

Hip Pain Increases With Age and Experience Level in Adult Karate Athletes: A Statewide Survey Study



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Purpose: To investigate the prevalence of hip pain from labral tears and femoroacetabular impingement (FAI) in karate athletes using a statewide online survey. **Methods:** An anonymous electronic survey was distributed via Qualtrics to all registered members of a statewide karate organization who were a purple belt or higher. Basic demographic information was collected as well as belt level, competitive level, and information regarding hip pain and treatment for hip pain. Microsoft Excel was used to store and analyze data. **Results:** Of 180 respondents, 123 (68.3%) never had hip pain when practicing karate, and 54 (30.0%) had hip pain at some point in their karate career. Three subjects did not provide an answer and were excluded. Furthermore, of the symptomatic individuals, 52 reported the location of their hip pain, whereas 2 subjects did not. Of the symptomatic individuals (54), 32 had formal diagnoses by a medical professional, 4 (12.5%) were diagnosed with FAI of the hip, 6 (18.8%) diagnosed with a hip labral tear, 3 (9.4%) diagnosed with hip bursitis, 3 (9.4%) diagnosed with hip arthritis, and 16 (50%) had other diagnoses. The remaining 22 participants have not received a formal diagnosis by a medical professional. **Conclusions:** The prevalence of hip pain in karate athletes in this survey was lower compared to athletes of other martial arts and kicking sports. No differences in the percentage of injuries were found between sex and years practiced; however a higher incidence of hip pain was found between elite status and age group. When evaluating hip pain in the karate population, orthopaedic surgeons should maintain an index of suspicion for FAI and hip labral tears. **Level of Evidence:** Level IV, retrospective cross-sectional study.

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Method and instrumentation for acetabular labrum reconstruction with royalties paid to Arthrex, patent 8708941 – Adjustable multi-component hip orthosis with royalties paid to Orthoamerica and DJO Global, and patent 9737292 – Knotless suture anchors and methods of tissue repair with royalties paid to Arthrex. He is the Medical Director of Hip Preservation at St. Alexius Medical Center, a board member for the American Hip Institute Research Foundation, AANA Learning Center Committee, the Journal of Hip Preservation Surgery, and Arthroscopy. He has had ownership interests in the American Hip Institute, Hinsdale Orthopedic Associates, Hinsdale Orthopedic Imaging, SCD#3, North Shore Surgical Suites, and Munster Specialty Surgery Center. Full ICMJE author disclosure forms are available for this article online, as [supplementary material](#).

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Martial artists are a unique subset of athletes who practice the art of combat and self-defense collectively known as martial arts.¹ A trained martial artist should be adept at blocking, striking, and evading techniques.^{1,2} Contrary to common belief, most martial artists do not suffer high levels of acute traumatic injuries.^{3,4} Younger and less-experienced martial artists are often not allowed to make full contact, allowing them to potentially avoid injury.^{3,5} Those who practice karate, known as karateka, must train their bodies to an advanced level of athleticism and combat so that they can successfully defend themselves.^{2,6} This level of training requires a significant dedication to the practice of repetitive movements involving the lower extremity.² Vitale et al.² reported a significant association between years practiced in karate with training hours per week and greater injury rates.

In an athletic hip, overuse activity can often lead to extra-articular soft-tissue injuries whereas intra-articular injuries are often associated with labral tears or chondral damage.⁷⁻⁹ The etiology of athletic hip labral tears is often due to repetitive movements or an isolated traumatic event.^{10,11} Certain structural abnormalities in the hip joint can predispose an athlete to a greater risk for labral tear, such as femoroacetabular impingement (FAI).¹²⁻¹⁶ Symptoms can manifest as anterior hip and groin pain that is exacerbated by hip adduction, internal rotation, and flexion, all of which are components that make up a diagnostic anterior impingement test.^{12,17,18} FAI can be in the form of cam morphology, pincer lesion, or combined types that cause abnormal loading and irritation of the labrum and associated cartilage.¹⁹ This can be further worsened by sport-specific activity such as kicks thrown in karate and can lead to thinning of the cartilage and tearing of the labrum.^{8,10,20,21}

As per the literature, there are a plethora of sports in which the athlete's hip may be subjected to various supraphysiologic forces and therefore associated with FAI and labral tears.^{9,20} Speed, power, flexibility, and accuracy of kicking techniques and stances force the hip joint into both internal and external rotation numerous times in a sparring bout, kata (forms), or basic technique in karate practice. Such factors in combination with unilateral loading can lead to asymmetry and subsequent injury in any context.

Furthermore, it is important to dichotomize karate athletes into elite athletes and nonelite athletes, as significant differences exist between the groups. Elite karate athletes may be defined differently across various countries but nonetheless are considered the highest level of karate athlete. In the United States, elite karate athletes are those who compete in the national Team Trial Divisions/recommended rank of first Dan or higher and had 5+ years of training. In regards to

strength and conditioning, elite male karate athletes differ significantly from novice male karate athletes in the maximal absolute bench press, half-squat one-repetition maximum, performance of isokinetic tasks and choice reaction time.²²

While many studies exist that look at injury rates during martial arts' competition, there are few studies that have reported the prevalence of FAI or labral tears in a specific subset of the martial arts community as a whole.^{1-4,6,23,24} Given our knowledge of the prevalence of FAI and labral tears in the general and athletic population, it is important to investigate the prevalence of such injuries in karate athletes who devote a significant amount of their training to high-intensity hip movement. Outcomes from a prevalence study could lead to better understanding of populations at risk and injury mechanism in this population. The purpose of this study was to investigate the prevalence of hip pain from labral tears and FAI in karate athletes using a statewide online survey. We hypothesized that karate athletes would have a lower prevalence of FAI and labral tears compared with other martial arts and kicking sports that were reported in the literature.

