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Injuries in martial arts and combat sports – preliminary results of research

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Authors' contributions:
A Study design
B Data collection
C Statistical analysis
D Data interpretation
E Literature search
F Manuscript preparation
G Funds collection

Summary

Study aim: At present there are sports with so-called high degree of risk connected with practicing them. This group includes, among others, combat sports. Probably the main argument supporting this approach to them was the essence of rivalry – direct combat of two competing sports persons. Almost all injuries connected with sport are caused by mechanical energy. Damages being a consequence of an impact are called injuries. The main aim of the study was estimating and evaluating the level of injuries in different martial arts and combat sports.

Material/methods: The research has been conducted on a target group of 282 practitioners of various martial arts and combat sports. As it happens in the environment of people doing sports, the majority of respondents were males 257 compared to 25 women. (However, in statements by only two women there is information about injuries.) Those are contestants being at the top in the world, very successful in their sports. Among them there are Olympic, world and European champions. Among the practitioners of far eastern martial arts there are many holders of high and the highest master's degrees of 'dan'. The survey has been conducted with contestants at various ages among whom some finished their professional careers. There are also data concerning deceased people which had been collected earlier. The tool used here has been the 'budō questionnaire' consisting of five open questions. It is very important to note that some practitioners have done more than one martial art or combat sport.

Results: Only 11.1% have not sustained any injury. Among all combat sports and martial arts the most frequent injuries have been broken bones (21%) and damages of knee ligaments (16%). The most frequent reason for injuries has been sporting fight 68%. However, most often (43%) training fight contributed to injuries than competition fight (25%). During training 21% of injuries occurred. In 3 cases (5.5%) injuries resulted in the end of sporting career. Usually this was caused by knee injuries.

Conclusions: Injury sustainability in martial arts and combat sports at the stage of professional training is relatively high. The most frequent injuries in martial arts and combat sports are broken bones (usually limbs). The most frequent place of injuries is the head.

Key words: **martial arts • combat sports • risk factors • injuries**

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Background

The level of sporting mastery in majority of sports requires loads similar to maximum possibilities of a human organism. Most sporting exercises and disciplines is, unfortunately, closely connected with health risks (injuregenic factors). As a result of this all the number of traumas and damages of the motion system including disastrous disfunctions connected with summing the microdamages [11] has been disturbingly increasing. It concerns especially injuries and damages of motor organs. At present it is estimated that the number of sportsmen of high professionality with serious disfunctions falls within 30-70% and in the Olympic years it usually reaches higher limits [14].

At present there are sports with so-called high degree of risk connected with practicing them. This group includes, among others, combat sports. Probably the main argument supporting this approach to them was the essence of rivalry – direct combat of two competing sports persons [3]. Due to great popularity of martial arts and combat sports it becomes necessary to draw attention to prevention of damages with practitioners [1]. Dobrzański states that "Impact of energy from outside causing damage of a living organism is called an injury" [10]. Almost all injuries connected with sport are caused by mechanical energy. Damages being a consequence of an impact are called injuries. We may distinguish two types of injuries: the first ones being a result of long-term gradual use of the material (e.g. knees, other joints) and the second ones – caused by an accident. Injuries sustained outside the training hall and competitions influence development of a career but they do not have any significance for the degree of trauma occurrence in a given sport or martial art.

How do we define combat sports and martial arts? "Combat sports are customarily called a group of those sports which essence of competition consists in direct combat of two competing sports persons" [15, p.18]. The main criterion distinguishing combat sports from martial arts (more rarely defensive/combat practices) is the rivalry in the form of the direct clash of two competing sports persons. Practice proves that rivalry within martial arts is also conducted, however, its object is not direct fight but in general sets of formal exercises or other expressing forms of movement. The statement that every combat sport is at the same time a martial art to a greater or smaller degree but not the other way round, is very important. Equally important is the fact that the origin of most combat sports reaches for the tradition of combat practices or in some cases it is more adequate to say defensive practices [15, p.18].

In the light of humanist theory of far eastern martial arts: "Martial arts are a historical category of perfect systems of hand-to-hand fight and wielding weapon connected with elements of metaphysics" [8, p. 20], on the other hand, "Ways of martial arts are certain forms of physical culture which on the basis of the tradition of warrior cultures lead, through training of fight techniques, to psychophysical perfection and self-realization. At the same time those are processes of education and positive ascetics" [8, p. 20] – Fig. 1.

In this perspective fight – on the way of martial arts – is not (in contradiction to a combat sport) a form of negative cooperation but, paradoxically, of positive cooperation. There is no opponent, there is an exercise partner, observation and meditation of nature. The only opponent is one's own weakness (physical, mental and moral) or – in the religious dimension – shaped evil (Satan, demons) [8].

