

## STUDY ON TEMPERAMENT AND THE OCCURRENCE OF JOINT INJURIES IN FOOTBALL-TENNIS

Ana-Maria RIZESCU<sup>1</sup>, Radu PREDOIU<sup>1\*</sup>

<sup>1</sup> National University of Physical Education and Sport, Faculty of Physical Education and Sport, Bucharest, Romania

\*Corresponding author: radu\_predoiu@yahoo.com

<https://doi.org/10.35189/dpeskj.2022.61.1.7>

**Abstract.** *The game of football-tennis appeared in 1922 in the former Czechoslovakia, being called at that time football over the rope. The first official rules were written in 1940. Football-tennis is a relatively young sport that has grown in popularity since the 1980s. This sports game can be played individually or in teams and includes five events: simples, doubles and triples, plus mixed doubles and triples (men + women). In a football-tennis match, the technique of kicking the ball differs from the techniques used in football and tennis, which indicates that the name of this sport as well as its theoretical and practical foundations are independent of football and tennis. Although not widely promoted in the media, football tennis is nationally represented in Romania by the National Championship (for seniors - both men and women - and juniors) and the Romanian Cup, and at international level, by the World Championships, European Championships and tournaments organised by sponsors on different occasions. The occurrence of joint injuries in the life of a non-athlete is not a drama, but the same cannot be said about an elite athlete who is forced to interrupt their sports activity for a shorter or longer period, depending on the severity of trauma. That is why we must first know the causes in order to prevent injuries. This paper provides an overview of the correlation between the type of temperament, age, seniority in sport and injury severity.*

**Keywords:** *football-tennis, performance, injury, temperament.*

### Introduction

Football-tennis appeared in 1922 in the former Czechoslovakia, when members of the Slavia Prague Football Club started playing a game they called football over the rope, because it originally required kicking the ball over a horizontally suspended rope that was later replaced by a net (Swiss Futnet Organization, n.d.).

In Romania, football-tennis has been played since the 1970s under the name of foot tennis, and the first eight editions of the Foot Tennis Balaci Cup were organised by Mr Sabino Frederico Tavares together with the Romanian Students' Union and the Foreign Students' Union in the 'Regie' campus between 1982 and 1989 (Federația Română de Football-tennis [Romanian Football-Tennis Federation], n.d.). Very interesting aspects regarding the (basic) technique of the game of football - tennis can be found in Romanian specialized literature - Grigore (2011). The author provides valuable information on kicking and heading the ball, from a standing position, from running, jumping, etc.

“Participation in sports that subject joints to high levels of impact and torsional loading increases the risk of joint injury and subsequent joint degeneration” (Buckwalter, 2003, p. 578), which can even lead to surgery. For this reason, injury prevention and the quality of recovery are crucially important for an athlete.

Injury rates are high among athletes, and psychosocial factors “such as personality, history of stressors and life event stress can influence injury occurrence” (Nippert & Smith, 2008, p. 399).

The occurrence of sports injuries is most often the result of overload or repetitive micro-trauma stemming from extrinsic or intrinsic factors (Renstrom & Johnson, 2012). Great champions talk about the importance of fluid and safe movements in competition, and the feeling of being completely in control (Pelin et al., 2020).

The literature suggests that experiencing an injury can act as a catalyst, allowing injured athletes to turn this event into an opportunity for their personal growth and development (Roy-Davis et al., 2017). This theory provides a number of interesting paths for future research and a detailed explanation of how sports injuries can contribute to growth and self-development experiences.

Injury occurrence causes great concern in sport, but especially in the case of elite athletes. Their assessment is based on injury incidence, severity or risk (Brooks & Fuller, 2012). Less known are the following issues: gender-specific differences in epidemiology, intrinsic and extrinsic risk factors and the outcomes of these conditions (trauma) by gender, but understanding them can improve clinical management and return to play after injury (Lin et al., 2018).

Age, gender, injury history, psychological and psychosocial stressors as well as general mental ability are factors that predispose to trauma. Certain lesions (for example, sprains, strains and dislocations) tend to recur. However, the recurrence of previous lesions can be prevented if they are properly treated, but some individuals may be at higher risk in this regard due to their injury-prone biological characteristics (Taimela et al., 2012).

“Sports trainers, sports therapists, physiotherapists, medical staff and sports psychologists should be aware of psychological factors impacting on the injury experience when involved in an athlete’s rehabilitation.” (Walker et al., 2007, p. 174). Wiese and Weiss (1987) also believe that “psychological rehabilitation in response to physical injury is of primary concern to athletes, trainers, coaches, and sport psychologists” (p. 318). These authors make suggestions regarding the application of sport psychology principles when working with injured athletes.

Psychological concepts are developed for the use of sports coaches and psychologists (but not only). The concepts refer to the psychological characteristics of sports groups and successful and less successful athletes, their tension states, the role of mental health in sport and the importance of looking beyond conscious verbalisations in an attempt to understand the athlete’s behavior during both competitions and training (Morgan, 2013). Researchers (Pelin et al., 2018) discuss the importance of generating adaptive, effective behaviors in athletes, presenting different behaviour control techniques.

Most studies investigating the influence of psychological factors on sports injuries have used different methods to analyse the personality profiles of individual athletes. However, the results generally agree that psychological factors can influence the risk of injury in athletes (Junge, 2000).

Bjornstal et al. (2008) provide an integrated model encompassing “personal and situational moderating factors, as well as cognitive, emotional, and behavioral responses of athletes to sport injury” (p. 46).

In football-tennis, risk factors are involved in the progressive degeneration of fibro-cartilaginous structures (for example, a meniscus tear does not generally occur on a normal meniscal structure but on a degenerate one).

“Temperament is a set of relatively consistent and stable traits that are related to emotions and formal characteristics of behavior.” (Rogowska & Maszkowska, 2020) Temperament traits are crucial for the adaptation of an athlete’s behaviour during training and competitions.

Temperament, as a component of personality, is characterised by the strongest genetic determination, because it is the most accessible to knowledge, the most easily observable side of personality, being maximally constant throughout life. It was classified in relation to somatic aspects (weight, height, proportion between different body segments), physiological characteristics or depending on the upper nervous activity. The various temperamental typologies were addressed by Mitrache and Predoiu (2016).

The present paper is based on Jung’s typology that proposes the following classification of temperament: people can be predominantly extroverted (communicative, sociable, open), predominantly introverted (less sociable and communicative, reserved), while the intermediate types are considered ambivert.

## **Methodology**

### *Scope*

The purpose of this paper is to identify the type of temperament of football-tennis players included in the senior men’s and women’s national teams and the junior national team. We also aim to investigate possible correlations between athletes’ temperament, age, seniority in sport and severity of joint injuries.

### *Participants*

The research participants were Romanian football-tennis players of the senior national teams (8 women and 8 men) and the junior national team (7 males). The age of female athletes ranges from 18 to 38 years, and their seniority in this sport is between 3 and 21 years, while the age of male athletes ranges from 23 to 50 years, and their seniority in this sport is between 7 and 28 years. Regarding juniors, their age ranges from 16 to 18 years, and their seniority in football-tennis is between 3 and 6 years.

It should be mentioned that the senior men’s and women’s teams have been ranked first at the World Championships (WC) and European Championships (EC) that take place every 2 years (even years for WC and odd years for EC) since 2012 until now. Juniors have also got the first place since 2014 up to the present.

