Causes of injuries in young female judokas

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Abstract

Background and Study Aim: The health aspect of physical activity is not often referred to "effort safety" and "motor safety" of those engaged in this type of activity. The benefits of systematic training to humans are stressed instead. Yet even people for whom sport is a leisure activity often put in extreme physical effort. The aim of the paper is to expand the knowledge of the causes and locations of injuries in young female judokas.

Material/Methods: We studied 30 females (14 juniors and 16 seniors) who were leading Polish judokas of various weight categories with medals from Polish Judo Championships and were aged 17–26 (average age was 20.9 years). On average, they had been training for 11 years. The study was based on our own questionnaire with 60 semi-open and closed questions. The questions concerned the personal characteristics of each athlete, including age, gender, weight, training experience, sports class as well as detailed information concerning factors that were the causes of each injury, according to the respondents. Detailed questions also dealt with the type and location of injuries as well as various aspects of judo training. In our statistical analysis we used a proportional ratio (in %), while the calculation of some empirical data (considered as variables and hypothetically interacting with each other) were based on the χ^2 test.

Results: Most injuries in young female judokas occur during periods of the most intense training activity. These are usually heavy injuries that exclude the injured person from training for more than 4 weeks. Light injuries in judo occur less often than moderate injuries. Injuries in judo are caused by aggressive fighting which, however, does not determine their seriousness. Aggressive behaviour was observed in all groups of judokas with light, moderate and heavy injuries.

Conclusions: An injury during a judo fight is a complex, multi-factor phenomenon. Coaches should carefully analyse training and competition fights of all judokas in order to individually influence the events that may lead to even light injuries.

Key words: combat sports • effort safety • motor safety • body injuries • sports class

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Background

The health aspect of physical activity is rarely discussed in terms of the "**effort safety**" and "**motor safety**" of those engaged in this type of activity [1]. The benefits of systematic training to humans are stressed instead [2–5]. Yet even people for whom sport is a leisure activity often put in extreme physical effort by subjecting their bodies to excessive loads or performing tasks of high coordination-related difficulty, or putting their health or life at risk due to environmental factors [6]. In extreme cases all these three factors are combined. Most combat sports are within this group. The positive impact of combat sports on the biological development of humans has been well documented for a long time, especially with regard to wrestling, judo and karate [7]. Studies carried out over the last 25 years have confirmed the significant impact of judo training on various aspects of somatic [8–12] as well as mental and social health [13–15]. At the same time, there is convincing empirical evidence

Effort safety – is the consciousness of an individual who starts physical effort or consciousness of a coach who has the right to encourage or even demand from this individual physical effort of a certain intensity and duration to be undertaken without risking life or health [1].

Motor safety – is the consciousness of an individual undertaking to perform a motor task or the consciousness of a coach who has the right to encourage and even demand from the individual performing the task to be undertaken without the risk of the loss of life, injury or other adverse health effects [1].

Sports class – assessment of a sport level of an athlete (rank) in a given discipline. Sports classes make it possible to compare the levels of various sports disciplines.