Aim of research

The basic aim of research is multifactor epidemiologic analysis of accidents in combat sports and martial arts. The research was supposed to give answers to a range of particular questions and aimed at estimating:

– the global evaluation of trauma occurrences in these sports;

– characteristics of the place and time of injury as well as health consequences;

– influence of cause-result factors on the occurrence of an injury;

– if there are any interdependencies of the degree of trauma occurrence to the degree of contactness of the sport or martial art.

The following hypotheses were accepted:

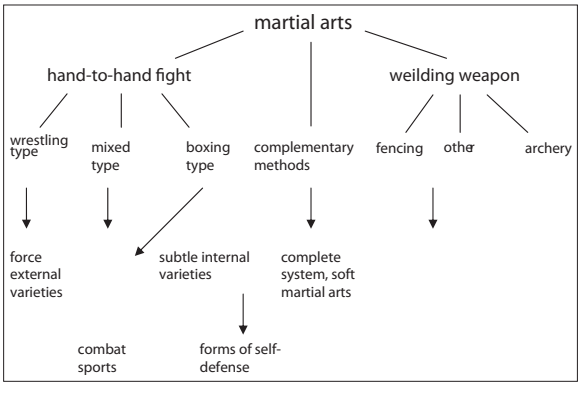

Figure 1. Simplified model of the system of far eastern martial arts.

– The most frequent injuries in martial arts and combat sports are broken bones.

– In martial arts and combat sports the degree of risk is high.

– The most injuries in martial arts and combat sports is placed in the head.

Material & methods

The research has been conducted on the target group of 282 representatives of various martial arts and combat sports. The absolute majority were men (only 25 women versus 257 men) which reflects the scale of participation of both sexes. These are the leading contestants from all over the world very successful in their sports. Among them there are Olympic champions, world and European champions – people of all weight categories taking part in senior competitions. Among the practitioners of far eastern martial arts there are many holders of high and the highest master's 'dan' degrees.

The survey has been conducted on contestants at different ages of which some had already finished their sporting careers. There is also data concerning deceased people, gathered beforehand.

The tool used has been 'budo questionnaire' consisting of five open questions. It is very important to note that several contestants have trained more than on martial art or combat sport.

Results

Research concerning trauma occurrence in martial arts and combat sports has indicated that majority of contestants have not avoided injuries during their sporting career. Only 11.1% have not sustained any injury. Respondents skipped information on minor injuries such as bruises, abrasions. One may think that in many cases this information has been omitted due to small degree of harmfulness of these injuries. This harmfulness may be questioned taking into consideration summing microinjuries and their consequences but the contestants' awareness regarding this problem is often low, which negatively influences not only research results but also, what is even more important, their health. Among 88.9% of practitioners 114 injuries of different kind have been noted resulting from doing a combat sport or a martial art. It has not been unusual that an individual contestant sustained more than one injury.

Among all combat sports and martial arts the most frequent injuries have been broken bones (21%) and damages of knee ligaments (16%). On the other hand, the least frequent have been eyebrow ridge cuts, elbow injuries, knocked out teeth, kidney stones (all consist 1%) and tensioned muscles, strained muscles, fractured bones, strained Achilles' tendon, hand injuries, bruises, hurts and injuries of an eye (all consist 2%) – Fig. 2 & 3.

Among the cause for injuries which have been mentioned in the questionnaire the following four groups of causes have been distinguished,

