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Chronic Boxer's Encephalophaty — what Can Blunt Head Trauma Lead to?

Encefalopatia bokserska — do czego mogą prowadzić tępe urazy głowy?

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Abstract

Introduction. Martial arts competitors are particularly vulnerable to blows to the head, which may result in brain injuries and brain damage, and consequently memory and speech disorders. Chronic boxer's encephalopathy, also known as boxing dementia. This is a type of brain injury that is caused by long-term exposure to head trauma, especially as a result of repeated concussions or injuries associated with boxing or other sports where there is a risk of head injuries. Chronic boxer's encephalopathy symptoms can vary, but often include memory problems, abnormal thinking, behavioral changes, balance problems, sleep disturbances, and other neurological symptoms. It is recommended to wear appropriate head protectors when practicing contact sports, avoid excessive trauma, and undergo periodic examinations, which can detect changes in the brains of people who are exposed to the risk of head injuries.
Aim. The aim of the study was to check the knowledge about chronic boxer's encephalopathy among people practicing martial arts.
Material and Methods. The study used a self-designed questionnaire, which consisted of a personal data sheet, 23 single-choice questions, and 7 multiple-choice questions. The study group consisted of 181 people practicing various martial arts.
Results. Slightly more than half of the respondents indicated that they knew what a chronic boxer's encephalopathy was. People with longer experience more often declared knowledge of the concept of chronic boxer's encephalopathy than people with shorter experience.
Conclusions. Many people practicing martial arts do not know what the risk of chronic boxer's encephalopathy is.
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Key Words: boxing, chronic boxer's encephalopathy, martial arts, neurosurgery

Streszczenie

Wstęp. Zawodnicy trenujący sztuki walki są szczególnie narażeni na uderzenia w głowę, w następstwie których mogą wystąpić urazy i uszkodzenia mózgu, a w konsekwencji zaburzenia pamięci oraz mowy. Encefalopatia bokserska, znana również jako otępienie bokserskie. Jest to rodzaj uszkodzenia mózgu, które jest spowodowane wieloletnim narażeniem na urazy głowy, szczególnie w wyniku powtarzających się wstrząsów czy urazów związanych z boksem lub innymi dyscyplinami sportowymi, w których istnieje ryzyko urazów głowy. Objawy encefalopatii bokserskiej mogą być różne, ale często obejmują problemy z pamięcią, zaburzenia myślenia, zmiany zachowania, problemy z równowagą, zaburzenia snu i inne objawy neurologiczne. Zaleca się noszenie odpowiednich ochraniaczy głowy w trakcie uprawiania sportów kontaktowych, unikanie nadmiernych urazów i przeprowadzanie badań okresowych, które mogą wykryć zmiany w mózgu u osób narażonych na urazy głowy.
Cel. Celem badania było sprawdzenie wiedzy na temat encefalopatii bokserskiej u osób trenujących sztuki walki.

Materiał i metody. W badaniu zastosowano ankietę konstrukcji własnej, która składała się z metryczki, 23 pytań jednokrotnego wyboru i 7 pytań wielokrotnego wyboru. Grupę badaną stanowiło 181 osób uprawiających różne sztuki walki.
Wyniki. Nieco ponad połowa ankietowanych wskazała, że wie co to encefalopatia bokserska. Osoby z dłuższym stażem częściej deklarowały znajomość pojęcia encefalopatii bokserskiej niż osoby z krótszym stażem.
Wnioski. Wiele osób trenujących sztuki walki nie wie z czym wiąże się ryzyko wystąpienia encefalopatii bokserskiej.
(PNN 2024;13(2):62–68)
Słowa kluczowe: boks, encefalopatia bokserska, sztuki walki, neurochirurgia

Introduction

Injuries and damage are an integral part of both amateur and professional sports. Although the etiology and mechanisms of injury often have characteristics specific to a given sports discipline, the event of injury itself is defined as an "unhappy set of circumstances". Sports injuries can be classified as typical and accidental. Typical injuries are characteristic to a specific sport, while accidental injuries occur randomly [1–5].

Chronic boxer's encephalopathy is a type of brain injury that can occur in people involved in combat sports, especially boxing. It is the result of multiple head injuries that were not properly treated or treated too late [6].