of the fact that people engaged in combat sports training suffer from a variety of injuries [16–24]. Analyses of these phenomena are the basis of recommendations related to injury prevention as well as motor rehabilitation of people engaged in specific combat sports training, e.g. judo training [25,26]. Effective prevention and rehabilitation in the future are determined by the ability of researchers studying these phenomena and combat sports coaches to implement relevant measures in practice. What they need is knowledge of injury epidemiology, rehabilitation and methodology of any given combat sport as well as an ability to cooperate with various specialists and use methods developed by medicine and psychology. Dziak and Tayara [27] have divided the various traumatic injuries of the motor system caused by mechanical factors according to the type, degree and location of the injury. They distinguish closed tissue injuries, wounds, fractures, sprains and dislocations. In addition, judo injuries also include teeth injuries, though these are rarer in comparison to karate [18]. Gawroński also divides the injuries depending on whether the impact of the harmful factor was a one-off incidence or a series of incidences. In this respects he distinguishes: acute injuries – caused by a sudden, single trauma and concurrent acute symptoms (bone fractures, sprains, joint dislocations, muscle tears), and chronic injuries – following a long-lasting repeated impact of a traumatic factor. Such injuries are in a way manifestations of tissue wear. A single stimulus has a physiological intensity and only after its multiple repetitions does an injury occur [28]. There are many causes of injuries (both endogenous and exogenous) and they must be analysed with reference to specific individuals. For many authors [29,30], traumatic factors include wrong selection of a sports discipline (also without initial medical check-up), errors in training methodology, shortcomings in the organisation of training and competition, bad hygienic and meteorological conditions (humidity, low temperature, poor quality of equipment), technical errors of athletes, aggressive fighting style, non-conforming to fair play principles, poor refereeing, lack of regeneration programmes, lack of supplementation, returning too quickly to training after an illness or injury, disregard for doctors' recommendations and for the biomechanical structure of movements. Negative changes in athletes' motor system occur when their load is not appropriate for their age, muscle strength, level of technical expertise and sports equipment. This leads to a state known as overload, when the forces at work in the process of load transfer become too strong for the physical strength of tissues as well as the adaptive and functional capacity of muscles, ligaments, joints and bones in humans [30]. An important role in judo training is played by the athletes' preparation for frequent falls. Numerous authors stress the necessity of teaching the athletes how to fall safely, not only because of the specific nature of judo fights [31–33]. Paradoxically, judokas, although very well prepared for falls and collisions with the floor, frequently sustain serious injuries in such situations. The aim of the study is to expand the knowledge of the causes and locations of injuries in young female judokas.

Material and Methods

We studied 30 females (14 juniors and 16 seniors) who were leading Polish judokas of various weight categories with medals from Polish Judo Championships, and who differed in terms of their **sports class** (Table 1). The studied athletes were selected randomly without prior knowledge of their health status. They were aged between 17 and 26 years (the average age was 20.9 years). On average, they had been training for 11 years. The average age for beginning of training was 9.8 years.

The questionnaire used in the study was developed by the authors and included 60 questions, both semi-open and closed. The questions concerned the personal characteristics of each athlete, including age, gender, weight, training experience, sports discipline, sports class as well as detailed information concerning factors that were the causes of each injury. Detailed questions also dealt with the type and location of injuries. The presented paper includes some of the answers, which were the most interesting ones according to the authors.

Table 1. Division of studied female judokas (n=30) according to their sports class.

Sports class	N	%
International champion	2	7
National champion	14	47
1st sports class	9	30
2nd sports class	5	16

When analysing sudden overloads in sports, it is important to know the criteria used to classify various injuries. In order to determine the general effect of an injury, the authors adopted Dec's and Matyja's division [29]:
- light injuries: causing exclusion from sports-related activities for 4–7 days,
- moderate injuries: causing exclusion from training and competition for 1–4 weeks,
- heavy injuries: excluding the athlete from any sports-related activity for over 4 weeks.

However, the authors point out that such a division is used to provide a general assessment of the effect of an injury, while the inability to continue training remains an individual issue.

Table 2. Number and proportion of injuries to the various parts of the body in studied Polish female judokas (n=30).

	Damaged part of the body			
	Head	Torso and neck	Upper limb	Lower limb
Number of injuries	1	4	13	12
%	3.33	13.33	43.33	40

Table 3. Number and proportion of injuries affecting specific tissues within the various parts of the body in studied Polish female judokas (n=30).

Part of the body	Number [% out of 30] of injuries of the tissue			Total and proportion [%]
	Bones	Muscles	Ligaments	
Head	1 [3.33]	0	0	1
Torso and neck	0	4 [13.33]	0	4 [13.33]
Upper limb	4 [13.33]	3[10]	6 [20]	13 [43.33]
Lower limb	3[10]	4 [13.33]	5[16.66]	12 [40]
Total and proportion [%]	8 [26.66]	11 [36.66]	11 [36.66]	30

Table 4. Seriousness of injuries sustained by Polish female judokas (n=30).