### *Instruments*

The athletes’ temperament was investigated using The Temperament Self-Assessment Questionnaire. The medical records of players were also consulted.

a) The Temperament Self-Assessment Questionnaire (adapted after Minulescu, 2012) is based on Jung's typology, which describes eight temperamental types: introverted thinking (IT), introverted feeling (IF), introverted sensation (IS), introverted intuition (IN), extroverted thinking (ET), extroverted feeling (EF), extroverted sensation (ES) and extroverted intuition (EI). We mention that this temperamental typology and the eight types of temperament have been approached and described in several scientific research papers, for example by Predoiu et al. (2021).

Players were presented four situations, each with eight commonly encountered response options. Their task was to assess to what extent each of the situations suited them best. The five response options were: 1 = Never; 2 = Very rarely; 3 = Sometimes; 4 = Often; 5 = Always.

The score for introverted temperament is obtained by summing up the following four temperamental types: introverted thinking (IT) + introverted feeling (IF) + introverted sensation (IS) + introverted intuition (IN). The score for extroverted temperament is obtained by summing up the following four temperamental types: extroverted thinking (ET) + extroverted feeling (EF) + extroverted sensation (ES) + extroverted intuition (EN).

We present below the four situations specific to the Temperament Self-Assessment Questionnaire (adapted after Minulescu, 2012), as well as the first response option (as an example) for each situation:

1) I have to perform a free activity with my teammates. I have the freedom to do whatever I want.

1. I would imagine various possibilities and, before making a decision, I would wait to see what that day will bring.

2) I am in the training hall, the fire alarm is sounding and I can smell smoke.

9. I would explore all possibilities of rescue and act as soon as possible.

3) I am involved in a controversial discussion with a colleague about something that I want to ask them to do, but that person openly disagrees with me during training.

17. Before acting, I would consider my colleague's arguments and weigh the facts.

4) My team's coach gives me the task to make a proposal to improve the working conditions in the training hall.

25. I would clarify my objectives and plan step by step the proposed approach.

b) The assessment of medical records focused on the traumatic history of the lower limbs. Depending on injury severity/recurrence, we developed (in collaboration with the specialist doctor) a scale of 0 to 5 as follows: 0 = no history of trauma; 1 = very mild trauma; 2 = minor trauma; 3 = moderate trauma; 4 = recurrent trauma of medium severity; 5 = severe recurrent trauma.

### *Procedure*

The research was conducted between November 2019 and July 2020, during the COVID-19 pandemic. The participants only sporadically performed outdoor training in Carol Park in Bucharest or, whenever possible, in the Sports Games Hall of the National

University of Physical Education and Sport in Bucharest. The temperament questionnaire was administered online.

Athletes were included in the research after obtaining their informed consent (or informed parental consent, in the case of juniors). They knew the objectives of the research, and the confidentiality of personal data and those recorded during the investigations was ensured.

**Results**

In Table 1, we refer only to the senior women’s national football-tennis team, mentioning the players’ age, seniority in sport (individually and arithmetic mean), predominant temperament (extroverted or introverted), type of injury suffered throughout the practice of this sport, but also the score/points for each participant.

The predominant temperament of senior female athletes is extroverted.

Table 1. *Senior women’s national team*

| Item no. | Age (years) | Seniority in sport (years) | Predominant temperament | Injury  |                       |
|----------|-------------|----------------------------|-------------------------|---|-----------------------|
|          |             |                            |                         | Type de injury  | Injury severity score |
| 1        | 26          | 16                         | extroverted             | 1. Meniscus injury and loss of synovial fluid<br>2. Grade 2 left ankle sprain<br>3. Tibial-tarsal tear            | 5                     |
| 2        | 26          | 10                         | extroverted             | 1. Grade 1 right ankle sprain<br>2. Adjacent cyst of the medial head of the gastrocnemius                         | 3                     |
| 3        | 20          | 6                          | introverted             | -   | 0                     |
| 4        | 30          | 17                         | extroverted             | 1. Grade 2 right ankle sprain   | 2                     |
| 5        | 23          | 10                         | extroverted             | 1. Grade 1 left ankle sprain  | 1                     |
| 6        | 38          | 21                         | extroverted             | 1. Complete, probably sub-acute/chronic tear of the anterior cruciate ligament in the left knee; it was operated. | 5                     |
| 7        | 21          | 5                          | introverted             | -   | 0                     |
| 8        | 18          | 3                          | extroverted             | -   | 0                     |
|          | <b>25.3</b> | <b>11.0</b>                |                         |   | <b>2.0</b>            |

Table 2. *Temperament of senior female football-tennis players*

| Type of temperament |    |    |    |             |             |    |    |    |             | Differences |
|---------------------|----|----|----|-------------|-------------|----|----|----|-------------|-------------|
| Extroverted         |    |    |    | Total score | Introverted |    |    |    | Total score |             |
| ET                  | EF | ES | EN |             | IT          | IF | IS | IN |             |             |
| 15                  | 12 | 17 | 18 | <b>62</b>   | 19          | 10 | 16 | 14 | <b>59</b>   | 3           |
| 16                  | 13 | 17 | 16 | <b>62</b>   | 18          | 12 | 13 | 14 | <b>57</b>   | 5           |
| 13                  | 16 | 18 | 13 | <b>60</b>   | 15          | 16 | 18 | 15 | <b>64</b>   | 4           |
| 16                  | 15 | 16 | 14 | <b>61</b>   | 18          | 13 | 12 | 14 | <b>57</b>   | 4           |
| 20                  | 18 | 20 | 18 | <b>76</b>   | 19          | 15 | 16 | 19 | <b>69</b>   | 7           |
| 16                  | 19 | 13 | 15 | <b>63</b>   | 18          | 8  | 15 | 12 | <b>53</b>   | 10          |

|            |            |            |            |            |            |            |            |            |            |    |
|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|----|
| 10         | 15         | 17         | 12         | <b>54</b>  | 14         | 18         | 13         | 11         | <b>56</b>  | 2  |
| 13         | 18         | 13         | 8          | <b>52</b>  | 11         | 9          | 8          | 13         | <b>41</b>  | 11 |
| <b>119</b> | <b>126</b> | <b>131</b> | <b>114</b> | <b>490</b> | <b>132</b> | <b>101</b> | <b>111</b> | <b>112</b> | <b>456</b> |    |

The type of predominant temperament for each athlete was determined based on the difference in score between the two fundamental orientations, namely introversion and extroversion (Table 2). If the sum of points for the four extroverted temperamental types is higher than the sum of points for the four introverted temperamental types, then the athletes have a predominantly extroverted temperament, otherwise their temperament is predominantly introverted.

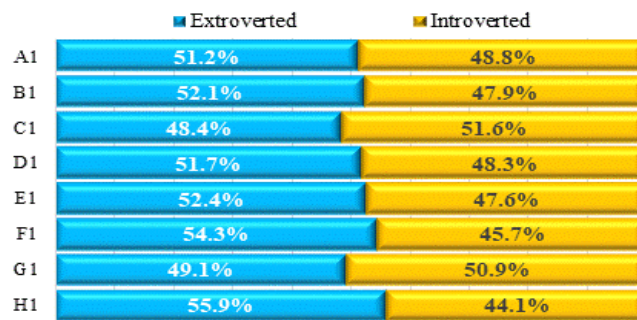


Figure 1. Temperament of senior female players as a percentage

Figure 1 shows that, in percentage terms, most female athletes in the senior national team are predominantly extroverted, except for two players whose temperament is predominantly introverted (however, in the case of athlete G1, we can talk about an ambivert temperament).

