

## Sports injuries in athletes with disabilities

Ivana Sretenović<sup>1</sup> , Goran Nedović<sup>1</sup> , and Srećko Potić<sup>2</sup> 

<sup>1</sup>University of Belgrade, Faculty of Special Education and Rehabilitation, Belgrade, Serbia

<sup>2</sup>High Medical College of Professional Studies “Milutin Milanković”, Belgrade, Serbia

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### Abstract

The aim of the study was to determine the type and localization of sports injuries in people with disabilities who play sports professionally or recreationally and to examine whether there was a difference in sports injuries between these two categories of para-athletes. The research sample consisted of 30 men with an average age of 40.96 years. The sample had two subsamples. The first group consisted of 13 respondents who participated in para-sports professionally. The second group comprised of 17 respondents who take part in para-sports recreationally. The respondents trained individual and team para-sports (parashooting, parataekwondo, paraswimming, paracycling, para-athletics, para-table tennis, sitting volleyball and wheelchair basketball). A questionnaire was created to gather overall demographic data, and a part of the Musculoskeletal Discomfort Form was used to localize musculoskeletal complaints. Descriptive statistics, measures of central tendency, the Mann-Whitney U test and Spearman's rank correlation coefficient were applied. The results showed that 76.6% of all para-athletes have suffered at least one injury, with most injuries occurring during training (63.3%). Shoulder trauma and soft tissue injuries were the most common. Both subsamples reported that they had experienced the most problems in the form of pain, discomfort and numbness in the neck and lower back. As far as people with disabilities are concerned, participation in para-sports carries inseparable and associated risks. Therefore, the data achieved in this study can be used in order to understand the risk factors leading to injury which are specific to para-athletes (disability-sport) and to develop injury prevention programs.

**Keywords:** para-athletes · professional para-sports · recreational para-sports · musculoskeletal injuries

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✉ Correspondence:  
Ivana Sretenović  
ivanasretenovic@fasper.bg.ac.rs

## Introduction

Exercising is becoming increasingly popular for people with disabilities and has numerous benefits. The benefits are reflected in improving motor and cognitive skills, maintaining and improving health, increasing the quality of life, and greater participation in everyday activities (Kljajić, Eminović, Arsić, & Trajković, 2018), then they can contribute to improving gait, muscle strength, and functional abilities (Sacks, Wu, Carter, & Karamitopoulos, 2022), better self-efficacy, self-determination, etc (Van de Vliet, 2012). Although exercising is beneficial, it also carries some risks for certain aspects of life (Martin, 2013). One particular health risk factor is related to the risk of musculoskeletal injuries, which require a quick and timely response to prevent additional and lasting consequences for people with disabilities. For people with disabilities, particularly those with permanent musculoskeletal and nervous system disorders, some additional risk factors lead to sports trauma or injury related to altered posture, the biomechanics of movement, and impaired neurological control of movement (Webborn, Willick, & Reeser, 2006). Sports injuries are relatively frequent. They occur as a result of trauma in varying degrees and can be acute and chronic, endogenous and exogenous (Timpka et al., 2014). Due to their frequency, as well as additional, secondary damage, several people with disabilities, whether recreational or professional athletes, have reduced or even stopped playing sports altogether (Fagher & Lexell, 2014). Various data on the prevalence and incidence of sports injuries in para-athletes can be found in the literature. According to recent studies, para-athletes have a higher prevalence and incidence of musculoskeletal injuries than athletes without disabilities, with the former being 40.8% and the latter being 1.43% of athletes with disabilities (Hirschmüller, 2020; Pinheiro et al., 2021). Current research suggests that injury patterns in athletes with disabilities are similar to non-disabled athletes (Ferrera & Peterson, 2000). The location of the injury depends on the kind of impairment and the sport. According to Ferrera and Peterson (2000), athletes who use a wheelchair are more prone to sustain upper extremity injuries than those with cerebral palsy, amputation of a lower extremity, or vision impairment. That is, para-athletes with cerebral palsy are more prone to soft tissue injuries in the knee, foot, and ankle, while para-athletes with amputations are more prone to lower back pain, and para-athletes in wheelchairs are more prone to osteoporotic fractures and shoulder girdle injuries (Sacks et al., 2022).

Although interest in sports for people with disabilities is increasing, para-athletes are still often left unnoticed in sports research and very little is known about the psychological factors that have an impact on injury risk or rehabilitation (McKay, Callaghan, Badenhorst, Runciman, & Derman, 2021).