Part of the body	Type of injury [% in brackets]			Total
	light	moderate	heavy	
Head	1 [3.33]	0	0	1 [3.33]
Torso and neck	1 [3.33]	3 [10]	0	4 [13.33]
Upper limb	1 [3.33]	5 [16.66]	7 [23.33]	13 [43.33]
Lower limb	4 [13.33]	3 [10]	5 [16.66]	12 [40]
Total	7 [23.33]	11 [36.66]	12 [40]	30

In our statistical analysis we used a proportional ratio (in %), while the calculation of some empirical data (considered as variables and hypothetically interacting with each other) were based on the χ^2 test. We have singled out factors that according to the respondents could be associated with injuries in judo (e.g. sports class was associated with the seriousness of the injury) or the links of which to injuries are well documented. However, in the case of the χ^2 test, when the number of observations is small (sample size in the various boxes), the assessment of the results may be imprecise. The χ^2 test provides researchers with precise results, when the size of samples exceeds five cases.

In the presented paper the authors use the term "body injuries" as a universal term to describe each injury irrespective of the divisions and classifications used by various other authors.

Results

We noted that all athletes had some injury and that each injury was connected with the athlete's discipline. The injuries suffered by the athletes usually (43.33%) affected their upper limbs (Table 2). The most numerous group of injuries is that of the injuries to the ligaments, followed by bone and muscle injuries. When it comes to the injuries to the lower limbs, the most frequent among them are also injuries to the ligaments, while injuries affecting the muscles are only slightly more numerous than those affecting the bones (Table 3). Analysis of injuries with regard to the damaged tissues indicates a statistically significant correlation. Most heavy injuries affect the ligaments and muscles (χ^2=10.9). On the other hand, we did not observe any link between the type (seriousness) of injury and age group (junior/senior) (χ^2=0.8).

Based on the athletes' statements, we found fewer injuries to the torso and neck (13.33% of all injuries) and fewest to the head. The least numerous group are light injuries (7 cases, i.e. 23.33%): 1 to the head, torso, neck and upper limbs, and 4 to the lower limbs. Moderate injuries mostly affect the upper limbs (5 cases, 16.66%) as well as the torso and neck (3 cases; 10%). Similarly, we found 3 cases of injuries to the lower limbs. No

moderate injuries affecting the head were found in the study. Most injuries were heavy injuries. They affected 12 athletes (40%), including 7 with injuries to their upper limbs and 5 with injuries to their lower limbs (Table 4).

When analysing the links between the type of injury and the sports class, we may conclude that the higher the class, the lower the number of heavy injuries. Unfortunately, this link is not statistically significant. The χ^2 test does not demonstrate a link between these two factors (χ^2=4.62). Given the small sample size in the subgroups, it is highly imprecise. The biggest number of heavy injuries with regard to the size of the sports class occurred among 2nd class athletes; the lowest – among national champion class athletes.

The training period is linked to the occurrence of injuries. We observed significant links between the seriousness of injuries and training period. The competition mesocycle is marked by the heaviest injuries (χ^2=10.2). This is also the period when we observed the biggest number of injuries (60%). In this period, training is at its most intense, while the number of competitions is the highest. The smallest number of injuries was recorded in the transition period, which is characterised by the least intense training (Figure 1). In judo, accidents occur more often during competitions (53% of incidents) than during training (47%). Most injuries were recorded during **tachi-waza** exercises and fights (73%), fewer in **ne-waza** (27%).

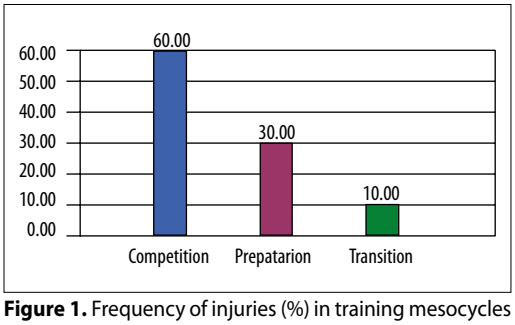

Figure 1. Frequency of injuries (%) in training mesocycles Polish female judokas (n=30).

If injuries occurred during training, most of them were picked up during the main part of training (78%); 22% occurred in the initial phase, while no case was recorded in the final part of training. The nature of training also affected the injuries. Half of the respondents who suffered an injury during training indicated that it occurred during a randori (training fight); 21% received an injury when practising team sports, 14% when performing technical elements, and 7% when running and exercising at the gym. A vast majority of the respondents (94%) said that the injury had occurred when they were in direct contact with an opponent or partner, while only 6% said that it had happened while they were doing individual exercises.

