

KINESIOLOGY & COACHING

ROZITA ABDUL LATIF^{1(ADEFG)}, YUSANDRA MD YUSOFF^{1(BCDEFG)},
WAHIDAH TUMIJAN^{1(CDF)}, ADAM FEIZREL LINOBY RONNY LINOBY^{1(CDF)}
SISWANTOYO YOYOK^{2(EF)}

1 Faculty Sport Science and Recreation, Universiti Teknologi MARA, Seremban Campus, Negeri Sembilan (Malaysia)

2 Sport Coaching Department, Sport Science Faculty, Yogyakarta State University (Indonesia)

*Corresponding author: Rozita Abdul Latif. Faculty of Sport Science and Recreation, Jalan Persiaran Tiga/1, 70300 Seremban, Negeri Sembilan, Malaysia;

e-mail: rozita.abdlatif@uitm.edu.my, tel. +6063842000

Injury in Martial Art Activities: Focusing on Pencak Silat Athletes

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Abstract

Background. SUKMA is the biggest national biannual sports event in Malaysia for athletes between 15 and 23 years of age. Combat activities are classified as sports that have a high risk of injuries due to the application of specific techniques and are listed in SUKMA.

Problem and aim: The purpose of this study was to provide an overview of the types of injuries that occur during competition situations among Pencak Silat athletes and the cases of different gender-specific injuries in Pencak Silat.

Material and Methods. The data were collected using an adopted questionnaire. Respondents of the study were 186 Pencak Silat athletes who participated in SUKMA XIX Perak 2018. Male respondents were 100 and female 86. 58.6% of the participants were between 18 and 21 years old.

Results. Based on the result, the most frequent injuries that occurred in Pencak Silat are bruises ($n = 69$), and the least frequent injuries are fractures [$n = 6$]. The primary cause of most of the injuries in Pencak Silat is kicking ($n = 87$). Other than that, the highest-rate recurring injuries that occurred during training and competition are bruises ($n = 48$, $n = 21$). In this study, the result also indicates that different injuries occur based on gender due to the capability of the gender.

Conclusions. This study presents the injury profiles in Pencak Silat. Injuries in martial arts are the result of kicks and punches that result mostly in bruises and occur frequently in male athletes. It is believed that understanding most risk factors will help to develop preventive measures for the safety of athletes.

Introduction

Combat sport is a professional sport that could only be performed by or involve athletes who possess the required techniques. Nowadays, this kind of sport increases its popularity, as it appears of greater demand to be exercised involving different age, gender or culture groups. Combat sports are sports that train the athletes to have good fitness skills, maximize flexibility, and build strength based on each of the combat sports types [Woodward 2009; Zetaruk *et al.* 2005]. Doing a combat sport is a form of exercise and nowadays it has become one of the major sports activities worldwide. There are many differences in a combat sport that can be determined by its

own culture and understanding. Combat sport is a soft sport, but it is also an aggressive sport that can cause injuries during training or while competitions [Habelt *et al.* 2011]. Injuries occur depending on how the sport is performed, as well as in what way each of them has a different impact on their participants. As an example, Taekwondo does not have any techniques that attack the lower body of the contestants, but for Muay Thai, the rules allow the participants to attack the opponent's lower body [World of Taekwondo Federation (WTF) 2017].

Boxing, Mixed Martial Arts, *Muay Thai*, *Taekwondo*, *Pencak Silat*, and *Wushu* are competitive activities that allow the participants to use aggressive movements that might cause injuries to the athletes during the training

session or in the competition. Injuries can cause short or long-term damages to the body [Langley, Brenner 2004]. Hammami *et al.* [2018] suggested conducting a study to identify the types and characteristics of injuries that occur in other combat sports and their related risk factors such as age, gender, or situation. Therefore, this study is to identify injuries that occurred among Pencak Silat athletes at SUKMA XIX Perak 2018 and to differentiate injuries that occur between gender.

1. Background of the study

Combat sport is a type of fighting, in which athletes use either technique of self-defence or employ attacking skills. These sports are popular in most countries across the world [Hammami *et al.* 2018]. Combat sports involve two individuals who already have the required technique and specific skills such as punching, taking down, and kicking based on the particular competition rules [Noh *et al.* 2015]. There are classified functions of combat techniques that involve striking or kicking styles, like Boxing, Karate, Taekwondo, and Pencak Silat. These activities usually do not allow the use of any weapon to either protect or attack one during the competition, as athletes use their bodies to develop and perform the technique [Krabben, Orth, van der Kamp 2019]. However, weapons can still be used in a specific category based on

the martial art itself such as Silat Seni, Fencing, Wushu, and others.

1.1 Combat sports

Combat sports are activities that involve fighting techniques and physical exercises that can be divided into armed and unarmed martial arts [Theeboom, De Knop 1999]. Combat sports require dedication and practice to increase physical strength and mental endurance. Martial arts are used and created to protect and find the inner strength of the practitioner [Shireman 2010]. There are various types of combat sports in Malaysia such as Judo, Jujutsu, Karate, Kickboxing, Mixed Martial Art, Muay Thai, Pencak Silat, Silambam, Taekwondo and Wushu, and selected types of combat sports are preferred as competitive activities among Malaysians [Chandran 2021]. Each of them has their way to perform it based on their belief, culture, and technique.

In combat sports, participants will use both self-defence and attacking skills. Self-defence movement is when participants make movements to prevent themselves from being attacked by their opponents. For example, to lift a hand to prevent an attack on the head or the body. Self-defence techniques should be used to ensure that participants do not suffer from severe injuries. Each combat sport has its own self-defence movements, which would reflect its nature.

