

Study and Analysis of Sports Injuries of Female Athletes in Martial Arts Taking into Account their Sexual Somatotypes

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Received: February 07, 2022; **Published:** February 22, 2022

Abstract

The article presents the results of a study aimed at identifying the frequency and characteristics of sports injuries in elite female wrestlers involved in Kyokushin karate, judo and taekwondo, which they received during the training and competitive period, taking into account their gender somatotypes. Athletes belonged to the first mature (reproductive) age. In the three studied groups of female wrestlers, the frequency and individual characteristics of their injuries and their types were studied and analyzed for each type of martial arts and injuries.

Keywords: *Female Athletes; Martial Arts; Injuries; Sexual Somatotypes*

Abbreviations

CMS: Candidates for Masters of Sports; MS: Masters of Sports; PW: Pelvic Width / d. Cristarum; SW: Shoulder Width; SDI: Sexual Dimorphism Index

Introduction

Modern women's sport of the highest achievements, in all its forms, requires athletes of different age groups, huge, and sometimes not always adequate for the female body, physical effort to achieve victory and the desired result, both during training and competition [1-8].

Quite often, in the process of applying these efforts and striving to get the desired result, both young, beginners, and even elite athletes receive injuries of various types and degrees of complexity. A direct consequence of these injuries is the cessation of training and competitive activity, for various periods of time, in terms of duration, and even, sometimes, to a complete cessation of sports and, unfortunately, disability [1-8].

Aim of the Study

The purpose of our study is to study and analyze the prevalence of injuries of various nature, upper, lower limbs, and other parts of the body that occur during the training and competitive period in elite female athletes of the first mature (reproductive) age involved in such types of martial arts as Kyokushinkai karate, judo and taekwondo.

Materials and Methods

To conduct this study, we created the author’s version of an anonymous questionnaire (Bugaevsky K.A., 2021©), consisting of 23 questions related to practicing a particular sport, as well as the presence/or absence of a particular type of injury and damage, throughout the entire period of playing sports/or this sport, by this athlete, incl. and practicing different types of martial arts. Also, to clarify the necessary details of the study, we used the method of questioning/extended interviewing of the studied female athletes. After the completion of the study, the results were processed and analyzed.

Result and Discussion

The study was conducted, with active and voluntary participation, 132 athletes involved in Kyokushin karate - 43 athletes, judo - 45 people, and taekwon-do - 44 athletes living in Ukraine (Nikolaev, Kherson, Novaya Kakhovka and areas of these regions). According to age indicators, the female athletes belonged to the first mature age. The average age of athletes in the Kyokushinkai Karate group was 23.43 ± 1.21 years, in the Judo group - 24.27 ± 1.14, in the Taekwon-do group - 23.87 ± 1.11 years. The age of sportswomen training in these types of wrestling martial arts ranges from 4.5 years to 9.5 years and more, for female athletes of the master of sports level. The sports qualification of women wrestlers is presented as follows: masters of sports (MS) - 41 (31.06%) female athletes, candidates for masters of sports (CMS) - 53 (40.15%) female athletes, and I category - 38 (28.79%) female athletes. The number of trainings - from 4-6 times a week in Kyokushinkai karate and judo, 2.5 - 3 hours each, up to 5 - 6 times a week, 2 - 3.5 hours for female athletes involved in taekwondo.

When conducting this study, anthropometric methods were used, which, later, were used to identify individual values of the sexual dimorphism index (hereinafter referred to as SDI) and included the measurement of two latitudinal dimensions of the body of athletes (biacromial size, or shoulder width (SW), and intercrest diameter (pelvic width (PW) / d. cristarum), the normative value of which for women of this age group is 28-29 cm [2]. Based on the results of carrying out the necessary anthropometric measurements, the values of shoulder width (SW) and pelvis width (PW) were obtained from the athletes of the three studied groups, which are given in table 1, at p < 0.05.

Name of indicator	Biacromial diameter/ (SW), cm	Interridge diameter/pelvic width (PW), cm
Female athletes involved in Kyokushin karate (n = 43)	34,24 ± 0,37	27,22 ± 0,27
Female athletes doing judo (n = 45)	34,51 ± 0,43	27,62 ± 0,37
Female athletes doing taekwondo (n = 44)	35,07 ± 0,22	27,47 ± 0,46

Table 1: Values of width of shoulders and pelvis in female athletes of the studied groups.