The study has revealed that over 65% of the respondents felt tired before a training session or a competition. When asked if they informed their coach about it, most respondents said that they had done so.

Over half of the judokas in the study (74%) believe that their injuries may have been caused by tissue overload, that is by successive micro-injuries, and most athletes decided to continue training despite increasing pain at the site of a previous injury. For over 56% of the respondents, injuries were repeated within the same tissue. No fewer than 99% of the respondents ignored their doctors' recommendations concerning a break in training and despite the fact that their injuries were not fully healed, they continued to take part in competition and training. The respondents decided to resume their physical activity prematurely, because of upcoming competition or qualifiers for the national team, desire to pursue their own plans (e.g. self-fulfilment) or fear of losing a scholarship (Figure 2).

According to the injured athletes, their premature resumption of intense physical activity had a considerable impact on the injury incidence in judo. This was indicated by over 81% of judokas in the study.

When assessing the impact of technical errors on injury incidence, 53.3% of the respondents indicated that technical errors did not influence the occurrence of injuries; 26.7% believed that their technical error had been the cause of their injury, while 20% indicated that the injury had happened as a result of their opponent's technical error (Figure 3). Figure 4 illustrates the attitude of the athletes in the study to fitness recovery treatment.

None of the judokas in the study took advantage of fitness recovery treatment on a regular basis. Such an attitude to one of the most important elements of sports training was explained by the respondents by their lack of time, by the fact that for them it was a waste of time; some respondents did not like it or did not feel a need for it. Only 6% of them claimed that their club did not provide them with any fitness recovery treatment. The female judokas take advantage of fitness recovery regimes during periods of intense training (mostly in training camps) (Figure 5).

No fewer than 29 respondents described their diet as not properly balanced, with only 5 of them receiving nutritional supplements. Only in 36% of cases was the use of food supplements or substitutes encouraged by the coach and controlled by a doctor. Over half of the

Tachi-waza – *jūdō* throwing techniques executed from a standing position. These include *te-waza* (hand techniques), *koshi-waza* (hip techniques) and *ashi-waza* (foot and leg techniques) [34].

Ne-waza or katame-waza – is a judo technique applied when the fight takes place on the floor. Ne-waza includes matholds and pins (oseakomi-waza), arm bars and joint locking (kansetsu-waza) as well as choking and strangling (shime-waza) [2].

Tori – an individual who applied a technique in *jūdō* training. The receiver of the technique is referred to as *uke* [34].

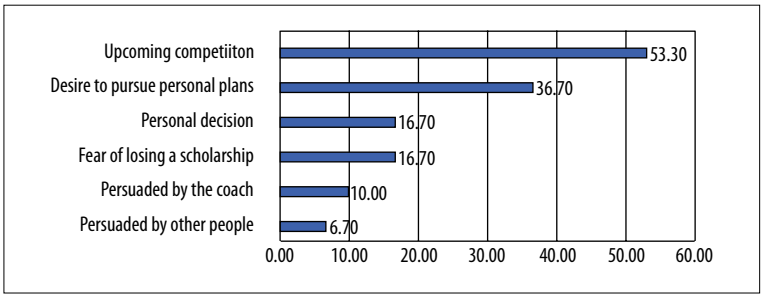

Figure 2. Causes of athletes (n=30) prematurely resuming training after an injury (%).

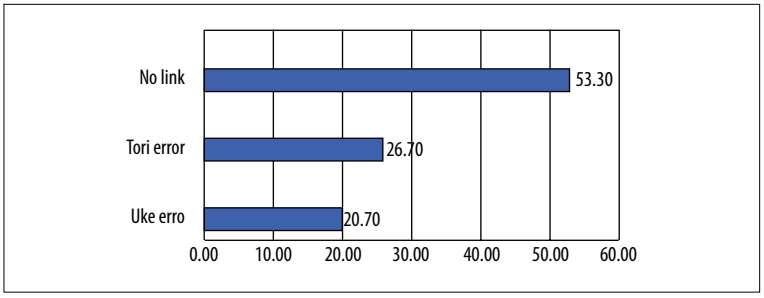

Figure 3. Influence of technical errors on injury incidence (%).