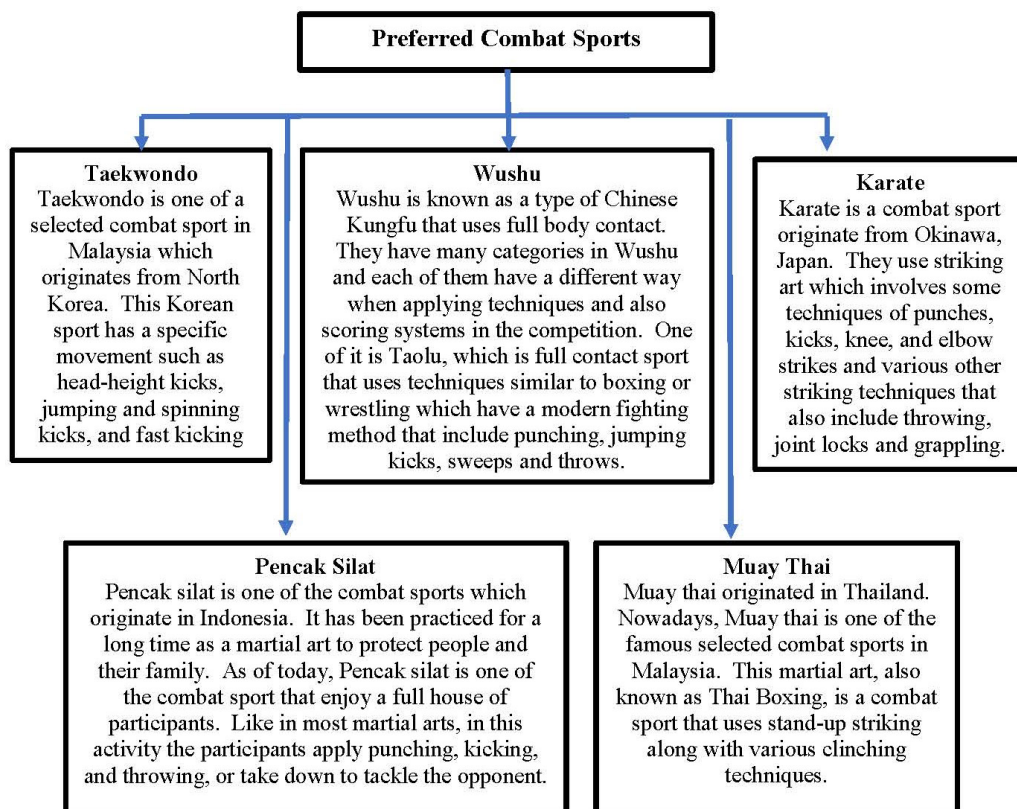


Figure 1. Preferred Combat Sports

Attacking skills are the highlight of combat sports because they will give points to the participants to win the match. Each type of combat sport has its way to strike a move but all combat sports movements will use punches, kicks, throws, and grappling the opponent.

1.2 Injuries in combat sports

Injury is when an accident happens and does damage to the body [Langley, Brenner 2004]. An injury might be a short or long-lasting one based on how it has occurred. In martial art sports, it is a common thing for the participant to have injuries during the training session or the competition. Injuries that occur during training sessions or competitions are known as sports injuries. Sports injuries are commonly caused by overuse, direct impact, or the application of a force that is greater than the body part can structurally withstand [Phillips 2000]. Sports injuries can result from several different causes including overtraining, overuse, improper warm-up, poor technique, and impact. When muscles are not used regularly, muscle waste can occur; meaning the muscle fibres have weakened, so when the person attempts to engage in vigorous exercise beyond their physical capability they may feel tired quickly, which can lead to injury [Health24, 2016].

Sports injuries can be divided into two categories which are acute and chronic [Elmagd 2016]. An acute injury may occur suddenly while activities are being done. Signs of acute injury are sudden, severe pain, swelling, and not being able to move any part of the joint normally. For example, a sprained knee is caused by a sudden twist. Chronic injury may occur after performing activities continuously over a long time. The sign of chronic injury is when athletes feel pain and swelling during activities. Repeated overuse of muscle groups or joints and poor technique can cause chronic injury [NIAMS 2018]. Athletes who did not have a proper warm-up or stretching prior to activities are usually prone to injuries [Shellock, Prentice 1985]. Common sports injuries were sprains, strains, fractures, dislocations, knee injuries, bruises, or swollen muscles [Amos *et al.* 2017].

The injury occurs when there are tension, compression, and shear forces exerted on our body [Michelle 2017]. In combat sports, it is a must to execute an attack on the opponent to get points, and when athletes apply their techniques, things usually get out of control, as it may cause a severe impact on the opponent who may end up with various injuries.

Zreik [2017] found in her study that injuries can occur in the competition or training session based on

Table 1. Attacking skills in combat sports – Pencak Silat

	Attacking skill
Punching	<i>the movement in which participants use hands with the right techniques to attack their opponents</i>
Kicking	<i>the movement where participants use their legs with the right techniques to attack the opponents. Some combat sports allow participants to do a high kick to hit the head of the opponent</i>
Throwing	<i>taking down the opponent is also one of the attacking skills that have been used in combat sports. This skill needs strength and the right technique to be performed. Combat sports such as Judo will use these skills for participants to get a point in the match.</i>
Counter attack	<i>This technique is also known as 'potong'. Counter attack is used when your opponent catches your strike either with hand or leg. Normally, in a weaponry system your opponent will die instantly or is badly injured due to the effectiveness of the technique. This is the best skill to beat, any martial arts that emphasizes catching and locking techniques.</i>
Sweeping	<i>This technique is used in silat olahraga. Not many other martial arts competitions use this in their match. You can use this technique to topple down your enemy. The impact of the wrong landing technique from a sweeping technique can lead your enemy to a coma.</i>
Catching	<i>This is the answer to any self defense that likes to use kicks as their main movements. Usually, the catching technique will be followed with topple down or strike that can hurt your opponent badly.</i>
Locking	<i>Most locking techniques in silat will end up with breaking the bones of the opponent particularly if he or she still tends to fight with you. This is the perfect technique in close combat fighting either with or without weapons.</i>
Elbow	<i>The unique strike in silat is copied by kick boxing and many other martial arts. Usually, this technique is used when you try to confuse your opponent with your body movements.</i>
Grappling	<i>a combination of self-defence and attacking skills in a combat sport in which participants grab the opponent and drop with the right technique and the opponent will perform self-defence techniques so as not to fall.</i>