Traumatic encephalopathy in boxers may occur in several stages. At an early stage, emotional imbalances are observed, such as irritability and mood swings — from euphoria to loss of fitness, depression, and apathy. There is an intention tremor on the non-dominant side, dysarthria, and slight coordination problems. The next stage is symptoms resembling the symptoms of Parkinson's disease, including muscle stiffness and slow movement. There are also memory disorders, difficulty concentrating, distracted thoughts, and slower thought processes. Paranoid syndromes such as morbid suspicion, delusions, and conspiracy theories may also occur [7,8].

In the advanced stage of chronic boxer's encephalopathy, the so-called boxing dementia occurs. It is characterized by slowing of thought and speech processes, progression of parkinsonian symptoms, difficulties in performing simple daily activities, impaired motor coordination, sleep, and consciousness. Amnesia may occur due to frontal lobe dysfunction, as well as epileptic seizures associated with intense headaches [9].

Depending on the location and extent of brain damage, various symptoms appear, such as changes in personality and character, frontal lobe syndrome (indiscrimination, excessive interest in sex, gluttony), associated with damage to the frontal lobe. The most effective way to prevent chronic boxer's encephalopathy is to avoid head injuries while practicing the sport. Both boxers and other athletes should use appropriate protection, such as head protectors, and strictly follow safety rules. Monitoring and assessment of head injuries, as well as appropriate treatment and rehabilitation following the occurrence of injuries, are also important [10].

The aim of this article was to analyze our own survey research and draw conclusions from the perspective of the hypothesis put forward here, that despite the increasing interest in sports, both amateur and professional, respondents are not fully aware of the risk of chronic boxer's encephalopathy.

Material and Methods

This study used a diagnostic survey method using a research tool in the form of a questionnaire, available in electronic and paper form, which contained an ordered set of questions to which the surveyed group of people voluntarily and anonymously provided answers. The questionnaire used contained 27 questions, divided into two sections: the first one, the personal data, contained questions about respondents' personal data, while the second part included questions related to the topic of the study. The study was exploratory in nature and concerned a section of society, which is the opinions and attitudes of people practicing martial arts, both amateur and professional, associated in various clubs throughout the country.

The study was conducted among 181 people practicing martial arts professionally. The respondents included 41% women (N=74) and 59% men (N=107). The largest part of respondents — 30% (N=54) lived in rural areas; cities with less than 50 thousand inhabitants — 28% (N=50), cities with 50 to 200 thousand inhabitants — 24% (N=43), cities with 200 thousand to 500 thousand inhabitants — 10% (N=19), city with over 500 thousand inhabitants — 8% (N=15). The largest group were people declaring their marital status as single — 60% (N=108), followed by married people — 16% (N=29), divorced — 2% (N=3), separated — 2% (N=3). Almost every fifth respondent — 21% (N=38) indicated that they had a partner. The study involved 6% (N=11) of respondents with primary education, 2% (N=3) lower secondary education, 4% (N=8) professional, 51% (N=93) secondary, 36% (N=66) higher. The minimum

age of the respondents was 16, and the maximum age was 66: women 17 and 55, men 16 and 66 (Table 1).

Table 1. Respondent's age distribution

Gender	N	$\bar{x}$	SD	Min	Max	Me
Women	74	25.51	8.23	17	55	21.00
Men	107	25.49	8.62	16	66	24.00
Altogether	181	25.50	8.44	16	66	23.00

N — number of observations; $\bar{x}$ — mean; SD — standard deviation; Min — minimum value; Max — maximum value; Me — median

Boxing was trained by 35% of respondents (N=100), kick-boxing by 25% (N=73), MMA by 23% (N=15), wrestling by 6% (N=17), judo by 5% (N=15), and karate 3% (N=9), taekwondo 1% (N=4) and other 1% (N=4). The question was multiple choice, some respondents indicated that they practiced more than one combat sport. The largest group were people practicing sports for 1 to 3 years — they constituted 40% of all respondents (N=73). In second place were competitors practicing martial arts for 4–8 years — 23% of respondents (N=41). Every fifth competitor 22% (N=40) indicated that he had been training for less than a year, and every eighth respondent 8% (N=14) had been practicing this discipline for 13 years or more. 7% of respondents (N=13) declared that they had been practicing sports for 9 to 12 years.

