

SPORT INJURIES IN ELITE AMPUTEE FOOTBALL PLAYERS

Jacek Wieczorek,^{1, A, B, C, D, E} Andrzej Wieczorek,^{2, A, C, D, E} Joanna Bauerfeind,^{1, A}
Paula Grzelińska,^{1, B, D, E} Robert Śliwowski,^{2, D} Tomasz Tasiemski^{1, A, C, D, E}

¹ University School of Physical Education Poznań, Department of Sport for People with Disabilities, Poland

² University School of Physical Education Poznań, Department of Team Sports, Poland

^A Study Design; ^B Data Collection; ^C Statistical Analysis; ^D Manuscript Preparation; ^E Funds Collection

Address for correspondence:

Jacek Wieczorek
Department of Sport for People with Disabilities
University School of Physical Education Poznań, Poland
E-mail: jwieczorek@awf.poznan.pl

Abstract Despite many previous studies dealing with various aspects of physical activity in individuals with an amputation, the risk of injury in amputee footballers has not been assessed thus far. The aim of this study was to characterize the incidence and causes of sport injuries experienced by amputee football players. Furthermore, the incidence of injuries was stratified according to the players' level of competitive aggressiveness and anger, and their role in the field. The study included 21 members of the Polish National Amputee Football Team, who have been followed-up for a period of 6 months. A total of 16 injuries were recorded, including three that required a medical consultation: luxation of the left elbow, adductor strain and ankle sprain. The group of injuries that have not been consulted with a physician included muscle strains ($n = 4$), abrasions ($n = 3$), bruising ($n = 3$), joint subluxations ($n = 2$) and luxation ($n = 1$). The injuries turned out to be more frequent in the lower limbs ($n = 10$) than in the upper ones ($n = 6$). The risk of injury turned out to be higher during trainings ($n = 9$) than matches ($n = 7$). Amputee football seems to be associated with low risk of injury, since only several bodily contusions were documented throughout the study period. The injuries occurred in 38% of the players; this makes amputee football a relatively safe discipline which can be recommended to physically disabled persons.

Key words amputee football, sport injuries, sport games, adapted sports, disability

Introduction

Many previous studies dealt with various aspects of physical activity in individuals who had an amputation. These studies centered primarily around the beneficial effects of physical activity on cardiorespiratory performance, muscle strength and body weight of amputees (Hutzler, Ochana, Bolotin, 1998; Chin, Sawamura, Fujita, 2001). Also some biomechanical aspects have been studied as potential determinants of sport results achieved by limb amputees (Gavron, 1995; Osborough, Payton, Daly, 2009).

Amputee football, also referred to as amp soccer or crutch football, is a relatively new form of sport activity for amputees (www.ampfutbol.pl). Amputee football is a team sport for individuals who had a unilateral lower limb amputation (outfield players) or a unilateral upper limb amputation (goalkeepers). As a result of regularly organized

tournaments, this discipline gains growing popularity worldwide. Amputee football is played with seven players on each team, each using two forearm crutches. The use of prostheses during amputee football matches is forbidden (Yazicioglu, Taskaynatan, Guzelkucuk, Tugcu, 2007). Each game consists of two 25-min halves with a 10-min rest period in between. Each team is allowed a 1-min time-out per either half (Yazicioglu, 2007).

Amputee football is one of few team sports suitable to study the effects of physical exercise on body and various functional aspects of limb amputees. Previous studies dealing with the problem in question centered primarily around an association between body composition, anaerobic performance and sprint ability (Özkan, Kayıhan, Köklü, Ergun, Koz, Ersöz, Dellal, 2012), as well as around nutritional characterization of amputee football players (Gomes, Riberio, Soares, 2006). Simim et al. (2013) studied anthropometric profile and physical performance characteristics of amputee football players. Also the effects of playing crutch football on balance, strength and quality of life in unilateral below-knee amputees have been studied (Yazicioglu, Taskaynatan, Guzelkucuk, Tugcu, 2007). Yanci (2014) compared the quality of life of amputated footballers and non-footballers; the study demonstrated that this discipline exerts beneficial effects on the quality of life of disabled people. Similar conclusions were also presented by Monteiro et al. (2014) who compared the quality of life of individuals with lower limb amputations who played football and those who did not engage in any sport activities.