the activity itself. Hence, the increase in injuries related to combat sports during training or in competition makes most of the younger generation stop participating due to numerous injuries [Hammami *et al.* 2018]. In the studies, Zreik [2017] also discovered that there are two elements: age and gender, which become factors to the injury because different ages and gender can make a huge difference in the types of injuries that may occur in combat sports. Taekwondo has become the main combat sport to endure injuries. It is because, in Taekwondo, the highest point is gained by the participant when they perform a striking kick at the head of the opponent [Cynarski, Kudłacz 2008].

a. Types of injuries in combat sports

In combat sports, competition rules allow participants to use techniques such as kicking, punching, throwing, and taking down the opponent in action to win the competition, as this will cause a severe injury [Nikitas *et al.* 2010]. Hammami *et al.* [2018] found that the percentage of injuries occurring in Taekwondo (51%) was higher than in any other combat sport, and it occurred in the lower body (63%). Common injuries that occur in combat sports are bruises, sprains and strains, concussions, fractures, dislocations, and overuse muscle injuries [Elmagd 2016].

i. Bruises

Bruises appear on the outer layer of the skin, it will appear dark, blue, and brown due to damaged blood cells that are caused by impact. Bruises will usually take a few days or weeks to recover and will not usually affect a person's activity. A cause of a bruise occurs when a greater force is exerted and impacts part of the body [Amos *et al.*, 2017]. Research conducted by Cynarski and Kudłacz [2008] showed that 49% of combat sports like Boxing, Mixed Martial Art, and Taekwondo can cause bruises.

ii. Sprain and Strain

Sprain and strain injuries are two different types of injuries but can be related to each other depending on the cause of injury. A sprain injury is an injury to a ligament or joints where it can be stretched or torn. The ligament, or joint, is a connection from one bone to another. Sprains happen when an athlete falls, twists a joint, or takes a hit that can impact the joint, e.g. dislocated from its normal position. Twisted knees are known as sprain injuries. When examining an injury, symptoms of sprains are recognized when one is not able to move or use the joint properly [Wollman 2013].

Based on Hammami *et al.* [2018], the most common joint injuries which occur in combat sports are primarily knee and shoulder sprains. A strain injury is an injury that happens to a muscle or a tendon. The tendon is a connective tissue that attaches muscle to bone. Strains are usually caused by twisting or pulling a muscle, or

a tendon. Strain is usually caused due to overstressing the muscles. When athletes apply too much force on a muscle in a repetitive motion, overuse a muscle, or do something beyond their physical ability it can cause strain. In most sports such as football, boxing, or wrestling, it is a much higher risk for the athletes to endure strains because they practice repetitive motions to perform the perfect technique. A symptom of strain is when the person feels a cramp in a certain muscle, has trouble moving the muscle, and the muscle is weak. If a muscle or a tendon is torn completely, it will be very painful, and the person might not be able to move. Sprain and strain can cause an athlete to have limited flexibility. These injuries might take a few weeks for a total recovery [NIAMS 2018].

iii. Concussion

A concussion is a traumatic brain injury that alters brain function. Symptoms may not appear right away. The person that has had a concussion will experience physical symptoms such as headaches, dizziness, and fatigue. Other symptoms are: having difficulty focusing, or having a memory deficiency. Athletes who have had a concussion cannot return to their sports activities until it is confirmed by a doctor that the athlete is fit to continue playing sports [BHC 2020]. A sudden quick head movement can cause a concussion. Complete recovery from a concussion can take several weeks or even months depending on the impact of the injury [CHEO 2017].

iv. Dislocation

A dislocation is an injury caused by chronic joint trauma [Lamb, Guy 2016]. The injury causes the bones to move from their normal position. The most common dislocations occur in the shoulder, elbow, knee, or hip joints, and the backbone. Most dislocations return to normal positions in a few weeks and after rehabilitation. Some parts of the joints, such as the shoulder or knee, are at a greater risk for a dislocation to repeat. Symptoms of dislocation are when the joint is forced out of its normal place, the person cannot move that part of the joint, and it becomes swollen [Mayo Clinic 2019].