Results

The results of our own research show that 41% of respondents (N=74) believe that hands, ankles, and wrists are most frequently injured during training or competition. 4% of respondents (N=8) stated that it was the chest and ribs, and 38% of respondents (N=68) stated that it was the head, including injuries to the nose, occiput, and ears. 14% of the surveyed boxers (N=26) admitted that these were fractures of their arms and legs. 3% of the surveyed players (N=5) stated that it was the back. Respondents could select more than one of the proposed answers.

According to players, the most common injuries during training include soft tissue injuries — 18% (N=118), facial wounds — 18% (N=112), nasal bone fractures — 17% (N=106), concussion — 11% (N=68) and facial hematomas — 11% (N=72). In this question, respondents could select more than one of the proposed answers.

96% of respondents agreed with the statement that using protectors reduces the risk of injury (N=174).

As it turned out, 64% of respondents (N=115) answered that they use protectors, and 28% (N=51) that they usually do. Only 5% of respondents (N=9) admitted that they do not use protectors during training, and 3% of respondents (N=6) admitted that they usually do not use them. Head protectors (helmets) are used by 27% of respondents (N=80), 52% use mouth/teeth protectors (N=152), 17% (N=50) use groin protectors, and 3% (N=9) indicated that he doesn't use any protectors at all.

The analysis of the questionnaires showed that injuries in combat sports are very common, as many as 29% of respondents (N=62) admitted that they had suffered 3–5 injuries during their career, 8% of respondents (N=18) admitted that they suffered more than 5 injuries, and 24% (N=50) stated that they suffered 2 injuries. 18% of respondents (N=39) believe that they have suffered one injury during their entire sports career, and 20% of respondents (N=43) admitted that they have not suffered a single injury so far (these were people who were just starting their career and training less than a year). Most often, respondents suffered injuries during training and sparring, 69% of respondents (N=171) admitted this. The next situation in which the surveyed competitors most often suffered injuries is competition, this was indicated by 14% of respondents (N=35, mainly people practicing martial arts for over 5 years). 17% of respondents (N=41) did not suffer any injury. 27% of respondents (N=49) were hospitalized due to their injuries.

The analysis of the survey results showed that 20% of the respondents (N=37) admitted that the injury had an impact on their sports career and that they had thought about ending it several times, 57% of the respondents (N=104) said that it had not influenced their career and it never even crossed their mind to end it. The opposite opinion was expressed by 3% of the surveyed players (N=5), who stated that the injury had an impact on their boxing career and they completely stopped further training, and 19% of respondents (N=35), who believed that they had not suffered any injury.

It turned out that 4% of respondents (N=25) experienced recurrence of the injury after healing, and 5% (N=33) tended to recur. In 8% (N=48) after healing the injury, it did not recur, and in 4% (N=23) it probably did not occur. 8% of boxers (N=52) participating in this study had no opinion on this subject or had not suffered any injury.

The decision to return to combat sports after recovery from an injury depends on the type and degree of the injury, as well as the recommendations of the medical staff and the physical condition and fighter's readiness. In some cases, after full recovery and appropriate rehabilitation, the fighter can return to training and boxing. However, in the case of serious injuries, re-injury may be more likely to occur, so a cautious approach is key, as well as regular check-ups to ensure that the body is fully ready to return to sporting activity.

After suffering an injury, 51% of respondents (N=93) stated that they had never used any rehabilitation. However, 22% of respondents (N=40) used motor rehabilitation in a health center or hospital, and 27% of respondents (N=48) used rehabilitation at home.

After completing the training, the respondents are most afraid of: memory and concentration disorders — 17% (N=61), speech disorders — 16% (N=56), neurological complications — 14% (N=52).

The analysis of the survey results showed that 54% of respondents (N=154) admitted that the causes of fatal accidents in combat sports are head injuries, 8% N-22), that blows to the heart area, 5% (N=14) that these were injuries to the abdominal cavity and 21% (N=61) that they were fractures of the spine in section C, 13% (N=36) that they were blows to the neck area.

Respondents could select any of the several causes of injury proposed by the researcher. It turned out that the most common reason mentioned by respondents was not using protective gear — it was mentioned by 24% of respondents (N=95). 23% of athletes participating in this study believe that the most common cause of injuries is sparring or boxing during competitions, and 18% of respondents (N=70) believe that not mastering protective techniques. 17% of the surveyed boxers (N=68) stated that the cause of injuries is the lack of the boxer's experience, and 14% of respondents (N=56) believe that it is a disregard of the opponent/sparring partner, 5% of the surveyed boxers (N=18) could not clearly assess this issue.