Although some psychological, motor and morphological aspects of amputee football were a subject of previous research, still a number of important issues, including health threats posed by this discipline, have not been addressed adequately thus far. Injuries constitute a potential adverse effect of practicing sport in both fully able-bodied and disabled persons. The issue of injuries in Paralympic sports is difficult to recognize owing small sample sizes, short periods of evaluation and lack of objective medical diagnoses (most available data originate from retrospective studies and survey-based analyses) (Willick, Webborn, 2011; Molik, Marszałek, 2013). The results of previous studies imply that the incidence of injuries among disabled and able-bodied athletes is similar, and differences between these two groups refer to the types and mechanisms of experienced contusions (Ferrara, Peterson, 2000). Willick and Webborn (2011) proposed two classifications of injuries acquired by disabled sportspersons: due to the type of practiced sport and due to the type of disability presented by an athlete.

Based on available literature, sport injury can be defined as a bodily injury that arose during training or competition, and disabled, hindered or modified athlete's participation in sport activities for at least one day (Ferrara, Buckley, McCann, 1992; Ferrara, Buckley, 1996). Such definition of sport injury was used in many previous studies dealing with the problem in question (Taylor, Williams, 1995; Bauerfeind, Koper, Wiczorek, Urbański, Tasiemski, 2015).

Previous research demonstrated that Paralympic athletes typically experience minor injuries that contribute to discontinuation of training for no more than seven days and do not require a long-term recovery (Molik, Marszałek, 2013). Previous studies of injuries experienced by physically disabled team sport athletes included primarily individuals who practiced wheelchair basketball (Danis, Mikula, 1999), sitting volleyball (Wiczorek Wiczorek, Jadczyk, Śliwowski, Pietrzak, 2007; Bolach, Bolach, Dorobisz, 2010), regular volleyball (Reeser, 1999; Bolach, Bolach, Łobos, 2010a), and wheelchair rugby (Bauerfeind, Koper, Wiczorek, Urbański, Tasiemski, 2015). These studies demonstrated that these are the injuries resulting from overstrain, rather than the so-called acute injuries linked directly to practicing sport, that represent the main problem in disabled athletes. Consequently, the authors of these studies emphasized the need to continuously improve the preventive measures. Molik and Marszałek (2013) pointed to the need to determine the underlying mechanisms of injuries in Paralympic athletes. Other authors

analyzed relationships between the incidence of injuries and the level of aggressiveness and anger in sports (Maxwell, Moores, 2007; Maxwell, Visek, 2009; Visek, Maxwell, Watson, Hurst, 2010).

Based on the review of available literature it can be concluded that the problem of sport injuries in limb amputees has not been studied thus far. In the lower limb amputee, an injury to the other, normal limb, will inevitably disable walking and not infrequently, such person will be temporarily forced to use a wheelchair. In upper limb amputees, a severe injury of normal limb will preclude involvement in basic activities of daily living, such as eating, everyday hygiene, driving, dressing up, etc. The aim of this study was to characterize the incidence of sport injuries among amputee football players. Furthermore, we analyzed the incidence of injuries according to the level of aggressiveness and anger in sports, as well as according to players' role in the field (defensive/offensive). An accurate medical diagnosis and characterization of sport injury determinants constitute the basis for efficient prevention of these adverse effects of sport activity in disabled individuals.

Material and methods

The study included members of the Polish National Amputee Football Team, 21 men aged between 17 and 44 years (mean 28.4 years, SD = 6.55). The subjects practiced amputee football for 2.7 years (SD = 1.04) on average, and their mean number of time spent for training was 230 min (SD = 124) weekly. The study group included 12 defensive players (8 defenders and 4 goalkeepers) and 9 offensive players (3 attackers and 6 midfield players). The subjects presented with two types of disability: congenital (n = 8) and acquired one (n = 13). In 16 players, hypoplasia or amputation involved the lower limb, and in 5 the upper limb. Aside from amputee football, 10 athletes have been also practicing another sport discipline (strength sports, swimming, jogging, cross country skiing, Alpine skiing, cycling). The study group included 5 persons with disability class A2, 6 and 3 with disability classes A4 and A8, respectively, and 7 with limb hypoplasia. The larger proportion of participants lived in an urban setting (n = 14) than in a rural setting (n = 7). The sample included the same number of participants with master and bachelor's degree (n = 4 each). The largest proportion of subjects had secondary education (n = 9), and the smallest primary (n = 3) or vocational education (n = 1). Most of the examined athletes were professionally active (n = 12); eight persons were still students and one remained unemployed.