Dislocation can occur in combat sports due to some aggressive techniques that are employed, such as throwing and take-down. It can cause the person to land in the wrong manner and hit hard onto the surface. Thirty-one-percent [31%] dislocation injuries happen in judo and wrestling [Hammami *et al.* 2018]

v. Fracture

A fracture is a broken bone; there are two different types of fracture which are closed or open fractures. A bone can fracture in several places, or into many pieces. A closed fracture, also known as a simple fracture is when the broken bone does not break out from the skin. An open fracture also called a compound fracture is when

Table 2. Types of Injury in Combat Sports

Activity	Types of Injury in Combat Sports				
	Bruises	Sprain and Strain	Concussion	Dislocation	Fracture
Taekwondo Do	yes	yes	yes	yes	yes
Karate	yes	yes	yes	no	no
Muay Thai	yes	yes	yes	yes	yes
Wuhu	no	yes	no	yes	no
Mixed Martial Art	yes	yes	yes	yes	yes

[Cynarski, Kudlacz 2008; Hammami *et al.* 2018; Strotmeyer *et al.* 2016; Zorakowski, Micheli 2005]

the broken bone tears the skin. Fracture injury occurs when a bone is exerted a stronger impact of force or pressure than it can withstand. A fracture can be recognized by a sound of a snap or a grinding sound when the injury occurred, by swelling, redness, and bruising [Giorgi 2017].

vi. Overuse Injury

Overuse injuries are injuries that occur due to repetitive motion and overuse of the muscle. These injuries can occur in tendons, joints, bones, or when experiencing soft tissue compartment syndrome. This injury may occur because the human body has a limitation of capacity to adapt to physical stress. Training errors and applying the wrong techniques can also cause overuse injuries. Symptoms of overuse injuries are swelling, redness, as also the injury area gets weaker, or cannot be used as normal. Overuse injury can take a few days or weeks to completely recovery [myPhysioWorks, 2017].

b. Injuries risk factors

Since martial arts nowadays are becoming ever more popular, and both genders are likely to be involved, it is necessary to draw attention to all risk factors of injuries to develop efficient strategies for trauma prevention. Several potential factors such as age, gender, experience, training, and competition that can cause injuries in combat sports were studied.

i. Gender

Based on previous research, Hammami *et al.* [2018] there is no compelling difference between the injuries that occur amongst men and women fighters in Taekwondo, MMA, and Boxing. Injuries happen mostly at the same locations because both genders used the same techniques.

ii. Training and Competition

Martial arts sports have a higher rate of injuries during training. This is because they need to implement and practice the right techniques, although not during competition, to gain experience and to improve their skills [Pieter 2005]. Most injuries occur during competitions. This is because each participant would use all the techniques they had learned, and employ all possible methods trying to win the game. According to Cynarski

and Kudlacz [2008] study, 56% of the injuries in Karate occurred during competition.

Table 3. Injuries Risk

Types of Injury	Gender		Situation
	Male	Female	Training
Bruise	yes	yes	yes
Sprain & Strain	yes	yes	yes
Concussion	yes	no	no
Dislocation	no	yes	yes
Fracture	yes	yes	no
Overuse Injury	yes	yes	yes

[Hamammi *et al.* 2018]

Injuries that often occur in self-defence activities, whether in competitions or shows are sprains, sprains, cuts, and bruises. This injury will cause imperfect movement in the shoulder, elbow, knee, or ankle. Hands are also prone to injuries during martial arts attacks. Each martial arts activity has a different type with different levels of injury regardless of the level of participation, gender, or even age.

2. Material and methods

This cross-sectional study was carried out in the SUKMA 2018 event in Perak which involved one hundred and fifty-five Pencak Silat athletes. Data have been collected using a questionnaire.

a. Sample

The researcher used convenience sampling techniques for this study. Convenience sampling is a specific type of non-probability sampling method that relies on data collection from population members who are conveniently available to participate in the study [Saunders *et al.* 2012]. Convenience sampling has been used for athletes who participate in the Pencak Silat competition at SUKMA Perak 2018.

The total number of pencak silat athletes for SUKMA Perak 2018 was 260. One hundred and fifty-five samples is to represent data out of 260 of the population

[Baumgartner, Hensley 2013] and to avoid unreturned questions from the samples; this study added 20 percent of the sample size [Enders 2003] which included 186 samples. There were 100 (53.8%) male respondents and 86 (46.2%) female respondents within the age groups of 17-18 years old (30.6%), 18 to 21 years old (58.6%), and 21-23 years old (10.8%). The result shows: higher frequency of athletes' experiences that is more than 5 years makes 76 people (40.9%) followed by 5 years - 62 people (33.3%), and 2 years - 48 people (25.8%).

b. Instrument

An instrument is vital because it helps the researcher collect all the data needed from the respondent. The instrument used by the researcher in this study is a questionnaire. A questionnaire is a well-established tool for acquiring information on participant ideas and experiences based on present or past behaviour, as it will determine the result to answer the research matter [Bulmer 2004]. The questionnaire contained 15 items including demography, type of sports that athletes are involved, period of time they had been practicing, Structured questionnaire, or in another name closed-ended questionnaire is the question that can be answered with yes or no, or by selecting listed-down suggested responses [Baumgartner, Hensley 2013]. Section B, which examines the type of injury, was adapted and adopted from Strotmeyer *et al.* [2016]. This questionnaire has been validated by three experts to ensure the validity and credibility of the results of the present study reflecting the Malaysian environment.

c. Research Procedures

Before this study was carried out and ethics approval was obtained from the University Ethics Committee (FSR 2/1/2018). Upon ethical approval, a pilot study was conducted to check the variability of the instrumentations. Potential study participants were solicited through an informative presentation arranged by the Persekutuan Silat Kebangsaan Malaysia (PESAKA). Before enrolling in the study, all volunteers were briefed regarding potential risks and benefits. Athletes who wished to participate signed an informed consent form and completed a brief survey on demographic data and collegiate injury history. Before answering the questionnaire, the participants explained the purpose of the study. The participants were given 30 minutes to answer the questionnaire.

d. Data Analysis

The data collected were analysed using Statistical Package for Social Science (SPSS) version 23.0 [Chicago IL, USA] statistical software. Descriptive analysis has been used to show an overview of the research data obtained. The descriptive analysis used for this study is explained by the number of frequencies (n) and percentages.