*Analysis of the four extroverted types of temperament*

In the senior women’s national team, the score for each type of temperament is represented in points (Figure 2) and as a percentage (Figure 3).

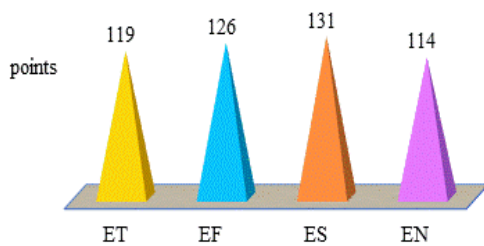


Figure 2. Points - Extroverted temperament

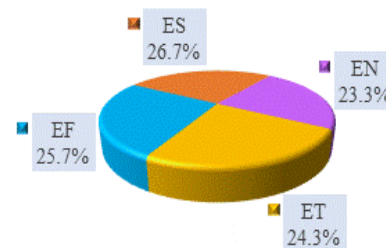


Figure 3. Percentage - Extroverted temperament

It can be seen that the ES (extroverted sensation) type of temperament is predominant with 131 points, which represents 26.7% of the total score, followed by the EF (extroverted feeling) type of temperament with 126 points, representing 25.7% of the total score. In the third and fourth positions, we find the ET (extroverted thinking) and EN

(extroverted intuition) types of temperament with 119 points (24.3%) and 114 points (23.3%), respectively.

*Analysis of the four introverted types of temperament*

The score for each type of temperament is represented in points (Figure 4) and as a percentage (Figure 5).

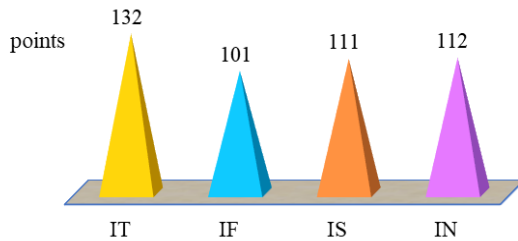


Figure 4. Points - Introverted temperament

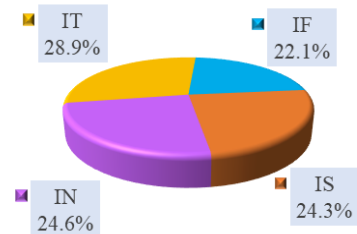


Figure 5. Percentage - Introverted temperament

The predominant temperamental type is IT (introverted thinking) with 132 points (28.9%), followed by IN (introverted intuition) with 112 points (24.6%). In the third and fourth positions, we find the IS (introverted sensation) and IF (introverted feeling) types of temperament with 111 points (24.3%) and 101 points (22.1%), respectively.

The share of these two fundamental orientations (extroversion and introversion) in the senior women’s national team is 51.8% (490 points) for extroversion and 48.2% (456 points) for introversion, as shown in Figures 6 and 7.

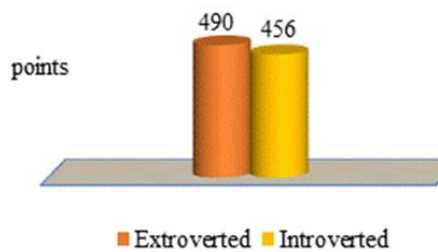


Figure 6. Points - Introverted and extroverted types of temperament

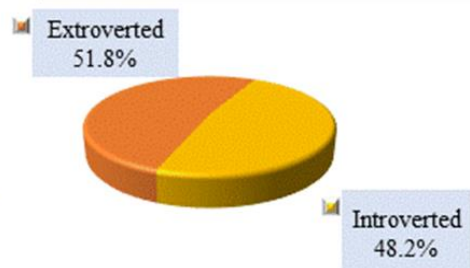


Figure 7. Percentage - Introverted and extroverted types of temperament

Regarding the severity of trauma in the senior women’s team, the group average was 2, and individual scores ranged between 0 (no history of trauma) and 5 (Figure 8).

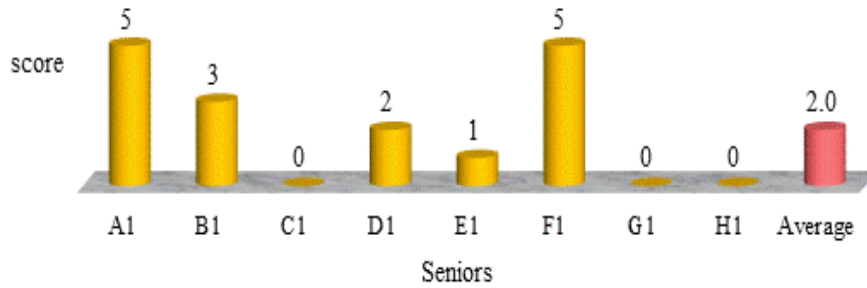


Figure 8. Severity of trauma in the senior women's team

The mean values and standard deviations for age, seniority in sport and injury severity score are shown in Table 3.

Table 3. Mean values and standard deviations for the parameters included in the correlation – Senior women's national team

| Parameters included in the correlation | Mean | Std. Deviation |
|--|------|----------------|
| Age                                    | 25.3 | 6.43           |
| Seniority in sport                     | 11.0 | 6.41           |
| Injury severity                        | 2.0  | 2.14           |

Table 4. Correlations between age, seniority in sport and injury severity in the senior women's national team

| Correlation        |   | Age     | Seniority in sport | Injury severity |
|--------------------|---|---------|--------------------|-----------------|
| Age                | r | 1       | 0.939**            | 0.800*          |
|                    | p |         | 0.001              | 0.017           |
| Seniority in sport | r | 0.939** | 1                  | 0.865**         |
|                    | p | 0.001   |                    | 0.006           |
| Injury severity    | r | 0.800*  | 0.865**            | 1               |
|                    | p | 0.017   | 0.006              |                 |

Note: r - Spearman's correlation coefficient; p - significance level; \* Correlation is significant at  $p < 0.05$  (two-tailed); \*\* Correlation is significant at the 0.01 (two-tailed) significance level.

According to the data shown in Table 4, age correlates positively and significantly with seniority in sport at the 0.001 significance level. The correlation coefficient is  $r = 0.939$ , and the significance threshold is  $p = 0.001$ . Age also correlates positively and significantly with injury severity at the 0.05 significance level. The correlation coefficient is  $r = 0.800$ , and the significance threshold is  $p = 0.017$ .

Seniority in sport correlates positively and significantly with injury severity at the 0.01 significance level. The correlation coefficient is  $r = 0.865$  ( $p = 0.006$ ).