The study was conducted between September 2014 and February 2015. During this period, examined athletes participated in a total of four training camps and ten amputee football games. Mean number of training and tournament days during the study period was 13.28 (SD = 7.88). The analysis included all athletes, as injuries were also recorded in those with lesser number of training and tournament days. All training sessions were preceded by a 20-min warm-up and ended with a 10-min stretching routine.

The study had a longitudinal character. The incidence and etiology of sport injuries were monitored throughout a 6-month period, with additional measurements and data collected at the beginning and at the end of the project. At the beginning of the project, in September 2014, the respondents completed sport activity, demographic and medical data questionnaires, and the levels of their aggressiveness and anger in sports were determined. Furthermore, the registers of injuries requiring/non-requiring a medical consultation have been handed out to the athletes. These registers were used to record the injuries experienced during the study period. At the end of the project, in February 2015, each participant was subjected to a medical consultation to classify any injuries that were not reported to a physician during the study period. Moreover, medical data provided by physicians in charge have been added to the records of more severe injuries. All of those who agreed to participate were informed about the

study background and objectives, and were asked to complete the consent form before entering the study. It was emphasized that their participation was voluntary and confidentiality was assured.

The study was based on a diagnostic survey with four instruments.

1. A personal survey consisted of three parts: sport activity (information on practicing amputee football: number of trainings, duration of training sessions, other practiced sport disciplines), demographic (sex, year of birth, marital status, place of residence, education, occupation), and medical questionnaire (date of diagnosis, type of disability).
2. A register of injuries that required a medical consultation (date, circumstances of the injury, date of medical intervention, conducted diagnostic tests, diagnosis, treatment and its duration, time of training absence, duration of ailments).
3. A register of sport injuries that have not been consulted with a physician. In this questionnaire, respondents provided information about the injuries (anatomical region, type) and circumstances thereof (place, type of strain, phase of a game/training, situation in the field).
4. The Competitive Aggressiveness and Anger Scale (CAAS) designated to identify athletes being prone to acts of aggression and anger (Maxwell, Moores, 2007). The scale includes 12 questions, six evaluating the level of aggressiveness and another six referring to the level of anger. Aggressiveness refers to the willingness to use physical and verbal abuse, and anger to the degree/level of irritation resulting from a loss, as well as to the degree/level of negative emotions against the opponents. The answers are given on a 5-item Likert-type scale, where 1 corresponds to "almost never" and 5 to "almost always". The higher the score, the higher the levels of aggressiveness and anger presented by a given athlete. Maxwell and Moores (2007) confirmed high reliability of the CAAS in a group of able-bodied athletes (Aggressiveness: $\alpha = 0.83-0.84$; Anger: $\alpha = 0.78-0.83$).

Characteristics of sport injuries were presented as numbers and percentages. Overall number of injuries was expressed as a measure of central tendency (mode). The level of competitive aggressiveness and anger was expressed with descriptive statistics (mean and standard deviation). Normal distribution of studied variables was verified with Shapiro-Wilk test. The significance of an intergroup difference in competitive aggressiveness and anger levels of offensive and defensive players was verified with Student t-test. Correlation between the level of competitive aggressiveness and anger and the incidence of sport injuries was determined on the basis of Spearman's rank correlation coefficient (r_s) values. The incidence rate for sports injuries was computed as the number of injuries divided by the number of players and the mean number of training and tournament days (Magno, Silva, Bilzon, Duarte, Gorla, Vital, 2013).