3. Results

The objective of this study is to identify injuries that occurred among Pencak Silat athletes at SUKMA XIX Perak 2018. Table 4 showed that the highest number of primary injury which occurred among Pencak Silat athletes was bruises (n=69, 37%), followed by sprains (n=47, 25.3%), overuse injury to muscle (n=29, 15.6%), strains (n=27, 14.5%), dislocation (n=7, 3.8%), fracture (n=6, 3.2%), and concussion (n=1, 5%). The table shows that the body part prone to endure higher injuries, as answered by the participants, was the lower body limb (n=122, 65.5%), followed by the upper body limb (n=33, 17.7%), others (n=27, 14.5%), and head (n=4, 2.2%).

Observing the table, a primary cause of injuries was kicking (n=87, 46.8%), followed by others (n=52, 28.0%), takedown (n=27, 14.5%), punching (n=16, 8.6%), and throwing (n=4, 2.2%). The table above shows that most injuries that occurred was during a training session (n=139, 74.7%), whereas during competition - only (n=47, 25.3%). Lastly, the table illustrates that the most frequent competition category involved combat (n=120, 64.5%) and martial art (n=60, 35.5%) sports.

Table 5. Types of injuries among athletes of Pencak Silat at SUKMA Perak 2018.

	Injury	Frequency
	Nature of Primary Injuries	Bruises
Concussion		1
Sprain		47
Strain		27
Fracture		6
Dislocation		7
Overuse Injury of Muscle		29
Body Parts Injury	Head	4
	Upper Body Limb	33
	Lower Body Limb	122
	Others	27
Primary Cause of Injuries	Kicking	87
	Punching	16
	Takedown	27
	Throwing	4
	Others	52
Injuries Occurred During	Training	139
	Competition	47
Competition Category	Combat	120
	Martial Art	66

a. Injury frequently occurred during the training session or in a competition

Fig. 2. Injury frequently occurs during the training session or in competition.

Figure 2, shows the comparison between each of the

injuries that occurred during training or competition. The most common injuries that occur in training are bruises (n=48, 69.6%); bruise injuries also account for the higher occurring ratio during competition (n=21, 30.4%), followed by sprain injuries - both in training (n=36, 76.6%) and (n=11, 23.4%) competition, strains (n=24, 88.9%) in training and (n=3, 11.1%) in competition, overuse injuries in training (n=24, 82.28%) and competition (n=5, 17.2%), dislocation injuries in training (n=5, 71.4%) and competition (n=2, 28.6%). Another type of injury, a concussion, has a high frequency in competition (n=1, 100%) and fracture injuries (n=4, 66.7%) in competition and (n=2, 33.3%) training.

b. Differences in injuries which occurred among athletes in Pencak Silat based on gender

Fig. 3. Injuries that occurred among athletes of Pencak Silat at SUKMA 2018 based on gender.

Figure 3 illustrates the differences in injuries that occurred based on gender. As for bruises, male participants show a higher result (n=36, 52.2%) than female participants (n=21, 30.4%). Only 1 male athlete had a result of concussion injury. For sprain injuries, male participants have a higher result which is (n=25, 53.2%), while the female (n=22, 46.8%), as for the strains - tendency amongst male participants is still higher (n=21, 77.8%) than amongst females (n=6, 22.2%). Considering fracture injuries, female participants have a higher percentage of (n=5, 83.3%), whereas male athletes endured (n=1, 16.7%). The same is true about dislocation injuries where female participants encountered (n=5, 71.4%) and male participants underwent (n=2, 28.6%). Muscle overuse injury: the higher result belongs to female participants - (n=15, 51.7%), as for the male participants it is (n=14, 48.3%).

4. Discussion

In relation to the objectives of the study, the objectives had been measured using a questionnaire that featured the demographic profile of a respondent, all injuries which occurred during training or in competition, and the different types of injury experienced by Pencak Silat athletes based on gender.

In this study, the injury frequency of male athletes (n = 100) is higher than that of female athletes (n = 86). Males are involved in more aggressive activities which can be applied through sport [Rahimizadeh *et al.* 2011], and that is one of the requirements when participating in combat sports. In terms of age - the result indicated that the percentage of participants involved in this study of 18 to 21 years old was the highest - 58.6%. Athletes' strength and stamina were greater at this age span when

compared to other ages making them more aggressive [www.bouldercentre.com, 2015]. In this study, the age range for the SUKMA competition was from 17 to 23 years old [Malaysia National Sports Council Official Site], and most of the athletes who participated in this study were between 18 and 21 years old. Another factor that accounts for various injuries occurrence among young athletes was that athletes might not have the wide range of complex motor skills needed [Adirim *et al.* 2003].

The result also indicates that the highest percentage of the participants' experience, [i.e. more than 5 years of practice], who were involved in this study, was 40.9%. Therefore, the highest risk of injury occurrence like concussion has the lowest frequency in this study. Age and experience are significantly correlated as potential risk factors in combat sports [Hammami *et al.* 2018]. This is because athletes who have more than 5 years of experience are considered professional athletes, which is one of the criteria needed to represent their particular state in a SUKMA event. The experience is based on the total number of competitions where the athletes took part. Having gained a lot of experience in various tournaments undeniably gives an advantage to the athletes on how to prevent serious injuries [Margo 2010]

a. Injuries encountered among participants of Pencak Silat at SUKMA Perak 2018

Based on our findings, the highest frequency of injuries was bruising (n = 69), as the less frequent injury was fracture (n = 6), followed by concussion injuries (n = 1). In a similar to a study by Cynarski and Kudlacz [2008], it was found that in Taekwondo the percentage of bruise injuries is 49.9%, and most other combat sports such as Boxing, Judo, and Wrestling have a higher chance of bruise injuries. Very many similar techniques applied in a combat sport such as punching and kicking are likely to cause bruise injuries the most.