An analysis of the obtained anthropometric values shows that all sizes in the three studied groups are practically close to each other, at p < 0.05, while in athletes of all three studied groups, the width of the shoulders exceeds the width of their bone pelvis. It was also found that in all athletes, the width of their pelvis is less than the normative, practically used, both in obstetrics and in sports morphology, within the normative limits - 28 - 29 cm [2,8]. The values of the SW and PW indicators obtained by us were used in determining the individual and group values of the sexual dimorphism index (SDI), according to the classification proposed by J. Tanner and W. Marshall, with the subsequent division of all martial arts athletes by sex somatotypes [2,8]. The SDI values were calculated by us, according to the classical, author’s formula: triple the value of the biacromial size, (SW), minus the value of d. cristarum (PW). For the norm, index values were taken, which were proposed by these authors for women: gynecomorphic sexual somatotype - less than 73.1 c.u.; mesomorphic sexual somatotype - from 73.1 to 82.1 c.u.; andromorphic sexual somatotype - more than 82.1 c.u. Numerous scientific studies allow us to unequivocally state that mesomorphic and andromorphic sexual somatotypes are classified as inverse, or pathological adaptive changes

that are not characteristic of the original, gynecomorphic (female) sexual somatotype [2,8]. The distribution of female athletes of the three studied groups, according to gender somatotypes, based on the obtained indicators of SDI, is presented in table 2, at a value of $p < 0.05$.

Name of Indicator	Female athletes involved in Kyokushin karate (n = 43)	Female athletes doing judo (n = 45)	Female athletes doing taekwondo (n = 44)
Gynecomorphic sexual somatotype (less than 73.1 c.u.)	-	-	-
Mesomorphic sexual somatotype (73.1 - 82.1 c.u.)	38 (88,37%)	39 (86,67%)	36 (81,82%)
Andromorphic sexual somatotype (more than 82.1 c.u.)	5 (11,63%)	6 (13,33%)	4 (9,09%)

Table 2: Sexual somatotypes in female sportsmens (n = 132).

The analysis of the obtained average group values of SDI in female athletes in three types of martial arts showed that the value of SDI is within the parameters of the mesomorphic sexual somatotype, or transitional from physiological to pathological, for women. Thus, the value of SDI in athletes involved in Kyokushinkai karate was 78.23 ± 0.36 c.u.; for athletes involved in judo wrestling - 79.53 ± 0.49 c.u.; for athletes involved in taekwondo - 75.46 ± 0.72 c.u. [2; 8]. Additionally, we found that in all the studied groups of athletes, there are no athletes with a physiological for women, gynecomorphic sexual somatotype. An inverse (pathological), for women, andromorphic sexual somatotype, is present, approximately in the same amount, in each of the studied groups. In total, the andromorphic sexual somatotype was determined by us in 14 (10.61%) athletes from the three studied groups.

Turning to the analysis of various types of injuries received by athletes during their training and competitive process, we used the author’s questionnaire (Bugayevsky K.A., 2021©) [3, p. 103-109]. After conducting the necessary research - anonymous questionnaire and survey/extended interviewing, we obtained the results that are shown in table 3, with the value of $p < 0.05$.

Name of indicator	Dislocation and stretching	Ears of soft body tissues	Fractures of different bones
Female athletes involved in Kyokushin karate (n = 43)	31 (72,09%) sportswomen	43 (100,00%) sportswomen	3 (6,98%) sportswomen
Female athletes doing judo (n = 45)	24 (53,33%) sportswomen	45 (100,00%) sportswomen	4 (8,89%) sportswomen
Female athletes doing taekwondo (n = 44)	39 (88,64%) sportswomen	44 (100,00%) sportswomen	5 (11,36%) sportswomen

Table 3: Types of injuries received by martial arts female athletes.

Analysis of the results obtained, in each of the investigated groups of athletes, convincingly showed that among all types of traumatic lesions in athletes, the dislocations of the joints are dominated, stretching the ligament apparatus of the upper or lower extremities and their departments (depending on sports specialization), and also - soft bruises Tissues, different intensity and localization. The presence of fracthers in athletes of various parts of the body (mainly limbs), the phenomenon is less frequent, but rather regrettable. Most often are fractures of different fingers on the upper and/or lower limbs, radial bone in a typical place, outer or inner ankle of that, or other of the limbs, as well as bones of the face, in contact martial arts, also ribs/ribs, with unsuccessful drops or shuffles. Among the tensile, dislocation and damage to the joints, damage to the knee/knee joints is dominated, as well as beam-crew and ankle joints, small joints of the

brush and/or foot. In total, in total, in all studied groups of female athletes, stretching and dislocations amounted to 94 cases, or they were identified in 48.48% of athletes. The total, the total number of bruises of soft tissues, obtained both during training and in the competitive period - 132 cases, or 100.00% of all female athletes.

The number of bone fractures of various parts of the body, primarily the upper and lower extremities - 12 cases, or 9.09% of the total number of female athlete under study. The highest traumatization rates and frequency of different types of injuries received, traumatic, are such modern types of female sports, like contact martial arts - Kyokushinkai Karate and Tekhvondo.

Among other traumatic factors, we have identified such as muscle pain, pain in the joints and bones, as well as pain in various spine sections arising, both during the period of performing one or another physical activity and manifestations in the period of rest - out of period Training and competitions. The distribution of all these pathological groups, in athletes, is presented in table 4, % ratio.