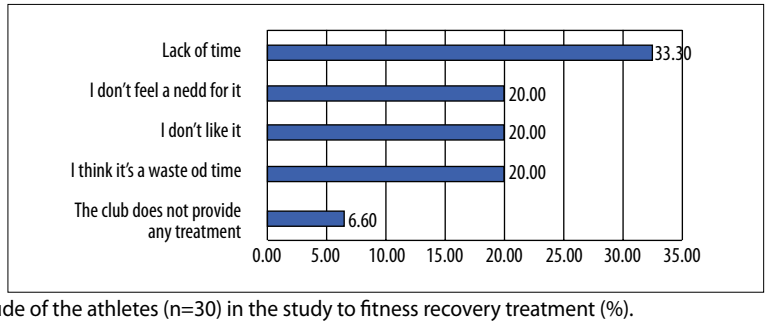

Figure 4. Attitude of the athletes (n=30) in the study to fitness recovery treatment (%).

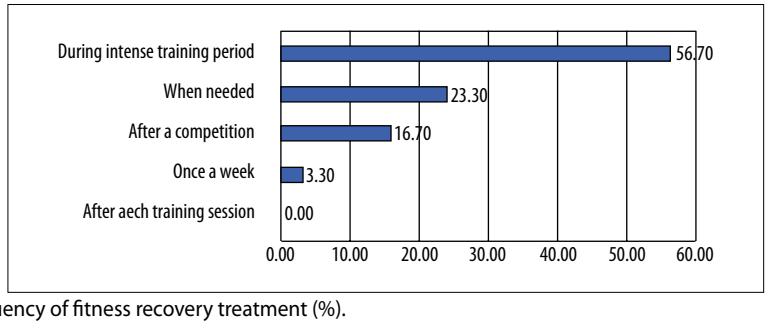

Figure 5. Frequency of fitness recovery treatment (%).

high class athletes used "supplements" on their own initiative, guided by the purpose and dosage described on the packaging by the manufacturer.

In judo, over half of the athletes always or almost always regulate their body weight before a competition, with a majority of them resort to reducing the amount of food they eat in order to reduce their weight.

Only one of the respondents said that the main part of the training was not preceded by a warm-up, and only 30% said that they felt well warmed up after the initial part of their training. Insufficient warm-up was cited as the cause of their injuries by over half of the athletes (Figure 6). When assessing the preparation of their coach, the element that the athletes held in highest regard was making sure training was safe, while its organisation (intensity, size and number of breaks) was regarded as the worst.

When assessing the factors influencing injury incidence, the athletes in the study believed that aggressive fighting

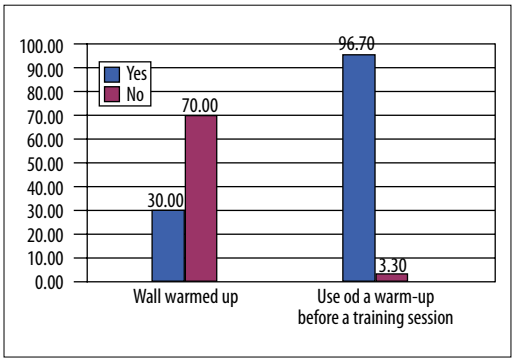

Figure 6. The athletes' (n=30) opinion on warm-up (%).

was the main contributing factor (27%), followed by excessive training load (22%) and premature resumption of training after injury (17%). The factors that were the least significant contributors to injury incidence were: lack of supplementation (4%) and factors that determine training safety (2%).

Discussion

In the literature on the subject various authors note that there are very few athletes today that have not experienced any injury in their careers. The study has demonstrated that all respondents suffered injuries related to their sports discipline. These results correspond to a large extent to the findings of other authors in whose studies the percentage of athletes suffering an injury in their career was high [17]. The average training experience of the judokas suffering an injury was 11 years, with the athletes beginning competitive sports training at a relatively early age. Similar observations were made by other authors [17], whose studies demonstrate that this training experience is, respectively, 9–12 and 10.4 years.