Other than that, the most frequented cause for the main occurrence of injury was kicking (n = 87) and the lowest frequented cause was throwing (n = 4). Most combat sports give the highest mark for kicking rather than punching, as such technique was much easier to enact than throwing the opponent. The study by Strotmeyer *et al.* [2016], stated that (69%) technique used in Muay Thai was kicking, and 48.7% of injuries were caused by employing the techniques. This study also showed that the highest percentage of body part injuries was on the lower body limbs (65.6%), whereas the head area has the lowest percentage (2.2%). Based on Lystad [2015], 51% of most common injuries occurring in Taekwondo are at the lower limbs. This is since attacking the lower body limb is easier than attacking the upper body limb, because the opponent will use strong defence techniques to make sure the attacker cannot get the point. For the Pencak Silat competition, the attacker will usually gain points by attacking the body protector which is worn on the upper body area. Henceforth, most body part injuries

occur on the lower body limb because this is one of the techniques used by the athletes to distract the opponent's focus to defend their body protector.

b. An injury frequently occurs during a training session or competition

This study indicates that most of the injuries occur during training sessions. The highest frequency injury occurring while training was bruises ($n = 48$), as the lowest is dislocation injury [$n = 5$]. These results are similar to Zetaruk *et al.* [2005] study which stated that 65% of most combat sports encounter high-frequency bruise injuries during training due to athletes' aggressiveness while learning new techniques. The training session is not just meant to develop the skills of the athletes, it is also designed in a way to train them to develop self-confidence and bring forth the best out of the athletes while trying to reduce any fear to make them acquire and adopt the various techniques, and that is why most of them will have the injuries during training [Shireman 2010].

The highest frequency of injuries occurring in the competition is bruise injuries ($n = 21$). However, the lowest frequency is concussion injury ($n = 1$). The reason why bruises are frequent injuries in training and competition sessions is due to the techniques the participant use, such as punching and kicking, as those may have a strong impact on the body and cause bruises. This study is not similar to the Lystad study [2015] which stated that [84%] of injuries occurred at the head and neck in Boxing. The reason why this study and the previous study [Lystad 2015] are not similar is that in the Pencak Silat competition, the rule clearly says that the participants are not allowed to attack the head of the opponent, and in Boxing, they are allowed to attack the head area to get a point [World Boxing Foundation, 2016]. The reason that athletes endure concussion injuries in Pencak Silat is that sometimes the athletes usually experience some anxiety and may have a feeling of overconfidence that subject them to make mistakes [Shireman 2010]. Sprain injuries also have the highest frequency ($n = 11$) in competition rather than in training sessions. This is similar to Hammami *et al.* [2018] that stated that 53% sprain injuries occur in Taekwondo.

This result is also similar to the previous study by Noh *et al.* [2015], which indicates that 69% of injuries mostly occur in training sessions, and 23% of injuries occur in competition. Based on their study, 6% of injuries that occur in the competition are caused by the surface and equipment of the competition [Noh *et al.* 2015].

c. Differences in injury occur among athletes of Pencak Silat based on gender.

Based on the finding, the result has shown that injury differences occur based on gender. The result indicates that male athletes have a higher frequency of experiencing some of the injuries, which are bruises ($n = 36$),

concussion ($n = 1$), sprains ($n = 25$), and strains ($n = 21$). The reason why male participants have a higher frequency for this nature of the injury is that male athletes are more aggressive than female athletes in combat sports [Ristolainen *et al.* 2009]. As for fracture ($n = 5$), dislocation ($n = 5$), an overuse injury to muscle ($n = 15$), female participants have higher frequency than males. This is because female bones are more fragile than male ones [Cawthon 2011]. According to NIAMS [2018] women are at a higher risk for kneecap dislocation than men, because women tend to have wider hips causing the thigh bones to slant inward and join the knee at a higher angle. The result showed that the two genders have different types of injuries due to different gender capabilities.

This result has no similarity with the previous study by Hammami *et al.* [2018] which stated that there is no significant difference between male and female athletes in undergoing injuries, like in Taekwondo. This is because female athletes assume that Taekwondo has provided a piece of equipment that can give them higher protection from getting injured rather than in Pencak Silat sport. Pencak Silat has also established a monopoly by male athletes because according to International Pencak Silat Federation [2013], there are a lot more class categories for male athletes than for females.

5. Conclusions

Pencak Silat is a new sport that has been introduced to the world. This sport has delivered so many gold medals that it raised the Malaysian position in international sporting events. The fact is that the majority of participants in combat sports may suffer at least one injury during their sporting career as it involves violent movements while engaging in such activities [Hammami *et al.* 2018]. Combat sports are classified as sports that have a higher risk of injury due to being a contact sport that applies specific techniques. Understanding the risk factors will help to introduce and develop preventive measures for athletes' safety.

In this study, some detailed data of injuries among athletes in Pencak Silat has been provided. The result has indicated different types of injuries which are bruises, concussions, strains, sprains, fractures, dislocations, and overuse injuries. Sports injuries are closely related to a rather dynamic period in which a lot of athletic activities have taken place. Such a period has got to be closely analyzed so we could develop new methods for injury prevention in the future. Additional recommendation from this study for future researchers is to investigate further how to more efficiently prevent injuries among athletes and to reduce the frequency of injuries occurring in combat sports, particularly in Pencak Silat.