Results

8 out of 21 athletes experienced an injury during the 6-month follow-up period. A total of 16 injuries were recorded, including three that required a medical consultation: luxation of the left elbow, adductor strain and ankle sprain (Table 1). All injuries that required a medical consultation occurred in defensive players. The group of 13 injuries that have not been consulted with a physician included muscle strains ($n = 4$), abrasions ($n = 3$), bruising ($n = 3$), joint subluxations ($n = 2$) and luxation ($n = 1$). Analysis of data presented in Table 1 suggests that injuries were more common in defensive players ($n = 10$; incidence rate = 0.06) than in offensive ones ($n = 6$; incidence rate = 0.05). The study group included three athletes who experienced more than three injuries during the analyzed

period and a few persons with single contusions. Thirteen athletes, among them 67% of offensive players (Mo = 0) and 57% of defensive players (Mo = 0), did not experience an injury throughout the analyzed period.

Table 1. Detailed analysis of injuries experienced by amputee football players, stratified according to their position in the field

No.	Athlete	Non-consulted with a physician					Consulted with a physician	Total
		abrasion	bruising	muscle strain	luxation	subluxation		
1.	Defensive	0	0	1	0	1	1	3
2.	Defensive	0	0	0	0	0	1	1
3.	Defensive	0	0	0	0	0	0	0
4.	Defensive	0	0	0	0	0	0	0
5.	Defensive	0	0	0	0	1	0	1
6.	Defensive	1	1	1	1	0	0	4
7.	Defensive	0	0	0	0	0	1	1
8.	Defensive	0	0	0	0	0	0	0
9.	Defensive	0	0	0	0	0	0	0
10.	Defensive	0	0	0	0	0	0	0
11.	Defensive	0	0	0	0	0	0	0
12.	Defensive	0	0	0	0	0	0	0
Total (n) [*]		1	1	2	1	2	3	10
Total (%) [*]		8%	8%	17%	8%	17%	25%	14%
1	Offensive	2	0	2	0	0	0	4
2	Offensive	0	1	0	0	0	0	1
3	Offensive	0	0	0	0	0	0	0
4	Offensive	0	0	0	0	0	0	0
5	Offensive	0	0	0	0	0	0	0
6	Offensive	0	0	0	0	0	0	0
7	Offensive	0	1	0	0	0	0	1
8	Offensive	0	0	0	0	0	0	0
9	Offensive	0	0	0	0	0	0	0
Total (n) ^{**}		2	2	2	0	0	0	6
Total (%) ^{**}		22%	22%	22%	0%	0%	0%	11%
Overall in the study group (n)		3	3	4	1	2	3	16
Overall in the study group (%)		14%	14%	19%	5%	10%	14%	13%

^{*} Offensive players.
^{**} Defensive players.

When the injuries were stratified according to their type and anatomical region involved (Table 2), they turned out to be more frequent in the lower limbs than in the upper ones. Lower limb injuries, specifically muscle strains (n = 3), abrasions (n = 2) and bruising (n = 2), typically involved thigh and hip. Subluxations or luxations (n = 2) were typical injuries of the upper limbs; also single cases of abrasion and bruising were observed in this anatomical region.

Circumstances of the injury may refer to the place it was experienced, type of strain, phase of a game/training and situation in the field (Table 3). The majority of injuries took place on a synthetic surface, the so-called artificial turf (n = 10). The risk of injury turned out to be higher during trainings (n = 9) than matches (n = 7). Most injuries (n = 10) occurred mid-training or mid-game. Regarding the situation in the field, four injuries took place during

interaction between a player who possessed the ball and his opponent. However, amputee football players equally often experienced injuries without interaction with their opponents, either possessing the ball (n = 4) or not (n = 4). Detailed data on the circumstances of injuries experienced by amputee football players are presented in Table 3.

Table 2. Anatomical regions affected during injuries experienced by amputee football players

		Non-consulted with a physician			Consulted with a physician
abrasion	bruising	muscle strain	luxation	subluxation	
upper limb (n = 6)					
- hand	- 2 nd digit	- biceps brachii muscle		- proximal interphalangeal joint - radiocarpal joint	- elbow luxation
Lower limb (n = 10)					
- thigh	- hip	- triceps surae muscle	- hip joint		- adductor strain
- knee	- stump	- quadriceps femoris muscle - hip adductors			- ankle sprain