In the presented study, the injuries suffered by the athletes mostly affected their upper limbs (43.33%), which are at the greatest risk of strain and injury in judo. According to Walentukiewicz [17], this is caused by "the athletes supporting themselves when falling, crashing against the mat and incorrectly performing various technical elements". The dominance of upper limb injuries is also confirmed by research carried out by Sterkowicz [16]. When it comes to the location of injuries, upper limb injuries are followed by those to the lower limbs, torso, neck and head. Similar results could be observed in the works of the authors mentioned above. In the presented study, the most frequent injuries were those to the ligaments, 43%, muscles, 36%, and bones, 26%.

In the studied group, heavy injuries, i.e. those after which the break in training is over 4 weeks long, were recorded in 12 athletes (with 5 affecting the upper limbs and 7 the lower limbs). The least numerous group is that of light injuries – with 7 cases (1 to the head, torso, neck and lower limbs and 4 to the upper limbs). Moderate injuries mostly affect the lower limbs (5 cases) as well as the torso and the neck (3 cases), only rarely affecting the upper limbs (1 case). No moderate injuries affecting the head were found in the study.

As it is well known, the most intense training occurs in the competition macrocycle, when the athletes must show considerable determination in order to improve the parameters necessary to achieve good results. The authors' own research indicates that it is in this period that most injuries occur (around 60% of all injuries). These results correspond to the findings of other authors [16]. An analysis of the data from the questionnaire shows that slightly more than a half of the judokas (52%) suffered injuries during competitions and not during training. Similar opinions are expressed by such authors as Dec and Matyja [29]. On the other hand, when studying the injuries to the anterior cruciate ligament, Rukasz and Sterkowicz [21] have concluded that this injury mostly occurs during training.

Over a half of the judokas believe that their injuries may have been caused by tissue overload, that is successive so-called micro-injuries. However, a vast majority of them decided to continue training despite increasing pain at the site of a previous injury. In over 60% of athletes injuries were repeated within the same tissues.

The authors of the available literature point out that one of the causes of injuries may be aggressive fighting, which leads to an increased injury incidence in judo [19,21]. This is confirmed by the results of the presented study. When filling in the questionnaire, 70% of the respondents indicated that it was the increasing aggression in combat sports that was the cause of injuries. Among the athletes who had an accident during training, the dominant group is that of the judokas who experienced it in the main part of their training (now fewer than 78%). The causes of such state of affairs may be found in insufficient warm-up, a fact confirmed by the authors' own research. Most respondents said that although the initial part of their training did include exercises preparing them for the main part, they were nevertheless insufficient. In addition, the main part of training is marked by direct contact with the opponent, which is characteristic of judo. Research carried out by other authors shows that many injuries occur during throws and falls [25], which allows us to say that most injuries will occur during tach-waza exercises and fights, i.e. when the athletes are in a vertical position. Such a conclusion is substantiated also by the findings of the presented study (73%).

As we have already mentioned, most injuries occur as a result of a direct fight with an opponent. An analysis of the circumstances of injuries in the studied group has revealed that only 6% of the athletes suffered an injury following individual exercises.

Ninety-nine percent of the judokas in the study disregarded their doctors' recommendations concerning a break in training and, despite having an injury that had not healed completely, they continued to take part in competitions or training. The respondents decided to resume activity prematurely because of the following reasons: upcoming competition or National Team qualifiers, desire to pursue their own needs (e.g. self-fulfilment) or fear of losing a scholarship. 10% of the respondents said they had been persuaded by their coach. Findings by Radzioch and his associates [19] indicate that those responsible should be the coaches, who cannot and should not force injured athletes in their charge to resume training just for a momentary benefit and satisfaction. On the other hand, Walentukiewicz writes [17] that "in an era of sport commercialisation and high profits for participating in competitions, often the athletes themselves decide to resume training or participation in competitions despite not having fully recovered from their injuries. The athletes do not wait for full recovery, they try to resume training as soon as possible and this may lead to lasting problems in their competitive careers".

When analysing fitness recovery regimes, the authors found out that none of the judokas in the study used them on a regular basis. Such an approach to one of the most important elements of sports training was explained by the respondents by a lack of time. However, some respondents said very clearly that they did not like such regimes or did not feel a need for them. Only 6% of them claimed that their club did not provide them with any fitness recovery treatment. Usually, women take advantage of fitness recovery regimes during more intense training periods (mostly in training camps).