The main aim of the study was to determine the type and location of sports injuries in people with disabilities who participated in sports professionally or as recreational para-athletes and to examine whether there was a difference in sports injuries between these two categories of para-athletes. Furthermore, an attempt has been made to determine whether there exists a correlation between injuries and certain variables.

## Method

The study sample consisted of 30 male para-athletes from the Republic of Serbia aged between 19 and 60 years (mean=40.96; SD=11.73). The sample was divided into two subsamples. The first group consisted of 13 (43.3%) respondents who practiced para-sports professionally, and the second group consisted of 17 (56.7%) respondents who practiced para-sports in their leisure time. We deal with individual and team para-sports, namely shooting, taekwondo, swimming, cycling, athletics, table tennis, sitting volleyball, and wheelchair basketball. The average number of years of participation in para-sports was 15.83 years (SD=8.20) (min=2, max=33). Five (16.7%) respondents trained daily, three respondents (10%) trained five to six times a week, eight respondents (26.7%) trained three to four times a week, and 14 respondents (46.7%) trained once or twice a week.

A questionnaire was created for the study to gather general demographic data and data on sports injuries. A part of the Musculoskeletal Discomfort Form was used for localized musculoskeletal complaints, which is based on the Nordic Musculoskeletal Questionnaire (NMQ, Kuorinka et al., 1987) and includes the assessment of complaints in the neck, shoulders, upper back, elbows, wrists, lower back, hips/thighs, knees and ankles/feet. It can be used as a questionnaire or as a structured interview. This questionnaire is characterized by high validity (range 80–100%) and reliability (range 78–100%) (Zwierzchowska, Gawel, Gomez, & Zebrowska, 2023).

This study was approved in advance by the Decision of the Professional Ethics Board of the High Medical College of Professional Studies

“Milutin Milankovic”, Belgrade, number II-1915-5 dated 19.1.2024. Each participant voluntarily provided written informed consent before participating.

IBM SPSS Statistics for Windows, version 22.0 was the statistical software used for all statistical analyses. Measures of descriptive statistics (frequency and percentages), the Mann-Whitney U test, and Spearman's rank correlation coefficient were used.

## Results

This section presents and analyzes the results related to the structure of respondents in terms of type, location, and other characteristics related to sports injuries. In addition, the distribution of responses to the NMQ is presented.

76.6% of all para-athletes stated that they sustained at least one injury in the years they had been playing sport, with most injuries occurring

during training sessions (63.3%). For 30% of recreational para-athletes, the injury lasted less than a month, while 20% of professional para-athletes stated that the injury lasted longer than a month. For a total of 66.6% of para-athletes, the injury required only rehabilitative recovery, and for 60% of both categories of para-athletes, the absence from training lasted less than one month. In the sub-sample of professional para-athletes, soft tissue injuries (sprains, strains, contusions of muscles, tendons, and ligaments; 16.7%) are the most prevalent, followed by shoulder injuries, rotator cuff syndrome (10%) and one lower limb injury and one bone fracture each. In the sub-sample of recreational athletes, the most prevalent injuries are shoulder injuries, rotator cuff syndrome (30%), soft tissue injuries (sprains, strains, contusions of muscles, tendons, and ligaments; 10%), and bone fractures. 80% of all respondents stated that personal responsibility had protected them from injury. More detailed results are shown in Table 1.

**Table 1.** Structure of respondents in relation to the characteristics of sports injuries

Item		Professional para-athletes N (%)	Recreational para-athletes N (%)	Total N (%)
Have you experienced a sports injury?	Yes	10 (33.3%)	13 (43.3%)	23 (76.6%)
	No	3 (10%)	4 (13.3%)	7 (23.3%)
Where was the injury sustained?	On training	6 (20%)	13 (43.3%)	19 (63.3%)
	At the competition	2 (6.7%)	-	2 (6.7%)
	Other	2 (6.7%)	-	2 (6.7%)
	I did not experience an injury	3 (10%)	4 (13.3%)	7 (23.3%)
Duration of injury	No injury	3 (10%)	4 (13.3%)	7 (23.3%)
	Less than a month	4 (13.3%)	9 (30%)	13 (43.3%)
	More than a month	6 (20%)	4 (13.3%)	10 (33.3%)
The injury demanded	Only rehabilitation	7 (23.3%)	13 (43.3%)	20 (66.6%)
	Surgical treatment and rehabilitation	2 (6.7%)	-	2 (6.7%)
Absence from training and competition due to injury	Nothing was needed	4 (13.3%)	4 (13.3%)	8 (26.6%)
	Less than a month	5 (16.7%)	13 (43.3%)	18 (60%)
	Up to 6 months	2 (6.7%)	4 (13.3%)	6 (20%)
	More than 6 months	6 (20%)	-	6 (20%)