Table 5. *Correlation between injury severity and types of temperament in the senior women's team*

| Types of temperament       | Correlation    | Injury severity |
|----------------------------|----------------|-----------------|
| Extroverted thinking - ET  | r              | 0.385           |
|                            | p (two-tailed) | 0.346           |
| Extroverted feeling - EF   | r              | -0.268          |
|                            | p (two-tailed) | 0.521           |
| Extroverted sensation - ES | r              | -0.252          |
|                            | p (two-tailed) | 0.547           |
| Extroverted intuition - EN | r              | 0.622           |
|                            | p (two-tailed) | 0.099           |
| Introverted thinking - IT  | r              | 0.696           |
|                            | p (two-tailed) | 0.055           |
| Introverted feeling - IF   | r              | -0.660          |
|                            | p (two-tailed) | 0.075           |
| Introverted sensation - IS | r              | 0.259           |
|                            | p (two-tailed) | 0.535           |
| Introverted intuition - IN | r              | -0.140          |
|                            | p (two-tailed) | 0.741           |

Table 5 shows that there are no significant correlations between the severity of trauma and the types of temperament. However, we highlight important connections between injury severity and the following temperamental types (the significance threshold is relatively close to 0.05, and the sample is small): introverted thinking ( $r = 0.696$ ,  $p = 0.055$ ), introverted feeling ( $r = -0.660$ ,  $p = 0,075$ ) and extroverted intuition ( $r = 0.622$ ,  $p = 0.099$ ).

Table 6. *Senior men's national team*

| Item no.    | Age (years) | Seniority in sport (years) | Predominant temperament | Injury  |                       |
|-------------|-------------|----------------------------|-------------------------|---|-----------------------|
|             |             |                            |                         | Type de injury  | Injury severity score |
| 1           | 25          | 13                         | introverted             | 1. Left lumbar sciatica<br>2. Grade 1 right ankle sprain; it was operated | 4                     |
| 2           | 32          | 18                         | extroverted             | -   | 0                     |
| 3           | 34          | 17                         | introverted             | 1. Partial tear of the anterior cruciate ligament in the left knee        | 2                     |
| 4           | 50          | 28                         | extroverted             | 1. Meniscus injury<br>2. Grade 2 left ankle sprain                        | 4                     |
| 5           | 23          | 7                          | extroverted             | -   | 0                     |
| 6           | 23          | 8                          | extroverted             | 1. Grade 1 muscle tear of the biceps femoris - lower limb                 | 1                     |
| 7           | 42          | 10                         | extroverted             | 1. Meniscus injury  | 3                     |
| 8           | 24          | 7                          | extroverted             | -   | 0                     |
| <b>Mean</b> | <b>31.6</b> | <b>13.5</b>                |                         |   | <b>1.8</b>            |

In Table 6, we refer only to the senior men's national football-tennis team, mentioning the players' age, seniority in sport (individually and arithmetic mean), predominant temperament (extroverted or introverted), type of injury suffered throughout the practice of this sport, but also the score/points for each participant.

The predominant temperament of senior male athletes is extroverted.

Table 7. The temperament of senior male football-tennis players

|            | Type of temperament |            |            |             |             |            |            |            | Total score | Differences |
|------------|---------------------|------------|------------|-------------|-------------|------------|------------|------------|-------------|-------------|
|            | Extroverted         |            |            |             | Introverted |            |            |            |             |             |
| ET         | EF                  | ES         | EN         | Total score | IT          | IF         | IS         | IN         | Total score |             |
| 18         | 18                  | 17         | 16         | <b>69</b>   | 18          | 20         | 18         | 16         | <b>72</b>   | -3          |
| 17         | 13                  | 18         | 16         | <b>64</b>   | 18          | 13         | 17         | 13         | <b>61</b>   | 3           |
| 14         | 15                  | 20         | 13         | <b>62</b>   | 17          | 18         | 17         | 15         | <b>67</b>   | -5          |
| 15         | 16                  | 17         | 18         | <b>66</b>   | 16          | 14         | 17         | 14         | <b>61</b>   | 5           |
| 16         | 14                  | 18         | 17         | <b>65</b>   | 19          | 12         | 14         | 11         | <b>56</b>   | 9           |
| 16         | 12                  | 18         | 17         | <b>63</b>   | 19          | 9          | 14         | 13         | <b>55</b>   | 8           |
| 17         | 15                  | 16         | 20         | <b>68</b>   | 20          | 14         | 14         | 17         | <b>65</b>   | 3           |
| 16         | 18                  | 20         | 16         | <b>70</b>   | 15          | 16         | 15         | 16         | <b>62</b>   | 8           |
| <b>129</b> | <b>121</b>          | <b>144</b> | <b>133</b> | <b>527</b>  | <b>142</b>  | <b>116</b> | <b>126</b> | <b>115</b> | <b>499</b>  |             |

The type of predominant temperament for each athlete was determined based on the difference in score between the two fundamental orientations, namely introversion and extroversion (Table 7). If the sum of points for the four extroverted temperamental types is higher than the sum of points for the four introverted temperamental types, then the athletes have a predominantly extroverted temperament, otherwise their temperament is predominantly introverted.

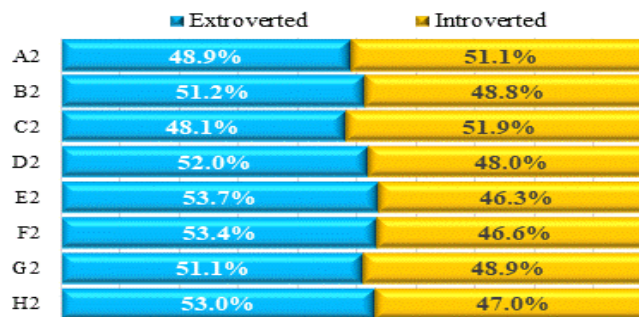


Figure 9. Temperament of senior male players as a percentage

Figure 9 shows that, in percentage terms, most male athletes in the senior national team are predominantly extroverted, except for two players whose temperament is predominantly introverted (however, in the case of athletes A2, B2 and G2, we can talk about an ambivert temperament).

*Analysis of the four extroverted types of temperament*

In the senior men’s national team, the score for each type of temperament is represented in points (Figure 10) and as a percentage (Figure 11).

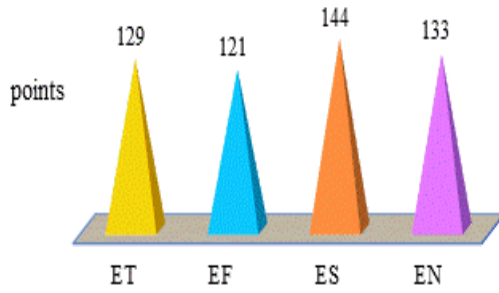


Figure 10. Points - Extroverted temperament

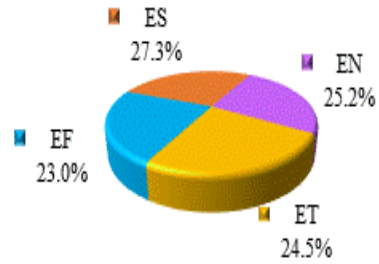


Figure 11. Percentage - Extroverted temperament

It can be noted that the ES (extroverted sensation) type of temperament is predominant with 144 points, which represents 27.3% of the total score, followed by the EN (extroverted intuition) type of temperament with 133 points, representing 25.2% of the total score. In the third and fourth positions, we find the ET (extroverted thinking) and EF (extroverted sensation) types of temperament with 129 points (24.5%) and 121 points (23.0%), respectively.

*Analysis of the four introverted types of temperament*

The score for each type of temperament is represented in points (Figure 12) and as a percentage (Figure 13).