The problem of overload has been noted by many authors [30]. It results from inappropriate training load and concurrent symptoms of fatigue. The authors note that nearly 70% of the respondents felt fatigued before training or before competitions. When asked whether they informed their coach about this, most of them replied in the affirmative. An interesting question in the study concerned the elements listed in the questionnaire (proper preparation of equipment and rooms, lack of supplementation and fitness recovery regimes, inappropriate diet, disregarding doctors' recommendations, micro-injuries, premature resumption of training after illness/injury, excessive training load and aggressive fighting) that could increase the risk of injuries in judo. When assessing the factors influencing injury incidence, the athletes in the study believed that aggressive fighting was the main contributing factor (27%), followed by excessive training load (22%) and premature resumption of training after injury (17%). The factors that were believed to be the least significant contributors to injury incidence were: lack of supplementation (4%) and factors that determined training safety (2%).

Judging from the results of the study, it can certainly be said that injuries in sport do not occur owing to just one element. An injury is a complex, multi-factor phenomenon. In different athletes different factors contribute to the occurrence of injuries, which is why coaches should not forget that the training process should be individualised. Given the small subgroup sizes, the χ^2 analysis carried out by the authors has not produced fully satisfying results. The analysis should be carried out on a much larger group of respondents so that the sizes of the subgroups could be much greater.

Conclusions

1. An injury is a multi-factor phenomenon, which, owing to the nature of judo, must be analysed on a case-to-case basis.
2. During an intense training and competition period, particular attention must be paid to fitness recovery, because this is the period in which most injuries are recorded.
3. Only people who have completed the treatment of their injuries can be allowed to resume their training.

References:

1. Kalina RM, Barczyński BJ: EKO-AGRO-FITNESS© original continuous program of health-oriented and ecological education in the family, among friends or individually implemented-the premises and assumptions. Arch Budo, 2010; 6(4): 179–84
2. Kobayashi K, Sharp HE: Sportowe Judo. Wydawnictwo Budo Sport. Warsaw 1998 [in Polish]
3. Kuński H: Trening zdrowotny osób dorosłych. Poradnik lekarza i trenera. Agencja Wydawnicza MEDSPORTPRESS. Warsaw 2002 [in Polish]
4. Klukowski KS (ed.): Medycyna aktywności fizycznej z elementami psychologii i pedagogiki. Tom I Medycyna aktywności fizycznej. Wysiłek fizyczny w aspekcie wieku. Pedagogika zdrowia. J. Piłsudski Academy of Physical Education. Warsaw 2010 [in Polish]
5. Pańczyk W: Health-related values of outdoor physical education. Leading concepts and transitions in Polish schools throughout 20 years (1986–2006). Arch Budo, 2010; 6(1): 13–24
6. Kalina RM, Bąk R: Ekstremum rekreacji ruchowej. [In:] Duricek M, Gallo P (eds.) Trendy Pohybovej Rekreacie a Sucasny Zivotny Styl, Univerzita Pavla Jozefa Safarika v Kosicach, 2007; 166–69 [in Polish]
7. Midgley R (eds): The complete encyclopaedia of exercises. Paddington Press. London. 1979
8. Jagiełło W, Kalina RM: Properties of Motor Development in Young Judokas. J Hum Kinet, 2007; 17: 113–20