**Table 1 (continued).** Structure of respondents in relation to the characteristics of sports injuries

Item		Professional para-athletes N (%)	Recreational para-athletes N (%)	Total N (%)
Type of injury	Damage to soft tissues (sprain, strain, contusion of muscles, tendons and ligaments)	5 (16.7%)	3 (10%)	8 (26.7%)
	Trauma in the shoulder area, rotator cuff syndrome...	3 (10%)	9 (30%)	12 (40%)
	Knee and lower limb injury	1 (3.3%)	-	1 (3.3%)
	Bone fracture	1 (3.3%)	1 (3.3%)	2 (6.7%)
	No injuries	3 (10%)	4 (13.3%)	7 (23.3%)
Protection against injury	Personal responsibility	7 (23.3%)	17 (56.7%)	24 (80%)
	Preventive training	5 (16.7%)	-	5 (16.7%)
	Coach's knowledge	1 (3.3%)	-	1 (3.3%)

The results of the individual items were compared amongst athletes with disabilities who participate in professional and recreational parasports using the Mann-Whitney U-test. A statistically significant difference between these subgroups was found for the item relating to how often they play sports per week ( $p=0.000$ ) and for the item relating to how they protect themselves from injury ( $p=0.002$ ). No statistically significant differences were found for the other items.

Table 2 shows the distribution of professional and recreational para-athletes' responses to the NMQ. The results show that both subsamples reported that they had experienced the most problems in the form of pain, discomfort, and numbness in the neck and lower back, while the least problems were recorded in the hip area. Using the Mann-Whitney U test, no statistically significant differences were found for NMQ. See Table 3 for the results of Mann-Whitney test.

**Table 2.** Distribution of responses to the Nordic Musculoskeletal Questionnaire

Have you at any time during the last 12 months had trouble (ache, pain, discomfort, numbness) in	Professional para-athletes		Recreational para-athletes	
	Yes (N, %)	No (N, %)	Yes (N, %)	No (N, %)
Neck?	8 (26.7%)	5 (16.7%)	10 (33.3%)	7 (23.3%)
Shoulders?	2 (6.7% in right shoulder)		2 (6.7% in right shoulder)	
	1 (3.3% in left shoulder)	7 (23.3%)	1 (3.3% in left shoulder)	10 (33.3%)
	3 (10% both)		4 (13.3% both)	
Elbows?	1 (3.3% in right elbow)		1 (3.3% in right elbow)	
	1 (3.3% in left elbow)	10 (33.3%)	1 (3.3% in left elbow)	14 (46.7%)
	1 (3.3% both)		1 (3.3% both)	

**Table 2 (continued).** Distribution of responses to the Nordic Musculoskeletal Questionnaire

Have you at any time during the last 12 months had trouble (ache, pain, discomfort, numbness) in	Professional para-athletes		Recreational para-athletes	
	Yes (N, %)	No (N, %)	Yes (N, %)	No (N, %)
Wrists/hands?	1 (3.3% in left wrist/hand) 1 (3.3% both)	11 (36.7%)	2 (6.7% in left wrist/hand) 1 (3.3% both)	14 (46.7%)
Upper back?	3 (10%)	10 (33.3%)	4 (13.3%)	13 (43.3%)
Lower back?	7 (23.3%)	6 (20%)	8 (26.7%)	9 (30%)
One or both hips/thighs?	-	13 (43.3%)	-	17 (56.7%)
One or both knees?	2 (6.7%)	11 (36.7%)	2 (6.7%)	15 (50%)
One or both ankles/feet?	2 (6.7%)	11 (36.7%)	3 (19%)	14 (46.7%)