As it turned out, 74% of respondents (N=134) believe that injuries are a normal thing and an indispensable risk for this discipline. 8% of respondents (N=15) said that they did not feel afraid of injuries, and 5% (N=9) said that injuries were frequent and they were already used to them. 4% of the surveyed boxers (N=7) admitted that they were afraid of getting injured. 9% of the surveyed boxers (N=16) could not assess this issue (Table 2).

The respondents showed little knowledge about chronic boxer's encephalopathy. A large part of the respondents (58% (N=105)) indicated that they knew what chronic boxer's encephalopathy was, but as many as 42% (N=75) had no knowledge about it. Due to the level of significance ($p<0.05$), statistically significant differences were noted between groups with different martial arts training experiences in terms of declared knowledge of the concept of chronic boxer's encephalopathy. People with longer experience more often declared knowledge of the concept of chronic boxer's encephalopathy than people with shorter experience (Table 3 and 4).

Table 2. Results of own research — own study

Variable	N	%
1	2	3
Body parts are most often injured during training or competition		
Hands, ankles, wrists	74	41
Chest, ribs	8	4
Head, including injuries to the nose, back of the head and ears	68	38
Arms/Legs fractures	26	14
Back	5	3
Altogether	181	100
Injuries suffered by respondents during training		
Not a single injury	43	20
1	39	18
2	50	24
3–5	62	29
More than 5	18	8
Altogether	212	100
The impact of an injury on a professional career		
Had influence	27	15
Had no influence	67	37
No, I only train as a hobby	52	29
Never had any injuries	35	19
Altogether	181	100
Health effects feared by respondents after completing martial arts training		
Speech disorders	56	16
Weakened psyche	15	4
Hearing problems	10	3
Dementia	27	7
Premature death	23	6
Occurrence of neurological complications	52	14
Occurrence of permanent neck and head injuries	41	11
Damage to the eye and sockets	26	7
Memory and concentration disorders	61	17
I am indifferent to injuries and subsequent side effects	50	14
Altogether	361	100
Causes of fatal accidents in combat sports		
Head injuries	154	54
Beats to the heart area	22	8
Abdominal injuries	14	5
Fractures of the spine in section c	61	21
Strikes to the neck area	36	13
Altogether	287	100

Table 2. Continued

1	2	3
Causes causing injuries and contusions		
Sparring or boxing in a competition	93	23
Not using protectors	95	24
Underestimating an opponent/sparring partner	56	14
Limited experience with boxers	68	17
Not mastering cover techniques	70	18
Hard to say	18	5
Altogether	400	100
Attitude of respondents to injuries		
Injuries are a normal thing, a risk indispensable in this discipline	134	74
I don't feel afraid of injuries	15	8
Injuries are notorious and I'm used to them	9	5
I'm afraid of getting injured	7	4
Hard to say	16	9
Altogether	181	100

N — number of observations; % — percent

Table 3. Length of martial arts training and knowledge of the concept of chronic boxer's encephalopathy — own study

Variable	Sum. rank		Z	p
	Yes	No		
How long have you been practicing martial arts?	10661.50	5628.50	3.36	0.00

Z — Mann–Whitney U test; p — level of statistical significance

73% of respondents (N=116) indicated that chronic boxer's encephalopathy is not curable, which is the correct answer. However, as many as 27% of respondents (N=43) indicated that it is curable. It is worth mentioning that these are people who have been practicing martial arts for less than a year. Therefore, we can also conclude that people who train are more aware of this disease than beginners.

Due to the level of significance (p>0.05), there were no statistically significant differences between groups with different martial arts training experience and the level of knowledge regarding the prognosis of chronic boxer's encephalopathy (Table 5).

As it turned out, 35% of respondents (N=63) stated that boxing dementia develops approximately 12–16 years after starting training, and 23% (N=63) indicated that it begins approximately 8–12 years after starting training. training, as many as 19% of respondents (N=34) indicated that the answer was more than 17 years from the start of training, and 12% of respondents (N=21) said that it started less than 7 years from the start of training.