Table 3. Circumstances of injuries experienced by amputee football players

Circumstances of the injury	I	II	III	IV	V	Sum
Place of injury						
Indoor (rubber surface/tartan)	2	0	0	1	0	3
Outdoor field with a synthetic surface (artificial turf)	1	3	4	1	1	10
Outdoor field with a natural grass	0	0	1	0	2	3
Type of strain						
Game	2	1	1	2	1	7
Training	1	2	4	0	2	9
Phase of a game/training						
Early game/training (warmup)	1	0	2	1	0	4
Mid-game/-training	2	2	2	1	3	10
Late game/training	0	1	1	0	0	2
Situation in the field						
Interaction with an opponent (while possessing the ball)	1	2	1	0	0	4
Interaction with an opponent (without possessing the ball)	1	0	1	0	0	2
Without interaction with an opponent (while possessing the ball)	0	0	1	2	1	4
Without interaction with an opponent (without possessing the ball)	0	0	2	0	2	4
Injury caused by crutches	1	1	0	0	0	2

I – abrasion, II – bruising, III – muscle strain, IV – luxation, V – subluxation.

Defensive players presented with lower levels of competitive aggressiveness and anger (mean = 31.5 pts, SD = 8.1) than offensive athletes (mean = 34.2 pts, SD = 12.3), but this difference did not turn out to be statistically significant (t = 0.6147, p = 0.5461). Moreover, no significant correlation was found between the level of aggressiveness and anger in sports and the number of experienced sport injuries ($r_s = -0.095$, $p > 0.05$).

Discussion

Amputee football is a discipline addressed to relatively young persons, typically with a history of lower limb amputation and some sport experience, usually in football. Due to specific character of this discipline, players should present with high levels of general and special fitness, as well as with adequate football skills (Yazicioglu, Taskaynatan, Guzelkucuk, Tugcu, 2007; Simim, Silva, Júnior, Mendes, Mello, Mota, 2013). These are athletes with such predispositions who are sought at early stages of recruitment. On the other hand, amputee football also promotes development of the characteristics mentioned above.

The aim of this study was to characterize sport injuries experienced by amputee football players during a 6-month follow-up period. Although the study subjects experienced a total of 16 injuries, most of them did not require a medical consultation. Our hereby presented findings imply that injuries experienced by amputee football players do not differ significantly from those observed among representatives of other sport disciplines. They are neither more specific nor more harmful than in the case of other sports (Danis, Mikula, 1999; Reeser, 1999; Wieczorek, Wieczorek, Jadczyk, Śliwowski, Pietrzak, 2007; Bolach, Bolach, Dorobisz, 2010; Bolach, Bolach, Łobos, 2010a; Bolach, Bolach, Osiecka, 2010b; Bauerfeind, Koper, Wieczorek, Urbański, Tasiemski, 2015). Bolach et al. (2010b) analyzed the incidence of sport injuries among wheelchair rugby players. They showed that the incidence of injuries among representatives of this discipline is low (33%), similar to that observed in our amputee football players (38%). Similar to amputee football players, the most common types of injuries experienced by wheelchair rugby players were bruising, abrasions and muscle strains (Bolach, Bolach, Osiecka, 2010b). Aside from injuries of this type, our amputee football players suffered also from upper and lower limb sprains and subluxations.

According to Bolach et al. (2010b), wheelchair rugby players more often experienced injuries during competition than during trainings; an opposite phenomenon was observed in our present study of amputee football players who were more prone to injury during trainings. Perhaps, this should be linked to lesser popularity of amputee football and resultant lower number of played matches. Similar to amputee football players, also athletes practicing wheelchair basketball were shown to be more prone to injury during trainings, and typically experienced contusions of upper limbs. Consequently, despite many differences in specifics of these two disciplines, amputee football and wheelchair basketball seem to show some similarities in this matter (Curtis, Black, 2009).

Our study demonstrated that most injuries experienced by amputee football players took place mid-training or mid-game, typically on a synthetic surface. The latter phenomenon should be linked with the fact that most of amputee football tournaments are held on such a surface, which can be considered an important determinant of injury.

Amputee football players are more prone to experience upper limb injuries than representatives of its natural reference discipline, conventional football. While conventional footballers most commonly suffer from contusions of lower limbs and heads, nearly a half of injuries experienced by our amputee football players involved upper limbs, predominantly hand (Junge, Dvorak, Graf-Baumann, 2004, Junge, Dvorak, 2015). High incidence of hand injuries among amputee football players results from the specifics of this discipline in which upper limbs are largely involved for locomotor purposes.