**Table 3.** The results of Mann-Whitney U-test

Variable	Professional para-athletes (N=13)	Recreational para-athletes (N=17)	U	Z	p-value
	Median [IQR]	Median [IQR]			
Age	43 [29.5-52.5]	45 [28.5-48.5]	109.00	-0.06	0.950
Number of weekly training sessions	3 [2-4]	1 [1-2]	29.50	-3.62	<b>0.000</b>
Experienced a sports injury	1 [1-1.5]	1 [1-1.5]	110.00	-0.03	0.977
Where?	2 [1-3.5]	1 [1-2.5]	85.00	-1.25	0.213
Duration of injury	2 [1.5-3]	2 [1.5-2.5]	91.00	-0.88	0.382
The injury demanded	1 [1-3]	1 [1-2]	89.50	-1.06	0.288
Absence from training a competition due to injury	2 [1-3]	1 [1-2]	72.50	-1.84	0.066
Type of injury	2 [1-4.5]	2 [2-4.5]	99.50	-0.48	0.628
Protection against injury	1 [1-2]	1 [1-1]	59.50	-3.068	<b>0.002</b>
Neck	1 [1-2]	1 [1-2]	107.50	-0.15	0.882
Shoulders	2 [1-2]	2 [1-2]	105.00	-0.27	0.789
Elbows	2 [1.5-2]	2 [2-2]	104.50	-0.36	0.717
Wrists/hands	2 [2-2]	2 [2-2]	108.00	-0.16	0.871
Upper back	2 [1.5-2]	2 [1.5-2]	110.00	-0.03	0.977
Lower back	1 [1-2]	2 [1-2]	103.00	-0.36	0.717
One or both hips/thighs?	2 [2-2]	2 [2-2]	110.50	0.00	1.000
One or both knees?	2 [2-2]	2 [2-2]	106.50	-0.28	0.776
One or both ankles/feet?	2 [2-2]	2 [2-2]	108.00	-0.16	0.871

Table 4 shows Spearman's rank correlation coefficients between demographic and injury-related variables. The correlations are significant at the level of  $p < 0.05$  and  $p < 0.01$ .

**Table 4.** Spearman's Correlation Matrix

Variables	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.
1. Age																			
2. Professional or recreational athlete	-0.01																		
3. Years of playing sports	0.79 <sup>a</sup>	-0.16																	
4. Number of weekly training sessions	-0.13	-0.67 <sup>a</sup>	-0.08																
5. Whether on injury occurred	0.08	0.00	-0.06	0.27															
6. Where an injury occurred	0.26	-0.23	0.13	0.31	0.86 <sup>a</sup>														
7. Duration of injury	-0.04	-0.16	0.16	-0.19	-0.79 <sup>a</sup>	-0.59 <sup>a</sup>													
8. Type of intervention	0.08	-0.20	-0.06	0.43 <sup>b</sup>	0.85 <sup>a</sup>	0.76 <sup>a</sup>	-0.52 <sup>a</sup>												
9. Absence from training	0.27	-0.34	0.13	0.28	0.74 <sup>a</sup>	0.83 <sup>a</sup>	-0.50 <sup>a</sup>	0.66 <sup>a</sup>											
10. Type of injury	-0.09	0.09	-0.14	0.21	0.77 <sup>a</sup>	0.71 <sup>a</sup>	-0.51 <sup>a</sup>	0.71 <sup>a</sup>	0.59 <sup>a</sup>										
11. Way to protect against injury	0.07	-0.57 <sup>a</sup>	0.22	0.33	-0.28	-0.12	0.39 <sup>b</sup>	0.12	0.12	-0.13									
12. Neck injury	0.04	0.03	0.08	0.13	0.03	0.07	-0.11	-0.01	-0.07	0.02	-0.08								
13. Shoulders injury	0.12	0.05	0.19	0.15	0.00	-0.02	-0.16	-0.09	-0.05	-0.09	0.08	0.71 <sup>a</sup>							
14. Cubits injury	0.14	0.07	0.24	0.00	-0.12	-0.13	0.18	-0.02	-0.18	-0.09	0.03	0.41 <sup>b</sup>	0.57 <sup>a</sup>						
15. Hand joint injury	0.37 <sup>b</sup>	-0.03	0.27	-0.03	0.25	0.33	-0.30	0.18	0.36	0.11	0.01	-0.18	-0.03	-0.22					
16. Lower back injury	0.02	-0.01	0.03	0.19	0.12	0.12	-0.14	0.03	0.17	0.04	0.05	0.45 <sup>b</sup>	0.63 <sup>a</sup>	0.51 <sup>a</sup>	-0.25				
17. Upper back injury	0.09	0.07	-0.07	0.24	-0.08	-0.06	-0.15	-0.05	-0.14	-0.11	-0.02	0.27	0.34	0.17	-0.09	0.55 <sup>a</sup>			
18. Knee injury	-0.41 <sup>b</sup>	0.05	-0.23	0.12	-0.25	-0.32	0.18	-0.32	-0.52 <sup>a</sup>	-0.23	-0.28	0.32	0.05	-0.20	-0.18	-0.22	0.00		
19. Foot injury	0.37 <sup>b</sup>	-0.03	0.27	-0.03	0.25	0.33	-0.30	0.18	0.36	0.11	0.01	-0.18	-0.03	-0.22	1.00 <sup>a</sup>	-0.25	-0.09	-0.18	