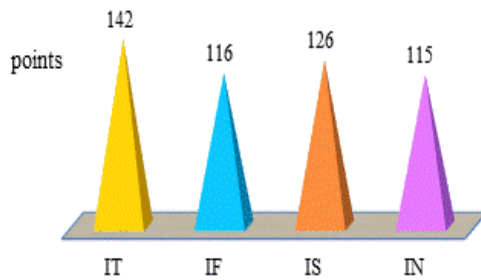


Figure 12. Points - Introverted temperament

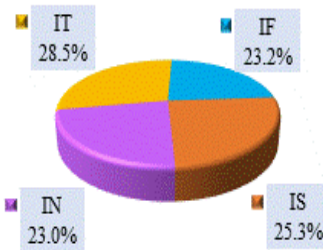


Figure 13. Percentage - Introverted temperament

The predominant temperamental type is IT (introverted thinking) with 142 points (28.5%), followed by IS (introverted sensation) with 126 points (25.3%). In the third and fourth positions, we find the IF (introverted feeling) and IN (introverted sensation) types of temperament with 116 points (23.2%) and 115 points (23.0%), respectively.

The share of these two fundamental orientations (extroversion and introversion) in the senior men’s national team is 51.4% (527 points) for extroversion and 48.6% (499 points) for introversion, as shown in Figures 14 and 15.

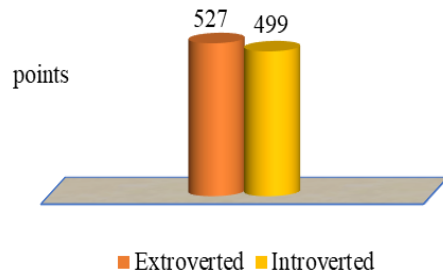


Figure 14. Points - Introverted and extroverted types of temperament

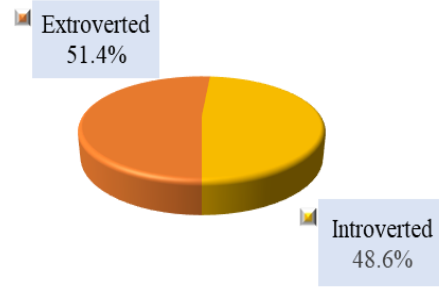


Figure 15. Percentage - Introverted and extroverted types of temperament

As regards the severity of trauma in the senior men’s team, the group average was 1.8, and individual scores ranged between 0 (no history of trauma) and 4 (Figure 16).

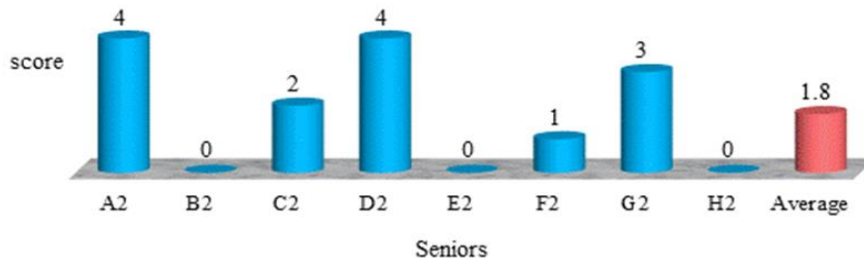


Figure 16. Severity of trauma in the senior men’s team

The mean values and standard deviations for age, seniority in sport and injury severity score are shown in Table 8.

Table 8. Mean values and standard deviations for the parameters included in the correlation – Senior men’s national team

| Parameters included in the correlation | Mean | Std. Deviation |
|--|------|----------------|
| Age                                    | 31.6 | 10.01          |
| Seniority in sport                     | 13.5 | 7.27           |
| Injury severity                        | 1.8  | 1.75           |

Table 9. Correlations between age, seniority in sport and injury severity in the senior men’s national team

| Correlation        |   | Age   | Seniority in sport | Injury severity |
|--------------------|---|-------|--------------------|-----------------|
| Age                | r | 1     |                    |                 |
|                    | p |       |                    |                 |
| Seniority in sport | r | 0.778 | 1                  |                 |
|                    | p | 0.023 |                    |                 |
| Injury severity    | r | 0.604 | 0.527              | 1               |
|                    | p | 0.112 | 0.180              |                 |

Note: r - Spearman’s correlation coefficient; p - significance level.

According to the data shown in Table 9, age correlates positively and significantly with seniority in sport. For the senior men’s team, there are no significant correlations between injury severity, age and seniority in sport.

Table 10. *Correlation between injury severity and types of temperament in the senior men’s team*

| Types of temperament       | Correlation    | Injury severity |
|----------------------------|----------------|-----------------|
| Extroverted thinking - ET  | r              | 0.082           |
|                            | p (two-tailed) | 0.847           |
| Extroverted feeling – EF   | r              | 0.423           |
|                            | p (two-tailed) | 0.296           |
| Extroverted sensation - ES | r              | -0.576          |
|                            | p (two-tailed) | 0.135           |
| Extroverted intuition - EN | r              | 0.255           |
|                            | p (two-tailed) | 0.542           |
| Introverted thinking – IT  | r              | 0.024           |
|                            | p (two-tailed) | 0.954           |
| Introverted feeling – IF   | r              | 0.471           |
|                            | p (two-tailed) | 0.239           |
| Introverted sensation - IS | r              | 0.464           |
|                            | p (two-tailed) | 0.247           |
| Introverted intuition – IN | r              | 0.521           |
|                            | p (two-tailed) | 0.186           |

Table 10 shows that there are no significant correlations between the severity of trauma and the types of temperament. However, we emphasise an important connection between injury severity and the extroverted sensation type of temperament, with  $r = -0.576$ ,  $p = 0.135$  (the significance threshold is not too far from 0.05, and the sample is small).

Table 11. *Junior national team*

| Item no.    | Age (years) | Seniority in sport (years) | Predominant temperament | Injury                        |                       |
|-------------|-------------|----------------------------|-------------------------|-------------------------------|-----------------------|
|             |             |                            |                         | Type of injury                | Injury severity score |
| 1           | 18          | 5                          | extroverted             | 1. Grade 1 right ankle sprain | 1                     |
| 2           | 16          | 4                          | extroverted             | -                             | 0                     |
| 3           | 17          | 5                          | extroverted             | -                             | 0                     |
| 4           | 16          | 5                          | extroverted             | -                             | 0                     |
| 5           | 17          | 3                          | extroverted             | 1. Grade 1 left ankle sprain  | 1                     |
| 6           | 18          | 6                          | extroverted             | 1. Grade 2 left ankle sprain  | 2                     |
| 7           | 18          | 5                          | extroverted             | -                             | 0                     |
| <b>Mean</b> | <b>17.1</b> | <b>4.7</b>                 |                         |                               | <b>0.6</b>            |

In Table 11, we refer only to the junior national football-tennis team, mentioning the players’ age, seniority in sport (individually and arithmetic mean), predominant temperament (extroverted or introverted), type of injury suffered throughout the practice of this sport, but also the score/points for each participant.

The predominant temperament of junior athletes is extroverted.

