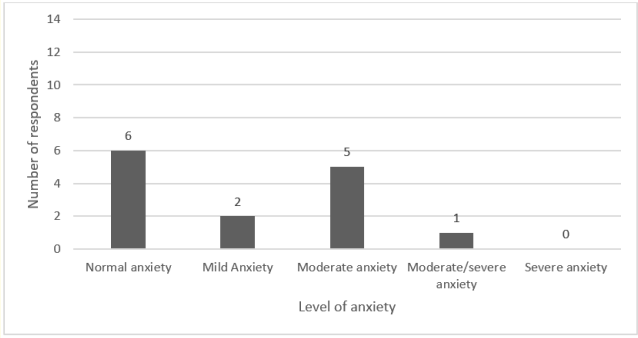

Figure 2: Level of anxiety among young tennis players before tournament.

Conclusions

- Comparing the physical condition of 12-14-year-old young tennis players before the European tennis tournament, it was found that boys have more knee problems compared to girls, and girls have more lower back and shoulder problems compared to boys.
- After comparing the quality of sleep of young tennis players aged 12-14 before the European tennis tournament, it was found that no significant connections were found between SDS categories and sleep disturbance when traveling neither between sleep - disorder breathing. A statistically significant connection found between SDS categories and performance issue when travelling. No performance issue correlates with 1st SDS category (none sleep problems).
- After determining the psycho-emotional state of young tennis players aged 12-14 before the European tennis tournament, it was found that mostly young tennis players experience normal anxiety and moderate anxiety, but there were no statistically significant differences between the research groups ($p < 0.05$).

Recommendations

- Conduct a similar study with a larger sample of participants.
- Accomplish further research comparing physical condition, quality of sleep and psychoemotional state of young tennis players aged 12-14 after tournament and compare the obtained results.

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