Legend: <sup>a</sup> – statistical significance  $\leq 0.01$ ; <sup>b</sup> – statistical significance  $\leq 0.05$

## Discussion

The main aim of the study was to determine the type and localization of sports injuries in people with disabilities who play sports professionally and recreationally and to examine whether there was a difference in sports injuries between these two categories of para-athletes. At the same time, we have tried to determine whether there was a correlation between injuries and certain demographic variables. As we have not found any issues comparing these two groups of para-athletes, we relay the rest of the discussion on the comparison with the available research for professional para-athletes.

Harrington, McQueeney, and Fearing (2021) surveyed professional para-athletes (swimmers, cyclists, and athletes) and found that over 64% of respondents train 11 hours per week, while 42% experience pain and 34% do not compete due to injury. In our sample, a total of 16.7% of respondents trained daily, and a total of 46.7% of para-athletes trained once or twice a week. Around 30% of para-athletes reported pain in the neck and lower back, which is consistent with the findings in the literature (Zwierzchowska, Gawel, & Rosolek, 2022). In our study, there are no para-athletes who have withdrawn from competitions and/or training but are only absent until their injuries are stabilized. In most cases, the time off has been less than one month.

Musculoskeletal injuries are localized in the upper body for most para-athletes and usually depend on the sport they play. Approximately 40% of respondents in both subgroups reported trauma to the shoulder area. These data, as well as the fact that a high percentage of respondents from our sample reported pain in the neck and lower back, can be linked to the fact that these are people with lower limb injuries (plegia) and the para-sports they practiced require greater use of the upper body (sitting volleyball, wheelchair basketball, para-tennis, para-athletics...). We found this interpretation in the available literature (De la Rosa-Morillo, Galloza-Otero, & Micheo, 2019; Gawel & Zwierzchowska, 2021; Zwierzchowska et al., 2023).

In both professional and recreational para-athletes, most injuries were sustained during training. Our results are consistent with the findings from the literature. Lexell, Loven, and Fagher (2021) report that most injuries (69%) occur during training, as do Fapojuwo, Kareem, and Bejide (2022), who suggest that most athletes are first injured during training and then during competition.

Available research findings showed that there is no significant correlation between injury prevalence and age, duration of sports participation, or risk factors for injury (Fapojuwo et al., 2022). These findings are partly consistent with our results. Namely, we can say that there was a statistically significant positive correlation between age, duration of sports participation, and injuries to some body parts. In addition, a statistically significant negative correlation was found between the duration of the injury and the type of intervention (only rehabilitation or surgical treatment and rehabilitation), absence from training, the type of injury, and the method used to protect against injury.

Considering that regular monitoring of athletes is an important aspect of athletic preparation to reduce injuries, the fact that 80% of our total number of para-athletes are protected from injury through personal responsibility is too high. If we take into account the fact that it often happens that medical staff underestimates injury (Fagher, Jacobsson, Timpka, Dahlström, & Lexell, 2016) or that daily access to coaches and medical staff is scarce (Skille, 2008), then the data is not surprising. We can say that para-athletes take responsibility for themselves, even though most of them believe that protection against injury is within the domain of physiotherapists (Fapojuwo et al., 2022).

This study has several limitations. First, this is reflected in the relatively small sample, which is heterogeneous concerning para-athletes and prevents us from drawing generalized conclusions. Another limitation could be that the sample consists only of male para-athletes, which means that we can only conclude one gender group of para-athletes. Future research should be expanded by increasing the number of respondents, homogenizing within para-sports, and including female para-athletes.

Based on the data which are presented and analyzed, we can say that almost  $\frac{3}{4}$  of para-athletes (professional and recreational) have suffered at least one injury in all the years they have been playing para-sport and that most of the injuries have occurred during training sessions. Musculoskeletal injuries most commonly include soft tissue injuries and trauma in the shoulder area, which can be related to the type of para-sport and the type of disability. Therefore, it can be said that participation in professional and/or recreational sports poses inseparable and combined risks for people with disabilities. The data obtained in this study can be used to understand the specific injury risk factors of

para-athletes (disability-sport relation) and to develop injury prevention programs.

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