In this study, we analyzed the incidence of sport injuries depending on players' position in the field. Most of defensive and offensive players did not experience an injury during the analyzed period, as confirmed by mode values equal to 0 ($Mo = 0$). The subset of players who experienced an injury included a greater proportion of defensive players, but the difference in the incidence of contusions among defensive and offensive athletes was

relatively small. It is noteworthy, however, that more serious injuries that required medical consultation were recorded solely among the defensive players. This observation is inconsistent with the results published by Bauerfeind et al. (2015), according to whom these were offensive wheelchair rugby players who were more prone to sport injuries. Consequently, our findings imply that amputee football, particular emphasis should be put on prevention of injuries in players with more defensive tasks.

Another objective of this study was to analyze a relationship between the level of competitive aggressiveness and anger and the players' position in the field. We assumed that depending on their aggressiveness and anger levels, amputee football players are predisposed to play as defenders or attackers, which in turn affects their risk of injury. However, we did not observe a significant difference in the competitive aggressiveness and anger levels of defensive and offensive athletes, which implies that this parameter is not related to player's role in the field. Furthermore, no significant relationship was found between the number of injuries experienced by our athletes and their aggressiveness and anger levels, which constitutes another argument for the lack of association between the risk of injury and player's personality. This finding is consistent with the results of the study of wheelchair rugby players, conducted by Bauerfeind et al. (2015).

We analyzed the risk of injury in amputee football players from a different perspective than in most previous studies dealing with the problem in question. The authors of previous studies typically analyzed the occurrence of injuries retrospectively, referring to the whole history of a given athlete (Wiczorek, Wiczorek, Jadczyk, Śliwowski, Pietrzak, 2007; Bolach, Bolach, Dorobisz, 2010; Bolach, Bolach, Łobos, 2010a; Bolach, Bolach, Osiecka, 2010b). Such attitude provides an information about the overall prevalence of injuries involving specific body parts in representatives of various disciplines, but without specifying a starting point of the analysis. In contrast, we studied the incidence of sport injuries among amputee football players during the specified 6-month period. As a result, the number of injuries documented in our study may seem relatively smaller. We studied a relationship between the incidence of injuries and the number of training sessions and games. Such attitude seems reasonable as it determines the link between each injury and its cause, thus providing a rationale for implementation of appropriate preventive measures (Bauerfeind, Koper, Wiczorek, Urbański, Tasiemski, 2015). Moreover, the data on anatomical regions being particularly predisposed to injury can be included in such analysis.

To the best of our knowledge, the hereby presented study was the first one to assess the risk of sport injury among amputee football players. Although amputee football is a relatively new sport discipline in Poland, it is a subject of a dynamic development, representing an attractive form of sport activity for persons with a history of unilateral limb amputation. We are well aware of potential limitations of this study, associated with a relatively small size of the sample and its heterogeneity in terms of age. However, it should be stressed that we examined solely the members of Polish National Amputee Football Team, i.e. a selected group of elite amputee footballers representing our country during international tournaments.

It should be remembered that playing football with crutches requires high speed and dynamics, frequent sidesteps, rapid start and stop movements, which is particularly challenging in the case of disabled athletes. Consequently, such persons need to present with a specific combination of strength and endurance, as well as with a good motor coordination, balancing skills and proprioception (Yazicioglu, 2007; Yazicioglu, Taskaynatan, Guzelkucuk, Tugcu, 2007; Özkan, Kayihan, Köklü, Ergun, Koz, Ersöz, Dellal, 2012). These skills constitute the basis for specific motor patterns characteristic for amputee football, sometimes substantially different from those typical for other team sports, including conventional football. Consequently, amputee football and conventional football

should be considered two distinct sport disciplines. The principal difference stems from the fact that amputee footballers use crutches, and as a result these are their upper limbs which play a key role during movement (Özkan, Kayıhan, Köklü, Ergun, Koz, Ersöz, Dellal, 2012). During the course of trainings, amputee players need to develop specific motor patterns that provide adequate football technique irrespective of changing fulcrum.