9. Trivic T, Drid P, Obadov S: Aerobic capacity of male judokas in comparison with university students of the Faculty of Sport and Physical Education. Arch Budo, 2009; 5: 143–46
10. Burdukiewicz A, Pietraszewska J, Andrzejewska J et al: Morphological differentiation and body composition in female judokas and female weightlifters in relation to the performed sport discipline. Arch Budo, 2010; 6(2): 111–15
11. Pałka T, Lech G, Sterkowicz S et al: Effect of Physical Endurance on the Course of Fight and Level of Sports Performance in Cadet Judokas. Arch Budo, 2010; 6: 123–28
12. Wolska B, Jagiełło W, Smulskij W: Factor structure of physical efficiency in female judo competitors at various stages of long-standing training. Arch Budo, 2010; 6(1): 25–31
13. Trulson ME: Martial arts training: a novel "cure" for juvenile delinquency. Human Relations, 1986; 39: 1131–40
14. Dąbrowski A, Dąbrowska A, Majcher P: Socjalizacyjne funkcje i edukacyjne wartości judo. Sport Wyczynowy, 1996; 9–10: 42–46 [in Polish, abstract in English, in Russian]
15. Sterkowicz S, Rukasz W, Weiss P et al: Wellness in Male and Female Versus Judo Training (a Pilot Study). Arch Budo, 2008; 4: 50–55
16. Sterkowicz S: Analiza wypadków u kobiet i mężczyzn uprawiających judo w latach 1977–1980, Sport Wyczynowy, 1983; 4: 37–38 [in Polish, abstract in Russian]
17. Walentukiewicz A: Epidemiologia urazów sportowych. Rocznik Naukowy AWFiS Gdańsk, 2002; 2: 20 [in Polish, abstract in English]
18. Parzeller M, Raschka Ch, Banzer W: Uszkodzenia zębów w sportach walki na przykładzie judo, zapasów i karate. Medicina Sportiva, 1999; 3(2): 127–28 [in Polish]
19. Radzioch W, Grzybowski A, Łęgosz P, Łatacz W: Analiza obrażeń w sportach walki w materiale Poradni Medycyny Sportowej w Częstochowie. Medycyna Sportowa. 2000; 9: 24 [in Polish]
20. Pańczyk W: Martial arts injuries. Med Sport Sci, 2005; 48: 59–73
21. Rukasz W, Sterkowicz S, Lech G: Przyczyny uszkodzeń więzadła krzyżowego przedniego u zawodników judo. Medicina Sportiva Practica, 2006; 7(4): 62–65 [in Polish, abstract in English]
22. Cynarski WJ, Kudłacz M: Injuries in martial arts and combat sports – a comparative study. Arch Budo, 2008; 4: 91–97
23. Sousa P, Marquezi M, Uliani R et al: Incidence of injuries to the lower limbs joints in kung fu athletes. Arch Budo 2010; 6(3): 137–42
24. Rukasz W, Sterkowicz S, Kłys A: Causes and types of injuries during ippon-seoi-nage throw. Arch Budo 2011; 7(1): 17–20
25. Sterkowicz S: W sprawie zapobiegania urazom głowy u judoków. Sport Wyczynowy, 1980; 8–9: 62–65 [in Polish, abstract in English, in Russian]
26. Sterkowicz S, Rukasz W: Typowe urazowe uszkodzenia ciała i ogólne wskazania w rehabilitacji ruchowej judoków. Medycyna Sportowa, 11,12/1996; 64/65: 12–17 [in Polish]
27. Dziak A, Tayara S: Urazy i uszkodzenia w sporcie. Wydawnictwo KASPER, Kraków 2000 [in Polish]
28. Gawroński W: Uraz, obrażenie, kontuzja. Medicina Sportiva, 1998, 2: 344 [in Polish]
29. Dec L, Matyja M: Epidemiologia uszkodzeń urazogennych ciała u sportowców. Kultura Fizyczna, 1978, 8: 358–59 [in Polish]
30. Rutkowska-Kucharska A, Bober T, Serafin R: Obciążenia układu ruchu w sporcie. Biocybernetyka i inżynieria biomedyczna, 2000; 5: 628–43 [in Polish]
31. Jaskólski E, Witkowski K, Kubacki R: Profilaktyka przeciwurazowa w klasach I-III. Jak nauczać padów na zajęciach wychowania f fizycznego. [In:] Koszczyc T, Lewandowski M. (ed.) Zajęcia ruchowe w kształceniu zintegrowanym. AWF, Wrocław, 2000, 183–86 [in Polish]
32. Kalina RM, Kruszewski A, Jagiełło W, Wołoch G: Combat sports propedeutics – basics of judo. J. Piłsudski Academy of Physical Education, Warsaw, 2003
33. Jaskólski E, Witkowski K, Maśliński J: Nauczanie samoasekuracji w przypadku zderzeń i upadków. [In:] Migasiewicz J, Zatoń K (ed.) Sport szkolny w teorii i praktyce. Wyniki badań naukowych i ich metodyczne aplikacje. AWF, Wrocław, 2006, 229–39 [in Polish]
34. Budō: The Martial Ways of Japan. Nippon Budokan Fundation, 2009