Name of indicator	Muscular pain of different location	Articular pains of different localization	Pain in different spinal departments
Female athletes involved in Kyokushin karate (n = 43)	43 (100,00%) sports-women	43 (100,00%) sports-women	39 (90,70%) sports-women
Female athletes doing judo (n = 45)	45 (100,00%) sports-women	45 (100,00%) sports-women	36 (80,00%) sports-women
Female athletes doing taekwondo (n = 44)	44 (100,00%) sports-women	44 (100,00%) sports-women	39 (88,64%) sports-women

Table 4: Types of pains detected in female athletes-martial arts.

Analysis of the results of the survey and advanced interviews of the female athletes of all three studied groups, convincingly showed that the overwhelming number of athletes, in all presented types of martial arts, such pathological manifestations are actively represented as muscle pain of different location - in 132 (100.00%) of all female athletes; articular pains of different localization (mainly in the knee, elbow, shoulder and ankle joints) - in 132 (100.00%) female athletes; Pain in different spinal departments (most often in the cervical and lumbar-sacral departments) - in 114 (86.36%) of all female athletes dealing with these types of martial arts. Additionally, in the process of studying the etiological factors of identified sports injuries, it was found that according to survey/extended interviewing, the most frequent causes of injuries obtained, are such etiological factors as a violation of elementary safety requirements - in 129 (97.73%) female athletes. Insufficient duration and volume of the workout, when performing the necessary exercise complex - in 114 (86.36%) female athletes; The lack of proper control by the coach, when performing this or other reception/exercise 58 (43.94%) cases of injuries female athletes.

Also, an analysis of injuries in the identified genital somatotypes of female athletes was carried out. The data obtained are presented in table 5, with the value of $p < 0.05$.

Name of indicator	Gynechomorphic sexual somatotype	Mesomorphic sexual somatotype	Andromorphic sexual somatotype
	Dislocation and stretching	Ears of soft body tissues	Fractures of different bones of the body
Female athletes involved in Kyokushin karate (n = 43)	No female athletes	40 (93,02%) sports-women	3 (6,98%) sportswomen
Female athletes doing judo (n = 45)	No female athletes	41 (91,11%) sports-women	4 (8,89%) sportswomen
Female athletes doing taekwondo (n = 44)	No female athletes	39 (88,64%) sports-women	5 (11,36%) sportswomen

Table 5: Types of injuries received by female athletes in genital somatotypes.

Analysis of the distribution of different types of injuries received by athletes, which is due to the lack of athlete groups in the studied groups, with gynecomorphic sexual somatotype, the bulk of all types of injuries is accounted for at representatives of the mesomorphic sexual somatotype, with the least small experience of these types of martial arts, with small and medium indicators of sports qualifications. Ears soft tissues are present in 120 (90.91%) female athletes with mesomorphic sexual somatotype, and fractures - in 12 (9.91%) athletes with andromorphic sexual somatotype, i.e. 10 times less!

Also, it was found that injuries obtained by athletes were distributed as follows (Table 6), % Relation.

Name of indicator	Getting different types of injuries during training	Getting different types of injuries during competitions
Female athletes involved in Kyokushin karate (n = 43)	85-95%	5-15%
Female athletes doing judo (n = 45)	90-95%	5-10%
Female athletes doing taekwondo (n = 44)	90-95%	5-10%

Table 6: The ratio of injuries obtained during training and competitions in athletes under study.

Analysis of the data obtained during questioning and additional interviews in the three studied groups convincingly showed that the overwhelming number of all types of injuries, athletes are obtained during the training process - from 85 to 95% of all cases, and only 5 - 10 - 15% of all injuries, in the process of competition.

The data conducted by the authors, as well as other researchers of this problem, indicate that, often injuries received during training and competitions are most often a direct consequence of not compliance with the elementary safety requirements, when performing certain technical techniques or Figures, in each of the sports. Also, the cause of the injuries obtained is the insufficient “warming up” of female athletes, at the initial stage of training, flariness/not in good faith in the performance of the technical requirements of one or another sports reception, as well as insufficient coaching control, for a detailed, scrupulous technical implementation of each of the athletes required sports elements, each in their sport [1, p. 77-81; 3-7]. Sometimes, to great regret, the combination of these reasons also leads to sports injuries in female athletes, regardless of their age, and the sport that they are engaged in [1, p. 77-81; 3-7].

Conclusion

1. It was established that 12 (9.92%) female athletes from three studied groups were determined by a pathological, inverse andromorphic sexual somatotype, which was installed in female athletes, with their highest sports experience, intensity and frequency of training.
2. It was determined that the bruises of soft tissues are present in 120 (90.91%) female athletes with mesomorphic sexual somatotype, dislocations of the Irasestrics of different joints - in 94 (71.21%) athletes, and fractures - in 12 (9.91%) female athletes with andromorphic sexual somatotype.
3. It is established that the overwhelming number of all types of injuries, female athletes are obtained during the training process - from 85 to 95% of all cases, and only 5 - 10 - 15% of all injuries, in the process of competition.

Conflict of Interest

I have no conflict of interest.

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Volume 13 Issue 3 March 2022

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