Table 12. *Temperament of junior football-tennis players*

| Type of temperament |            |            |            |             |             |            |            |           |             |             |
|---------------------|------------|------------|------------|-------------|-------------|------------|------------|-----------|-------------|-------------|
| Extroverted         |            |            |            |             | Introverted |            |            |           |             | Differences |
| ET                  | EF         | ES         | EN         | Total score | IT          | IF         | IS         | IN        | Total score |             |
| 18                  | 14         | 19         | 18         | <b>69</b>   | 18          | 20         | 18         | 16        | <b>72</b>   | 3           |
| 16                  | 17         | 17         | 12         | <b>62</b>   | 18          | 13         | 17         | 13        | <b>61</b>   | 1           |
| 20                  | 20         | 20         | 20         | <b>80</b>   | 17          | 18         | 17         | 15        | <b>67</b>   | 13          |
| 16                  | 12         | 17         | 12         | <b>57</b>   | 16          | 14         | 17         | 14        | <b>61</b>   | 4           |
| 15                  | 20         | 20         | 17         | <b>72</b>   | 19          | 12         | 14         | 11        | <b>56</b>   | 16          |
| 16                  | 14         | 17         | 16         | <b>63</b>   | 19          | 9          | 14         | 13        | <b>55</b>   | 8           |
| 17                  | 15         | 17         | 15         | <b>64</b>   | 20          | 14         | 14         | 17        | <b>65</b>   | 1           |
| <b>118</b>          | <b>112</b> | <b>127</b> | <b>110</b> | <b>467</b>  | <b>127</b>  | <b>100</b> | <b>111</b> | <b>99</b> | <b>437</b>  |             |

The type of predominant temperament for each athlete was determined based on the difference in score between the two fundamental orientations, namely introversion and extroversion (Table 12). If the sum of points for the four extroverted temperamental types is higher than the sum of points for the four introverted temperamental types, then the athletes have a predominantly extroverted temperament, otherwise their temperament is predominantly introverted.

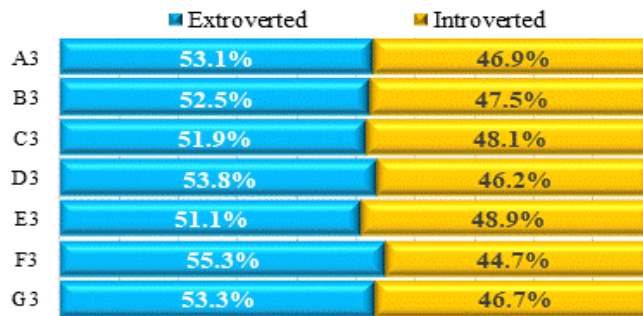


Figure 17. Temperament of junior players as a percentage

Figure 17 shows that, in percentage terms, all players in the junior national team are predominantly extroverted (however, in the case of athlete E3, we can talk about an ambivert temperament).

*Analysis of the four extroverted types of temperament*

In the junior national team, the score for each type of temperament is represented in points (Figure 18) and as a percentage (Figure 19).

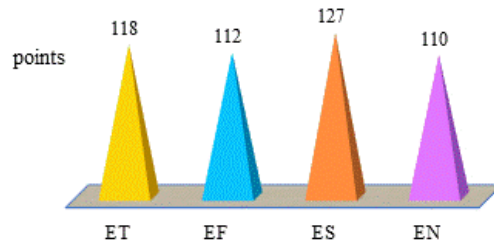


Figure 18. Points - Extroverted temperament

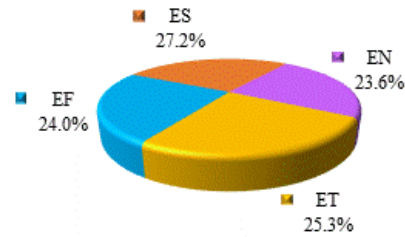


Figure 19. Percentage - Extroverted temperament

One can see that the ES (extroverted sensation) type of temperament is predominant with 127 points, which represents 27.2% of the total score, followed by the ET (extroverted thinking) type of temperament with 118 points, representing 25.3% of the total score. In the third and fourth positions, we find the EF (extroverted feeling) and EN (extroverted intuition) types of temperament with 112 points (24.0%) and 110 points (23.6%), respectively.

*Analysis of the four introverted types of temperament*

The score for each type of temperament is represented in points (Figure 20) and as a percentage (Figure 21).

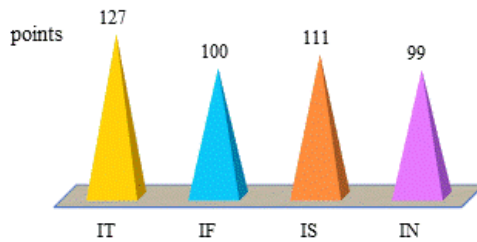


Figure 20. Points - Introverted temperament

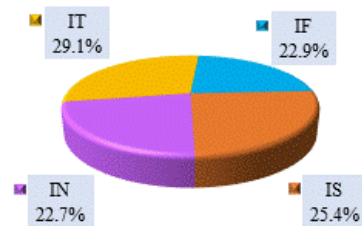


Figure 21. Percentage - Introverted temperament

The predominant temperamental type is IT (introverted thinking) with 127 points (29.1%), followed by IS (introverted sensation) with 111 points (25.4%). In the third and fourth positions, we find the IF (introverted feeling) and IN (introverted intuition) types of temperament with 100 points (22.9%) and 99 points (22.7%), respectively.

The share of these two fundamental orientations (extroversion and introversion) in the junior national team is 51.7% (467 points) for extroversion and 48.3% (437 points) for introversion, as shown in Figures 22 and 23.

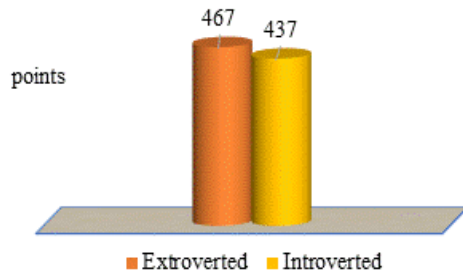


Figure 22. Points - Introverted and extroverted types of temperament

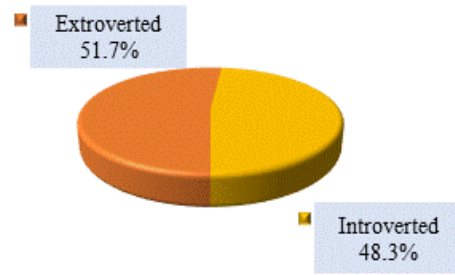


Figure 23. Percentage - Introverted and extroverted types of temperament

Regarding the severity of trauma in the junior national team, the group average was 0.6, and individual scores ranged between 0 (no history of trauma) and 2 (Figure 24).

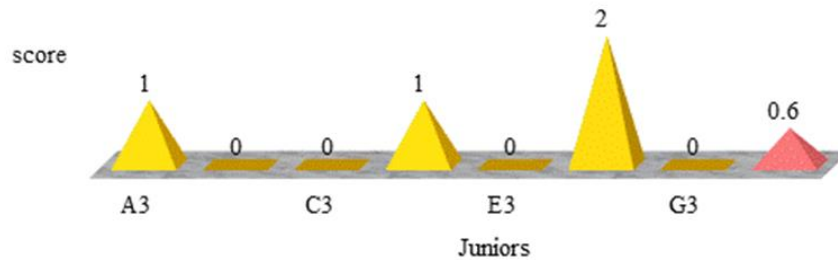


Figure 24. Severity of trauma in the junior national team

The mean values and standard deviations for age, seniority in sport and injury severity score are shown in Table 13.