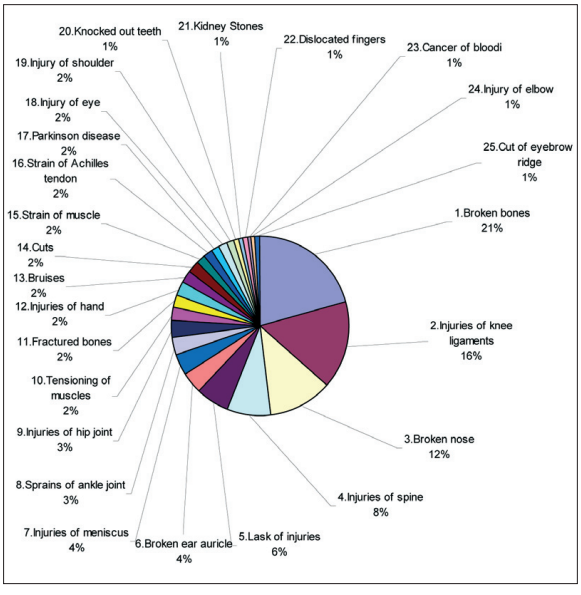

Figure 2. Percentile of all health problems of respondents. Source: own research

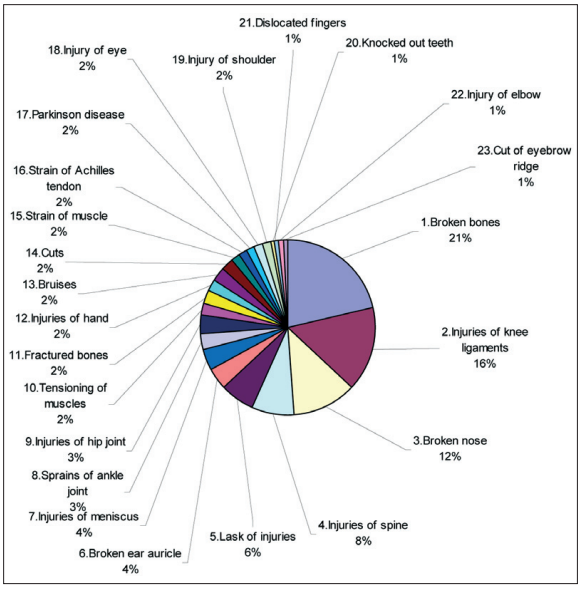

Figure 3. Percentile of injuries in all martial arts and combat sports. Source: own research

1. Injuries sustained during competition.

2. Injuries sustained as a result of a hobby – outside the training room and competition.

3. Injuries sustained during training fight.

4. Injuries sustained during training.

The research has shown that the most frequent reason for injuries has been sporting fight 68%. However, most often (43%) training fight contributed to injuries than competition fight (25%). During training 21% of injuries occurred (Fig. 4). In 3 cases (5.5%) injuries resulted in the end of sporting career. Usually this was caused by knee injuries.

The analysis of the frequency of injuries in particular sports has also been done. These combat sports and martial arts from which the most data has been collected have been specified. Those have been boxing, jujutsu, karate, judo, kick-boxing. The remaining group of sports has been called 'others'. The number of questionnaires was not large enough to consider them separately. This group includes taekwondo, iaido, westling, aikijutsu, kobudo, aikido, kung-fu, fencing, thai-boxing, escrima, kendo, kenpo, kuntaiko, sumo, arnis, yung jung do, ninjutsu.

Injuries in particular parts of the body occurred with different frequency (Tab. 1). There have been the most cases of head injuries (21), less frequent have been knee injuries (8) and hand injuries (7). Injuries of foot (4), shank, elbow and chest (3 in each category). There have been 2 injuries of the ankle joint and 1 injury of a thigh.

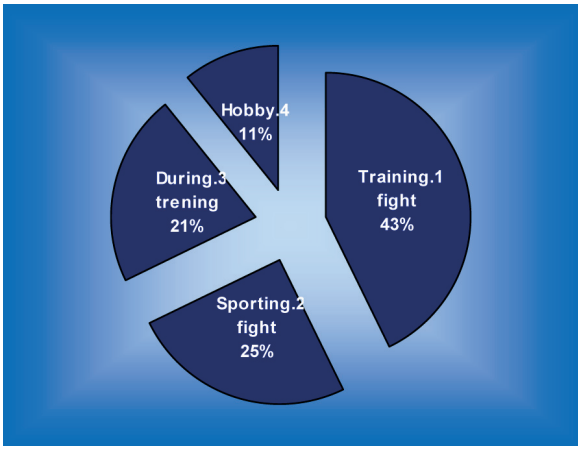

Figure 4. Percentile of injury sustainability in all combat sports and martial arts. Source: own research

In percentage terms injuries on the head are 35%. A little rarer injuries of a knee (14%) and of a hand (12%) were repeated. Injuries concerning a shoulder and a foot make up 7%. Those in the area of the chest, shank, elbow, back were 5% each. The smallest percentage is for the injuries of a thigh (2%) and of an ankle joint (3%).

In general most frequently the right side of the body was injured which was the most clearly visible in cases of damages of the right knee and right hand. In placement of head injuries the central line was dominant.

Discussion

Many authors combine Asian traditions of martial arts with medicine in their works drawing main attention to their connections with acupuncture. Knowledge of

Table 1. Placement of body injuries.