The benefits of this current study are meant for all

coaches and athletes who are involved in combat sports. As for coaches and athletes, they may be provided greater knowledge, as they will also gain a broader understanding of the different types of injuries in combat sports such as Taekwondo, Muay Thai, and Karate. Hence, coaches could be enabled to prevent injuries from occurring to athletes not only by planning and applying the right training but also by teaching the athletes the proper techniques. Apart from all the benefits for both coaches and athletes, this current study may appear useful to the management team. The management team will have certain knowledge and awareness of all types of injuries and therefore they may be able to provide the athletes with appropriate equipment to reduce the frequency of injuries amongst them. In conclusion, this current study has reported on the different types of injuries that occur in combat sports, especially in Pencak Silat, in Malaysian setting and therefore, it would be able to assist management, coaches and athletes particularly in reducing the frequency of injuries in Pencak Silat.

References

- Adirim T.A., Cheng T.L. (2003), *Overview of Injuries in the Young Athletes*, "Sports Medicine", Vol. 33, pp. 75-81.
- Amos B., Cronin C., Ellig E., Valentine F., Havens L. et al. (2017), *Common areas where pressure injuries develop*. Retrieved from <https://www.healthlinkbc.ca/health-topics/zm2441>
- Baumgartner T.A., Hensley L.D. (2013), *Conducting and Reading Research in Kinesiology*, McGraw-Hill, New York, NY.
- Better Health Channel (BHC) (2020), *Head Injuries and Concussion*. Retrieved from www.betterhealth.vic.gov.au.
- Bulmer M. (2004), *Questionnaires, V.1*, Sage Publications, Thousand Oaks, CA.
- Cawthon P.M. (2011), *Gender differences in osteoporosis and fractures*, "Clinical Orthopaedics and Related Research", vol. 469, no. 7, pp. 1900-1905.
- Chandran S. (2021), *Five traditional martial arts in Malaysia, from silat to wushu*, "The Star", retrieved from <https://www.thestar.com.my/lifestyle/living/2021/04/09/five-traditional-martial-arts-in-malaysia>.
- Children's Hospital of Eastern Ontario (CHEO) (2017), *ACL Injuries*. Retrieved from <https://www.cheo.on.ca/en/resources-and-support/acl-injuries.aspx#Pamphlets>
- Cynarski W.J., Kudlacz M. (2008), *Injuries in martial arts and combat sports – a comparative study*, "Archives of Budo", vol. 4, pp. 91-97.
- Cynarski W.J. (2012), *Values of Martial Arts in the Light of the Anthropology of Martial Arts*, "Journal of Combat Sport and Martial Arts", vol. 3, np. 3, pp. 1-4.
- Elmagd M.A. (2016), *Common sports injuries*, "International Journal of Physical Education, Sports, and Health", vol. 3, no. 5, pp. 142-148.
- Giorgi A.Z. (2017), *What is Fracture?*, Healthline from www.healthline.com/health/fracture
- Habelt S., Hasler C., Steinbruck K., Majewski M. (2011), *Sports injuries in adolescents*, "Orthopedic Reviews", vol. 3, no. 2, p. 18.
- Hammami N., Hattabi S., Salhi A., Rezgui T., Oueslati M., Boussida A. (2018), *Combat sport injuries profile: A review*, "Journal Science and Sport", vol. 33, pp. 73-79.
- Health24. (2016, March 29), *Sports Injuries*: NIH Publication no.13-5278; Retrieved from www.health24.com/Medical/Sports-injuries/Overview/causes-of-sports-injuries-20160329
- International Pencak Silat Federation (2013), www.persilat.org
- Krabben K., Orth D., van der Kamp J. (2019), *Combat as an Interpersonal Synergy: An Ecological Dynamics Approach to Combat Sports*, "Sports Medicine", vol. 49, pp. 1825-1836.
- Langley J., Brenner R. (2004), *What is an injury?*, "Injury Prevention", vol. 10, no. 2, pp. 69-71.
- Lystad R.P. (2015), *Injuries to Professional and Amateur Kickboxing Contestants: A 15-Year Retrospective Cohort Study*, "Orthopedic Journal of Sports Medicine", vol. 3, no. 11, pp. 1-5.
- Magee D.J. (2008), *Orthopedic Physical Assessment. Laboratory Manual of Physical Geology. Laboratory Manual of Geology*, (5th edn.). Retrieved from <https://books.google.com.my/books>
- Margo K. (2010), *The benefits of competitive athletic sports participation in today's sports climate*. Retrieved from <http://www.chicagonow.com/the-athletes-sports-experience-making-a-difference/2010/02/the-benefits-of-competitive-athletic-sports-participation-in-todays-sports-climate/>
- Mayo Clinic [September 2019], *Discoloration*. Mayo Foundation for Medical Education and Research. Retrieved from www.mayoclinic.org/diseases-conditions/dislocation/symptoms-causes/syc-20354113
- Michelle S. (2017), *How Do Injuries Occur?* Buffalo Rehab Group. Retrieved from <https://buffalorehab.com/blog/how-do-injuries-occur/>
- myPhysioWorks (2017), *Physiotherapy crucial for sports injury recovery*. Retrieved from <http://myphysioworks.com/physiotherapy-crucial-sports-injury-recovery/>
- National Institute of Arthritis and Musculoskeletal and Skin Diseases (NIAMS) (19 Oct. 2018), *Health Information on Sports Injuries*. National Institute of Arthritis and Musculoskeletal and Skin Diseases, U.S. Department of Health and Human Services. Retrieved from www.niams.nih.gov/health-topics/sports-injuries.
- Nikitas N.N., Evangelia K.C., George N.N. (2010), *The evolution of sports trauma over time*, "Medicine of Science Technology", vol. 51, pp. 159-161.
- Noh J.W., Park B.S., Kim M.Y., Lee L.K., Yang S.M., Lee W.D., Shin Y.S., Kim J.H., Lee Y.U., Kwak T.Y., Lee T.H., Kim J.Y., Park J., Kim J. (2015), *Analysis of combat sports players' injuries according to playing style for sports phys-*