Table 13. Mean values and standard deviations for the parameters included in the correlation – Junior national team

| Parameters included in the correlation | Mean | Std. Deviation |
|--|------|----------------|
| Age                                    | 17.1 | 0.90           |
| Seniority in sport                     | 4.7  | 0.95           |
| Injury severity                        | 0.6  | 0.79           |

Table 14. Correlations between age, seniority in sport and injury severity in the junior national team

| Correlation        |   | Age   | Seniority in sport | Injury severity |
|--------------------|---|-------|--------------------|-----------------|
| Age                | r | 1     |                    |                 |
|                    | p |       |                    |                 |
| Seniority in sport | r | 0.445 | 1                  |                 |
|                    | p | 0.317 |                    |                 |
| Injury severity    | r | 0.336 | 0.700              | 1               |
|                    | p | 0.461 | 0.080              |                 |

Note: r - Spearman's correlation coefficient; p - significance level; \* Correlation is significant at  $p < 0.05$ .



According to the data shown in Table 14, injury severity does not correlate significantly with seniority in sport and age ( $p > 0.05$ ).

Table 15. *Correlation between injury severity and types of temperament in the junior team*

| Types of temperament       | Correlation    | Injury severity |
|----------------------------|----------------|-----------------|
| Extroverted thinking - ET  | r              | -0.181          |
|                            | p (two-tailed) | 0.698           |
| Extroverted feeling - EF   | r              | -0.681          |
|                            | p (two-tailed) | 0.092           |
| Extroverted sensation - ES | r              | -0.372          |
|                            | p (two-tailed) | 0.411           |
| Extroverted intuition - EN | r              | -0.061          |
|                            | p (two-tailed) | 0.897           |
| Introverted thinking - IT  | r              | -0.090          |
|                            | p (two-tailed) | 0.848           |
| Introverted feeling - IF   | r              | -0.296          |
|                            | p (two-tailed) | 0.520           |
| Introverted sensation - IS | r              | -0.051          |
|                            | p (two-tailed) | 0.913           |
| Introverted intuition - IN | r              | -0.059          |
|                            | p (two-tailed) | 0.899           |

Table 15 shows that there are no significant correlations between the severity of trauma and the types of temperament. However, we highlight an important connection between injury severity and the extroverted sensation type of temperament, with  $r = -0.681$ ,  $p = 0.092$  (the significance threshold is relatively close to 0.05, and the sample is small).

## Discussion and conclusion

Exposure to trauma is nowadays pervasive in societies around the world, especially among high-level athletes. In order to understand the risk and protective factors for trauma and its consequences, a public health framework should be established to generate opportunities for prevention (Magruder et al., 2017).

Sports injuries relate to a multicausal and complex phenomena (Alahmad et al., 2020; Meeuwisse & Hagel, 2010). Within sports practice, injuries may occur as a result of intentional or unintentional actions (Meeuwisse et al., 2007). Among the factors related with the injuries' occurrence, specialized literature mentions the biomedical, nutritional, dispositional, or postural ones (Aicale et al., 2018). The role of psychological factors is also very important in the risk of athlete injuries (Hausken-Sutter et al., 2021; Slimani et al., 2018; Ivarsson et al., 2017). Stress represents a decisive factor in the origin of injuries - according to The Stress and Injury Model (Andersen & Williams, 1998). The link between temperament and the risk of athlete injuries was less investigated.

When talking about the current findings, most athletes playing in the national football-tennis team experienced joint injuries to their lower limbs. Following the questionnaire administered for the identification of temperament, it has been found that only four players in the national football-tennis team are predominantly introverted, more precisely, two

senior male athletes and two senior female athletes (however, in the case of one female player and three male players, we can talk about an ambivert temperament).

Predominantly introverted athletes (females) did not experience joint injuries (unlike extroverted female athletes). This can be explained (in the case of female athletes) by the specificity of the predominantly extroverted temperament, which is characterised by a greater fighting spirit and more initiative in the game, and the specificity of athletes who have a predominantly introverted temperament: they are more patient, calm, meticulous and prudent in everything they do.

The severity of trauma is higher in senior male and female players compared to juniors. These results are in line with Olmedilla Zafra et al. (2022) findings, which assert that "considering the age variable, the athletes aged 18 years old or over show a higher prevalence than the group under 18 years old". The mentioned authors argue, also, that a higher prevalence of injuries was found in the traditional football group than in the indoor football group.

The present study results underline that in the senior men's and women's national teams, there is a significant correlation between age and seniority in sport, while age and seniority in sport correlate with injury severity only in the case of senior female athletes.

The originality of this paper is that the research participants are athletes playing in the national football-tennis team, an aspect that we consider to have a big impact on this sport, which is not very developed and promoted in Romania but has major and notable results.

The research findings highlight that there is an important correlation between certain types of temperament and the severity of joint injuries; it is true that this connection is statistically insignificant, but the sample is small, the statistical power is low and entails the risk of a type 2 ( $\beta$ ) statistical error, and the significance threshold is relatively close to 0.05. More precisely, in the case of senior women, we emphasise the following temperamental types: introverted thinking, introverted feeling and extroverted intuition, in the case of senior men we notice the extroverted sensation type of temperament, and in the case of juniors, we can talk about the extroverted feeling type of temperament. Specialists should pay particular attention to these temperamental types in the process of preventing joint injuries in athletes.

In the future, research could also address other temperamental typologies to try to capture what is characteristic of athletes with a higher risk of injury. At the same time, researchers could address other mental phenomena such as instrumental and stimulating risk in sport (Makarowski et al., 2021) and use larger samples of participants in order to provide a specific picture of athletes prone to sports injuries. Not least, the results (in the context of aspects related to injuries and trauma), must be related to indicators such as: the competitive system, the style of play, the technique of kicking, with the head, from running, from jumping, the training surfaces or effort capacity.

## References

- Aicale, R., Tarantino, D., & Mafulli, N. (2018). Oversuse injuries in sport: A comprehensive overview. *Journal of Orthopaedic Surgery and Research*, 13(1): 309. DOI: 10.1186/s13018-018-1017-5