	Number of injuries	Left side of the body	Wright side of the body	In central line
Head	21	2	4	15
Knee	8	1	7	-
Hand	7	2	5	-
Shoulder	4	1	3	-
Feet	4	2	2	-
Shank	3	1	2	-
Elbow	3	2	1	-
Chest	3	1	1	1
Back	3	-	-	3
Ankle jooint	2	1	1	-
Thigh	1	-	1	-
Total	**59**	**13**	**27**	**19**

Source: own research

these traditions allows to fight more effectively but also to treat [6, 12, 16, 17, 18, 19, 20, 24]. However, literature on injuries in combat sports and martial arts has not exhausted the subject so far. Although much research has been already done in this respect, it has not answer all the questions. Surely there is still much to check in this area.

Hapek conducted survey in the group of 102 participants of a karate course representing the following styles, 59 – kyokushinkai, 36 – shotokan and 7 – taekwondo (Tab. 2). The questionnaires were completed during a recreational course with karate specialty. "Except three participants who stated no injuries 99 karatekas suffered from 348 injuries among which 66 were multiple" [13, p.166]. Hapek writes that the main reason for injuries is incorrect conduct of classes. "Long-lasting exercises of incorrect elements in the phase of exercise without the co-practitioner leads to microinjuries and injuries of an elbow, shoulder, knee, hip, spine etc. in particular" [13, p.166]. He noted the most twists – 47% and bruises – 41%. Than there are dislocations – 5.9% and breakings – 5.9% [13]. Similar conclusions as those mentioned above were reached by English researchers [1, 2, 5]. On the other hand specialists indicate health or even therapeutic function of martial arts training [4, 7, 9, 21, 22].

The fact that majority of martial arts and combat sports practitioners sustained at least one injury during their sporting career may suggest a high level of danger connected with practicing these sports. One of the few who did not suffer from any injury, Sato Shizuya (9 dan judo) said: "I had a lot of luck".

Combat sports and martial arts are classified in the first group of risk of an injury due to contactness. This group also includes football and skiing [25]. On the other hand the range of sports being the most frequent causes of injuries includes many sports. Apart from recognized as the most injuregenic contact sports such as hokey, basketball, football, handball or wrestling this list also includes horse riding, cycling, skiing, volleyball and tennis. Very interesting results were obtained from the analysis of frequency of injuries in particular sports. Football and basketball (19% of injuries each), skiing and cycling (14% each) are dominant. Commonly recognized as very "injuregenic" sports such as ice hokey, boxing or wrestling make up altogether less than 4% of cases [26].

Majority of injuries happen during competition fights. It may result from the fact that it is then when contestants fighting with great dedication forget about the risk. Aiming at victory at any cost they put themselves in danger of an injury. The basis for many sports is punching which cause many injuries. Punches also contribute to falls during which damages happen. Apart from punches and kicks the throws used in judo, jujutsu and wrestling are also dangerous.

In researched sports the most frequent injuries have been broken bones and second frequent – injuries of knee ligaments. In particular in boxing and kick-boxing (related to boxing) broken noses occurred most often.

In the most contact combat sports, which are kick-boxing and boxing, broken bones have been definitely the most frequent (broken noses in particular). In sports in which contestants more often fight in distance breakings have also been the most frequent but they have outnumbered knee injuries only slightly. For boxing and kick-boxing broken noses appeared to be characteristic which results from hitting on the face. For far eastern martial arts practitioners injuries of knees have been specific.

The number of data from different varieties of martial arts and combat sports reflects popularity of a given sport. The best-known appeared karate, judo and jujutsu. Among the representatives of these disciplines the most data was collected.

Due to insufficient data it was impossible to analyze the influence of time (period of training a given sport) on frequency of injury occurrence.

Conclusions

On the basis of research results one may formulate the following conclusions:

Table 2. Injury sustainability in particular styles: kyokushinkai, shotokan, taekwondo.

	Bruises	Twists	Dislocations	Breakings	Total
Kyokushinkai	136 (33w)	56 (3 w)	34 (1 w)	9	235 (37 w)
Shotokan	54 (24 w)	26 (3 w)	17	2	99 (27 w)
Taekwon-do	4 (2 w)	7	1	2	14
Total	**194 (59 w)**	**89 (6 w)**	**52 (1 w)**	**13**	**348 (66 w)**

Source: Hapek 1981, p.169

a) injury sustainability in martial arts and combat sports at the stage of professional training is relatively high;

b) the most frequent injuries in martial arts and combat sports are broken bones (usually limbs);

c) broken bones occur in all studied sports;

d) the most frequent place of injuries is the head;

e) the most dangerous injuries were the injuries of knees which in a few cases resulted in finishing sporting career;

f) the most injuries happen during competition fights;

g) the more contact the sport is, the more broken bones occur.

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