Consequences of sport injuries in physically disabled persons are markedly more serious than in able-bodied athletes (Bauerfeind, Koper, Wieczorek, Urbański, Tasiemski, 2015). This puts particular emphasis on monitoring of injuries experienced by physically disabled athletes during the course of training, and identification of their determinants. Such data are vital from the perspective of coaching team, medical staff and players themselves, providing information on the most common types of injuries, typically affected anatomical regions and predisposing situations in the field.

Conclusions

1. Amputee football seems to be associated with low risk of injury, since only several bodily contusions were documented throughout the study period. The injuries occurred in 38% of the players; this makes amputee football a relatively safe discipline which can be recommended to physically disabled persons.

2. Contrary to conventional football, injuries experienced by amputee football players were not limited to lower limbs, but also upper limbs were affected. Most injuries were abrasions, bruising and muscle strains. The occurrence of upper limb injuries should draw attention of coaching teams and medical staff to appropriate training and biological renewal programs aimed at proper preparation of players to competition.

3. Amputee footballers more often experienced injuries during trainings than matches, which points to their considerable involvement in preparation to sport competition.

4. Sport injuries were more frequent among defensive than offensive players; also injuries requiring medical consultation occurred solely in the former group.

5. Offensive and defensive players did not differ significantly in terms of their competitive aggressiveness and anger levels, which implies that the latter parameter is not related to athletes' function in the field. Moreover, no association was found between the incidence of sport injuries and the levels of aggressiveness and anger presented by amputee footballers.

References

- Bauerfeind, J., Koper, M., Wieczorek, J., Urbański, P., Tasiemski, T. (2015). Sports Injuries in Wheelchair Rugby – A Pilot Study. *J Human Kinet*, 48, 123–132.
- Bolach, E., Bolach, B., Dorobisz, K. (2010). Traumas and sport damages in sitting volleyball. *Rozprawy naukowe AWF we Wrocławiu*, 30, 136–145.
- Bolach, B., Bolach, E., Łobos, S. (2010a). Strains and injuries of the disabled players of standing volleyball. *Rozprawy naukowe AWF we Wrocławiu*, 30, 146–155.
- Bolach, B., Bolach, E., Osiecka, A. (2010b). Sports injuries and overstraining syndromes in wheelchair rugby players. *Rozprawy naukowe AWF we Wrocławiu*, 30, 126–135.
- Chin, T., Sawamura, S., Fujita, H. (2001). Effect of endurance training program based on anaerobic threshold (AT) for lower limb amputees. *J Rehabil Res Dev*, 38 (1), 7–11.
- Curtis, K., Black, K. (1999). Shoulder Pain in Female Wheelchair Basketball Players. *J Orthop Sports Phys Ther*, 29 (4), 225–231.
- Danis, D., Mikula, W. (1999). Injuries and strain syndroms in sportsmen of basketball on wheelchairs. *Med Sport*, 101, 15–17.
- Ferrara, M.S., Buckley, W.E. (1996). Athletes with disabilities injury registry. *Adapt Phys Act Q*, 13, 50–60.