- Alahmad, T. A., Kearney, P., & Cahalan, R. (2020). Injury in elite women's soccer: A systematic review. *The Physician and Sportsmedicine*, 48(3), 259-265.  
DOI: 10.1080/00913847.2020.1720548
- Bjornstal, D. M. W., Smith A. M., Shaffer, S. M., & Morrey, M. A. (2008). An integrated model of response to sport injury: Psychological and sociological dynamics. *Journal of Applied Sport Psychology*, 10(1), 46-69. <https://doi.org/10.1080/10413209808406377>
- Brooks, J. H. M., & Fuller, C. W. (2012). The influence of methodological issues on the results and conclusions from epidemiological studies of sports injuries. *Sports Medicine*, 36(6), 459-472. <https://doi.org/10.2165/00007256-200636060-00001>
- Buckwalter, J. A. (2003). Sports, joint injury, posttraumatic osteoarthritis. *Journal of Orthopaedic & Physical Therapy*, 33(10), 578-588.  
<https://www.jospt.org/doi/10.2519/jospt.2003.33.10.578>
- Grigore, G. (2011). Fotbal Tennis [Football Tennis]. In G. Ghițescu, D. Badea, & G. Grigore (Eds), *Jocuri Sportive - streetball, rugby, tenis cu piciorul, fotbal în sală* [Sports games - streetball, rugby, football tennis, indoor football] (pp. 135-142). Discobolul.
- Ivarsson, A., Johnson, U., Andersen, M. B., Traanaeus, U., Stenling, A., & Lindwall, M. (2017). Psychosocial factors and sport injuries: Meta-analyses for prediction and prevention. *Sports Medicine*, 47(2), 353-365. DOI: 10.1007/s40279-016-0578-x
- Lin, C. Y., Casey, E., Herman, D. C., Katz, N., & Tenforde, A. S. (2018). Sex differences in common sports injuries. *PM & R*, 10(10), 1073-1082.  
<https://doi.org/10.1016/j.pmrj.2018.03.008>
- Federația Română de Football-tennis. (n.d.). *Istoric* [History].  
<http://www.frft-caj.ro/frft.php?lang=ro&pagina=1>
- Hausken-Sutter, S. E., Pringle, R., Schubring, A., Grau, S., & Barker-Ruchti, N. (2021). Youth sport injury research: A narrative review and the potential of interdisciplinarity. *BMJ Open Sport & Exercise Medicine*, 7: e000933.  
<http://dx.doi.org/10.1136/bmjsem-2020-000933>
- Junge, A. (2000). The influence of psychological factors on sports injuries. *The American Journal of Sports Medicine*, 28(5), 10-15. [https://doi.org/10.1177/28.suppl\\_5.s-10](https://doi.org/10.1177/28.suppl_5.s-10)
- Magruder, K. M., McLaughlin, K. A., & Elmore Borbon, D. L. (2017). Trauma is a public health issue. *European Journal of Psychotraumatology*, 8(1): 1375338.  
<https://doi.org/10.1080/20008198.2017.1375338>
- Makarowski, R., Piotrowski, A., Predoiu, R., Görner, K., Predoiu, A., Mitrache, G., Malinauskas, R., Vicente-Salar, N., Vazne, Z., Cherepov, E., Miklósi, M., Kovács, K., Pelin, R., Boe, O., Rawat, S., Deshpande, A., Plopa, M., & Plopa, W. (2021). The English-speaking, Hungarian, Latvian, Lithuanian, Romanian, Russian, Slovak, and Spanish adaptations of Makarowski's Stimulating and Instrumental Risk Questionnaire for martial arts athletes. *Archives of Budo*, 17, 1-33. WOS: 000663516800001
- Meeuwisse, W., & Hagel, B. (2010). The multicausality of injury - current concepts. *Sports Injury Research*, 16: 99. DOI:10.1093/acprof:oso/9780199561629.003.08
- Meewisse, W. T., Tyreman, H., Hagel, B., & Emery, C. (2007). A dynamic model of etiology in sport injury: the recursiveness of risk and causation. *Clinical Journal of Sport Medicine*, 17(3), 215-219. DOI: 10.1097/JSM.0b013e3180592a48
- Mitrache, G., & Predoiu, R. (2016). *Psihopedagogie* [Psychopedagogy]. Discobolul.
- Minulescu, M. (2012). *Temperamentul școlărilor. Dialogul temperamentelor: profesor și elev. Modul I – Inițiere* [School children's temperament. Temperament dialogue: teacher and student. Module I – Initiation]. Comunicare.ro.
- Morgan, W. P. (2013). Selected psychological considerations in sport. *Research Quarterly*, 45(4), 374-390. <https://doi.org/10.1080/10671315.1974.10615285>

- Nippert, A. H., & Smith, A. M. (2008). Psychologic stress related to injury and impact on sport performance. *Physical Medicine and Rehabilitation Clinics of North America*, 19(2), 399-418. <https://doi.org/10.1016/j.pmr.2007.12.003>
- Olmedilla Zafra, O., Martins, B., Ponseti-Verdaguer, F. J., Ruiz-Barquín, R., & García-Mas, A. (2022). It Is Not Just Stress: A Bayesian Approach to the Shape of the Negative Psychological Features Associated with Sport Injuries. *Healthcare*, 10(2): 236. <https://doi.org/10.3390/healthcare10020236>
- Pelin, F., Predoiu, R., Mittrache, G., & Predoiu, A. (2020). Mental features of top level athletes. *Discobolul – Physical Education, Sport and Kinetotherapy Journal*, 59(1), 5-14. <https://doi.org/10.35189/dpeskj.2020.59.1.1>
- Pelin, F., Predoiu, R., Mittrache, G., Predoiu, A., & Grigore, V. (2018). Generation of efficient behaviours in the case of performance athletes. *Discobolul - Physical Education, Sport and Kinetotherapy Journal*, 53(3), 31-38.
- Predoiu, R., Dumitru, E. Ș., Predoiu, A., Gheorghită, N., & Tudorancea, Ș. D. (2021). Temperament and emotional intelligence in the case of sports managers. *Discobolul – Physical Education, Sport and Kinetotherapy Journal*, 60(2), 170-181. <https://doi.org/10.35189/dpeskj.2021.60.2.9>
- Renstrom, P., & Johnson, R. J. (2012). Overuse injuries in sports. *Sports Medicine*, 2(9), 316-333. <https://doi.org/10.2165/00007256-198502050-00002>
- Rogowska, A., & Maszkowska, B. W. (2020). Examining temperament of physical education undergraduates. *Journal of Physical Education and Sport*, 20(S6), 3186-3193. <http://dx.doi.org/10.7752/jpes.2020.s6431>
- Roy-Davis, K., Wadey, R., & Evans, L. (2017). A grounded theory of sport injury-related growth. *Sport, Exercise and Performance Psychology*, 6(1), 35-52. <https://doi.org/10.1037/spy0000080>
- Slimani, M., Bragazzi, N. L., Znazen, H., Paravlic, A., Azaiez, F., & Tod, D. (2018). Psychosocial predictors and psychological prevention of soccer injuries: A systematic review and meta-analysis of the literature. *Physical Therapy in Sport*, 32, 293-300. DOI: 10.1016/j.ptsp.2018.05.006
- Swiss Futnet Organization. (n.d.). *All about futnet*. <https://www.futnet.ch/en/node/41>
- Taimela, S., Kujala, U. M., & Osterman, K. (2012). Intrinsic risk factors and athletic injuries. *Sports Medicine*, 9(4), 205-215. <https://doi.org/10.2165/00007256-199009040-00002>
- Walker, N., Thatcher, J., & Lavalley, D. (2007). Review: Psychological responses to injury in competitive sport: A critical review. *Perspectives in Public Health*, 127(4), 174-180. <https://doi.org/10.1177/1466424007079494>
- Wiese, D. M., & Weiss, M. R. (1987). Psychological rehabilitation and physical injury: Implications for the sportsmedicine team. *The Sport Psychologist*, 1(4), 318-330. <https://doi.org/10.1123/tsp.1.4.318>
- Williams, J. M., & Andersen, M. B. (1998). Psychosocial antecedents of sport injury: Review and critique of the stress and injury model'. *Journal of Applied Sport Psychology*, 10(1), 5-25. <https://doi.org/10.1080/10413209808406375>