- iotherapy research, "Journal of Physical Therapy Science", vol. 27, pp. 2425-2430.
28. O'ong M. (2016), *Pencak silat for future generations: My Training Guide to Keluarga Pencak Silat Nusantara techniques*, Silkworm Books, Indonesia.
 29. Phillips L.H. (2000), *Sports Injury Incidence*, "British Journal of Sports Medicine", vol. 34, no. 2, pp. 133-136.
 30. Pieter W. (2005), *Martial Arts Injuries*, "Epidemiology of Pediatric Sports Injuries", vol. 48, pp. 59-73.
 31. Rahimizadeh M., Arabnarmi B., Mizany M., Shahbazi M., Bidgoli Z.K. (2011), *Determining the difference of aggression in Male & Female, athletes, and Non-Athletes students*, "Procedia – Social and Behavioral Sciences", vol. 30, pp. 2264-2267.
 32. Saunders M., Lewis P., Thornhill A. (2012), *Research Methods for Business Students*, 6th edition, Pearson Education Limited.
 33. Shapie M.N.M., Oliver J., O'Donoghue P., Tong R. (2013), *Activity Profile During Action Time in National Silat Competition*, "Journal of Combat Sports and Martial Arts", vol. 4, pp. 81-86.
 34. Shellock F.G., Prentice W.E. (1985), *Warming-up and Stretching for Improved Physical Performance and Prevention of Sports-Related Injuries*, "Sports Medicine", vol. 2, no. 4, pp. 267-278.
 35. Shireman J. (2010), *The effect of martial arts training on self-concept, self-esteem, and self-efficacy*, Usma.Edu, 1-15. Retrieved from http://www.usma.edu/cfe/literature/shireman_10.pdf
 36. Stenius M. (2014), *Attacking in the Body in Mixed Martial Arts: Perceptions, Opinions and Perspectives in Combat Sport of Ultimate Fighting*, "Arts and Humanities in Higher Education", vol. 4, no. 2, pp. 77-91.
 37. Strotmeyer Jr.S., Coben J.H., Fabio A., Songer T., Brooks M. (2016), *Epidemiology of Muay Thai fight-related injuries*, "Journal Injury Epidemiology", vol. 3, no. 30, pp. 1-8; doi: 10.1186/s40621-016-0095-2.
 38. Theeboom M., De Knop P. (1999), *Asian martial arts and approached of instruction in physical education*, "European Journal of Physical Education", vol. 4, pp. 146-161.
 39. Wollman S. (2013), *Sprains and strains. Patient Education Series*, Nursing 2013. Lippincott Williams & Wilkins.
 40. Woodward T.W. (2009), *A Review of the Effects of Martial Arts Practice on Health*, "Wisconsin Medical Journal", vol. 108, no. 1, pp. 40-43.
 41. World Taekwondo Federation (2017), *Event operation rules*. Retrieved from <https://taekwondo.ch/wp-content/uploads/2018/09/World-Taekwondo-Event-Operations-Rules-June-23-2017.pdf>
 42. Zetaruk M.N., Violan M., Zurakowski D., Micheli L.J. (2005), *Injuries in martial arts: a comparison of five styles?*, "British Journal of Sports Medicine", vol. 39, no. 2, pp. 29-33.
 43. Zreik N.H. (2017), *Orthopedic injuries in martial arts*, University of Central Lancashire. Retrieved from <http://clock.uclan.ac.uk/20738/1/20738%20Zvreik%20Nasri%20Final%20e-Thesis%20%28Master%20copy%29.pdf>.

Kontuzje w sztukach walki: szczególne uwzględnienie zawodników Pencak Silat

Słowa kluczowe: zawody, kontuzja, płęć, sporty walki

Streszczenie

Tło. SUKMA jest największą krajową imprezą sportową organizowaną dwa razy w roku w Malezji dla sportowców w wieku od 15 do 23 lat. Sporty walki są klasyfikowane jako sporty, w których występuje wysokie ryzyko urazów z powodu stosowania specyficznych technik, wymienionych w SUKMA.

Problem i cel: Celem tego badania było przedstawienie przeglądu rodzajów urazów, które występują podczas zawodów wśród zawodników Pencak Silat, oraz przypadków urazów charakterystycznych dla różnych płci w Pencak Silat.

Materiał i metody. Dane zebrano przy użyciu zaadaptowanego i przyjętego kwestionariusza. Respondentami badania było 186 zawodników Pencak Silat, którzy wzięli udział w SUKMA XIX Perak 2018. Mężczyźni stanowili 100 respondentów, a kobiety 86. 58,6% uczestników było w wieku od 18 do 21 lat.

Wyniki. W oparciu o wyniki można stwierdzić, że najczęstszymi urazami, które występują w Pencak Silat są siniaki (n = 69), a najrzadziej występującymi urazami są złamania [n = 6]. Główną przyczyną większości urazów w Pencak Silat jest kopnięcie (n = 87). Poza tym, najczęściej powtarzającymi się urazami, które wystąpiły podczas treningu i zawodów, są stłuczenia (n = 48, n = 21). Wyniki tego badania wskazują również, że urazy różnią się w zależności od płci ze względu na jej możliwości.

Wnioski. Niniejsze opracowanie przedstawia profile urazów w Pencak Silat. Urazy w sztukach walki są wynikiem kopnięć i uderzeń, które w większości przypadków prowadzą do stłuczeń i często występują u sportowców płci męskiej. Wierzy się, że zrozumienie większości czynników ryzyka pomoże w opracowaniu środków zapobiegawczych dla bezpieczeństwa sportowców.