- Ferrara, M.S., Buckley, W.E., McCann, B.C. (1992). The injury experience of the athlete with a disability: prevention implications. *Med Sci Sports Exerc*, 24, 184–188.
- Ferrara, M.S., Peterson, C.L. (2000). Injuries to Athletes With Disabilities: Identifying Injury Patterns. *Sports Med*, 30 (2), 137–143.
- Gavron, S.J. (1995). Biomechanical analysis of elite sprinters with below-knee amputations. *BIJAPER*, 2 (1), 1–14.
- Gomes, A.I.S., Riberio, B.G., Soares, E.A. (2006). Nutritional profil of the Brazilian Amputee Soccer Team during the precompetition period for the world championship. *Nutr*, 22, 989–995.
- Hanife, B.A. Yanci (2014). Comparison of the quality of life of footballer and non-footballer amputees. *Int J Acad Res*, 6 (2), 350–355.
- Hutzler, Y., Ochana, S., Bolotin, R. (1998). Aerobic and anaerobic arm-cranking power outputs of males with lower limb impairments: Relationship with sport participation intensity, age, impairment and functional classification. *Spinal Cord*, 36 (3), 205–212.
- Junge, A., Dvorak, J. (2015). Football injuries during the 2014 FIFA World Cup. *Br J Sports Med*, 49, 599–602.
- Junge, A., Dvorak, J., Graf-Baumann, T. (2004). Football Injuries During the World Cup 2002. *Am J Sports Med*, 32 (1), 23–27.
- Magno e Silva, M., Bilzon, J., Duarte, E., Gorla, J., Vital, R. (2013). Sport Injuries in Elite Paralympic Swimmers With Visual Impairment. *J Athl Training*, 48 (4), 493–498.
- Maxwell, J.P., Moores, E. (2007). The development of a short scale measuring aggressiveness and anger in competitive athletes. *Psychol Sport Exerc*, 8, 179–193.
- Maxwell, J.P., Visek, A.J. (2009). Unsanctioned aggression in Rugby Union: Relationships among aggressiveness, anger, athletic identity, and professionalization. *Aggressive Behav*, 35, 237–243.
- Molik, B., Marszalek, J. (2013). The specificity of injuries in Paralympics sport. *Postępy Rehabilitacji*, 3, 39–49.
- Monteiro, R., Pfeifer, L., Santos, A., Sousa, N. (2014). Soccer Practice and Functional and Social Performance of Men With Lower Limb Amputations. *J Hum Kinet*, 43, 33–41.
- Osborough, C.D., Payton, C.J., Daly, D.J. (2009). Relationships between the front crawl stroke parameters of competitive unilateral arm amputee swimmers, with selected anthropometric characteristics. *J Appl Biomech*, 25 (4), 304–312.
- Özkan, A., Kayihan, G., Köklü, Y., Ergun, N., Koz, M., Ersöz, G., Dellal, A. (2012). The relationship between body composition, anaerobic performance and sprint ability of amputee soccer players. *J Hum Kinet*, 35, 141–146.
- Simim, M.A.M., Silva, B.V.C., Júnior, M.M., Mendes, E.L., Mello, M.T., Mota, G.R. (2013). Anthropometric profile and physical performance characteristic of the Brazilian amputee football (soccer) team. *Motriz-Revista De Educacao Fisica*, 19 (3), 641–648.
- Reeser, J.C. (1999). Injury patterns among elite disabled standing volleyball players. *Int J of Volleyball Res*, 1 (1), 12–17.
- Taylor, D., Williams, T. (1995). Sport injuries in athletes with disabilities: wheelchair racing. *Paraplegia*, 33, 296–299.
- Wieczorek, J., Wieczorek, A., Jadczyk, Ł., Śliwowski, R., Pietrzak, M. (2007). Physical activity and injuries and overstraining syndromes in sitting volleyball players. *Stud Phys Cult Tourism*, 14, 299–305.
- Willik, S., Webborn, N. (2011). Medicine. In: Y.C. Vanlandewijck, W.R. Thompson (eds.), *Handbook of Sports Medicine and Science. The Paralympic Athlete* (pp. 74–88). London: Wiley-Blackwell.
- Visek, A.J., Maxwell, J.P., Watson, J.C., Hurst, J.R. (2010). A cross-cultural evaluation of the factorial invariance of the Competitive Aggressiveness and Anger Scale. *J Sport Behav*, 33, 218–237.
- Yazicioglu, K. (2007). The rules of amputee football. In: *Amputee Sports for Victims of Terrorism* (pp. 94–100). Centre of Excellence Defence Against Terrorism, Ankara, Turkey. Amsterdam: IOS Press.
- Yazicioglu, K., Taskaynatan, M.A., Guzelkucuk, U., Tugcu, I. (2007). Effect of playing football (soccer) on balance, strength, and quality of life in unilateral below-knee amputees. *Am J Phys Med Rehabil*, 86, 800–805.

Cite this article as: Wieczorek, J., Wieczorek, A., Bauerfeind, J., Grzelińska, P., Śliwowski, R., Tasiemski, T. (2017). Sport Injuries in Elite Amputee Football Players. *Central European Journal of Sport Sciences and Medicine*, 18 (2), 13–22. DOI: 10.18276/cej.2017.2-02.