Muhammad Ali suffered from symptoms of dementia, which were partly related to his boxing and the multiple head injuries he suffered during his sporting career. Although there was no official diagnosis of chronic boxer's encephalopathy, his symptoms suggested the presence of this type of neurodegenerative condition caused by sports-related brain injuries. The majority of respondents — 88% (N=140) answered that Muhammad Ali was affected by chronic boxer's encephalopathy.

Table 4. Length of martial arts training in relation to declared knowledge regarding chronic boxer's encephalopathy — own study

Have you ever heard of a chronic boxer's encephalopathy? (boxing dementia)	How long have you been practicing martial arts?									
	Less than 1 year		1–3 years		4–8 years		9–12 years		13 years and more	
	No.	%	No.	%	No.	%	No.	%	No.	%
Yes	12	30.0	47	65.3	25	61.0	11	84.6	10	71.4
No	28	70.0	25	34.7	16	39.0	2	15.4	4	28.6
Altogether	40	100.0	72	100.0	41	100.0	13	100.0	14	100.0

No. — number; % — percent

Table 5. Length of training in combat sports in relation to knowledge regarding the prognosis of chronic boxer's encephalopathy

Variable	Sum. rank		Z	p
	Yes	No		
How long have you been practicing martial arts?	3161.00	9559.00	1.08	0.28

Z — Mann–Whitney U test; p — level of statistical significance

Discussion

Using protective equipment such as a boxing helmet or other protective equipment can certainly reduce the risk of certain types of injuries. Protectors can absorb some of the force of an impact and protect specific areas of the body. This can reduce the risk of serious injury in some cases. However, in sports, especially in contact sports, there are many factors that influence the risk of injury, and protective gear can only reduce, but not completely eliminate, this risk. Proper training, techniques, supervision of trainers and compliance with safety rules are as important as the use of protectors [11,12].

Injuries can have a significant impact on a fighter's boxing career. Serious injuries can lead to breaks in training, reduced physical fitness, and even the end of a sports career. Even less serious injuries can affect training regularity and athletic performance. Any injury, especially when it requires long-term convalescence, can affect an athlete's development, technical skills, and mental strength, which can affect his or her career in combat sports [13,14].

Practicing martial arts can lead to body damage, such as injuries to joints, muscles, and ligaments, which may potentially affect your health in the future. Blows to the head can lead to more serious health problems, including the risk of chronic boxer's encephalopathy and neurological disorders. Long-term involvement in combat sports can also lead to mental health problems such as stress, anxiety, and even depression related to the pressure and stress of competition [15]. Intense training can impact the cardiovascular system, which can result in both beneficial and adverse changes in heart health. After completing combat sports training, it is important to maintain physical activity, but also to regularly monitor your health, recover and avoid further injuries. Many of these health effects can be controlled and minimized through appropriate health care, regular check-ups, and a healthy lifestyle after retirement.

Chronic boxer's encephalopathy, also called boxing dementia, is a neurological condition that can occur in boxing competitors or people who have experienced repeated head injuries, especially as a result of frequent concussions and repeated trauma. Symptoms of boxing dementia may include memory problems, mood changes, difficulty concentrating, problems with logical thinking, and in advanced cases, difficulty performing daily activities. The extent of symptoms may vary from person to person. However, boxing dementia is a serious condition that can significantly impact the quality of life and daily functioning. Regular head injuries in boxing can lead to this type of condition, so head injury prevention is key to reducing the risk of boxing dementia [16,17].

Chronic boxer's encephalopathy is a difficult condition to treat. Currently, there is no effective medicine or therapy that could completely eliminate the effects of this disease. There are various treatment strategies that can help manage symptoms, but the treatment process mainly aims to relieve symptoms and delay the progression of the disease [16].

Boxing dementia usually begins to develop after repeated head injuries that occur as a result of repeated concussions. Symptoms of boxing dementia can usually appear after many years of active participation in sports, usually around 12–16 years after starting your sports career [18].

Conclusions

The results of our own research show that many people practicing martial arts do not know the symptoms and do not know what the risk of chronic boxer's encephalopathy is.

Implications for Nursing Practice

Nursing staff should first focus on the first phase prevention, the so-called primary prevention. The most effective way to prevent boxing encephalopathy is to avoid head injuries. To prevent this, you should follow basic safety rules and use specialized protectors.

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