Methods

An online anonymous survey was created to identify hip specific injuries. The 10-question survey was conducted via Qualtrics (Provo, UT) and was composed of basic demographic information as well as sport-specific items ([Appendix Table 1](#)). Study subjects were recruited through a Midwestern statewide karate organization that has served more than 75 park districts for the past 35 years and ranges from beginners to elite veterans. To identify potential injuries in athletes with guaranteed high-volume repetitive hip motion, the survey was administered to karate athletes who were purple belts or higher. E-mails were obtained from registration information for participants who were members of the Midwestern karate organization. E-mails were sent to approximately 500 participants in December 2019. The e-mail headline did not include the words "hip pain," but hip pain was mentioned in the text of the e-mail body. This sample population is believed to be a good representative sample and thus have good external validity. Confidentiality of subjects was protected via anonymity of surveys. Survey links were not emailed to any participant younger than 18 years of age. Data from children younger than the age of 18 years was collected from information relayed by a parent. There was no means of harming any participants included in this survey. Participants were allowed to select multiple diagnoses. Also, participants were allowed to answer if treatment has been recommended even if they have not received an official diagnosis by a medical professional.

This study was performed in accordance with the ethical standards in the 1964 Declaration of Helsinki. This study was carried out in accordance with relevant regulations of the US Health Insurance Portability and Accountability Act (HIPAA). Details that might disclose the identity of the subjects under study have been omitted. This study was approved by the institutional research board (ID: 5276)

Data Analysis

Categorical data were analyzed using a χ^2 test. A P value $< .05$ was considered to be statistically significant. All collected data were stored in an Excel spreadsheet (Microsoft, Redmond, WA).

Results

One hundred eighty subjects completed the entirety of the survey. Distribution of sex was 63% (112) male and 37% (66) female; 2 subjects did not answer. The median number of years of karate practiced was 9 years. The belt type/competitor level and the number of the subjects in each sub level is specified in Tables 1 and 2, respectively. Of 180 subjects, 123 (69.5%) never had hip pain, whereas 54 (30.5%) had hip pain while practicing karate. Three subjects did not answer. Among the 54 subjects who reported pain, 2 subjects did not answer the localization question, 26 of 52 (50.0%) localized pain to the lateral aspect of their hip, 14 (26.9%) localized pain to the groin, 7 (13.5%) localized pain to the upper thigh, and 5 (9.6%) localized pain in the buttocks (Fig 1). Our study suggested that hip pain was more common in individuals beyond their teenage years (P value .004) (Table 3). There were 72 teenagers, 15 (21%) of whom had hip pain, but no confirmed diagnoses of FAI or labral tears. In contrast, 6 individuals were in their twenties, 4 with reported hip pain (66.6%) and 2 diagnosed with FAI and labral tear (33.3%). However, there was no statistically significant difference in hip pain rate between male and female athletes (P value .741) (Table 4). Furthermore, there was a statistically significant difference in the subjects with and without hip pain when compared between groups that were stratified according to the years of

Table 1. The Karate Belt Type and the Number of Subjects in Each Sublevel

Class/Type/Level	Sublevel	Total No. of Subjects
Unspecified	NA	1
Lower	Purple	3
Brown	Third Kyu Brown	31
	Second Kyu Brown	15
	First Kyu Brown	25
Black	Third-degree Black	12
	Second-degree Black	19
	First-degree Black	74
Total surveyed		180

Table 2. Karate Athletic Status and the Number of Subjects in the Respective Subcategories

Athletic Status	Subcategory	Total No. of Subjects
Nonelite		139
Elite athletes	Competitor	23
	Members of USA National Team (Jr. or Sr.)	18
Total		180

practice ($P < .00001$) (Table 5). Those participants who were at the elite level reported hip pain in significantly greater numbers when compared with the nonelite level subjects ($P = .003$) (Table 6). Among the symptomatic elite karate athletes who sought medical diagnosis in our study, labral tear was prevalent in 33% (3 of 9); however, this was not found to be statistically significant when compared with nonelite athletes ($P = .326$) (Table 7).

Medical Treatment

Of the 54 respondents experiencing hip pain, one declined to indicate whether they had been seen by a medical professional for this symptom. Twenty-six of 53 (49.0%) had been evaluated by a medical professional, whereas 27 of 53 (51.0%) had not sought a medical professional for help. Four patients of the 26 who were diagnosed by a medical professional were diagnosed with both FAI (4) and labral tear (4) of the hip. Two of the 26 patients diagnosed by a medical professional were diagnosed with solitary labral tear, 3 were diagnosed with hip bursitis, 3 were diagnosed with hip arthritis, and 16 had other diagnoses (Fig 2). Other diagnoses included hip flexor strain, tendonitis, growth plate injury, iliac crest strain, hip dysplasia, and iliotibial band syndrome. Of the other diagnoses, hip flexor strain (5) was the most common.

Medical treatment was recommended for 25 (71.4%) of the 35 subjects who answered the question regarding treatment (Fig 3). Physical therapy was recommended for 17 (48.6%) of the 35, oral pain medications or anti-inflammatory medications were recommended for 8 (22.9%) of the 35, surgery was recommended for 5 (14.3%), and 5 (14.3%) had other treatment options such as acupuncture, rest, stretching and steroid injections. For the 5 subjects who were recommended surgery, arthroscopic labral repair (3) and total joint replacement (1) were the recommended types. One subject did not answer as to the type of surgery recommended.

Discussion

The main objective of this study was to investigate the prevalence of hip labral tears and FAI in karate athletes. There were a total of 180 subjects who took part in the survey, of whom 54 subjects (30%) reported hip pain

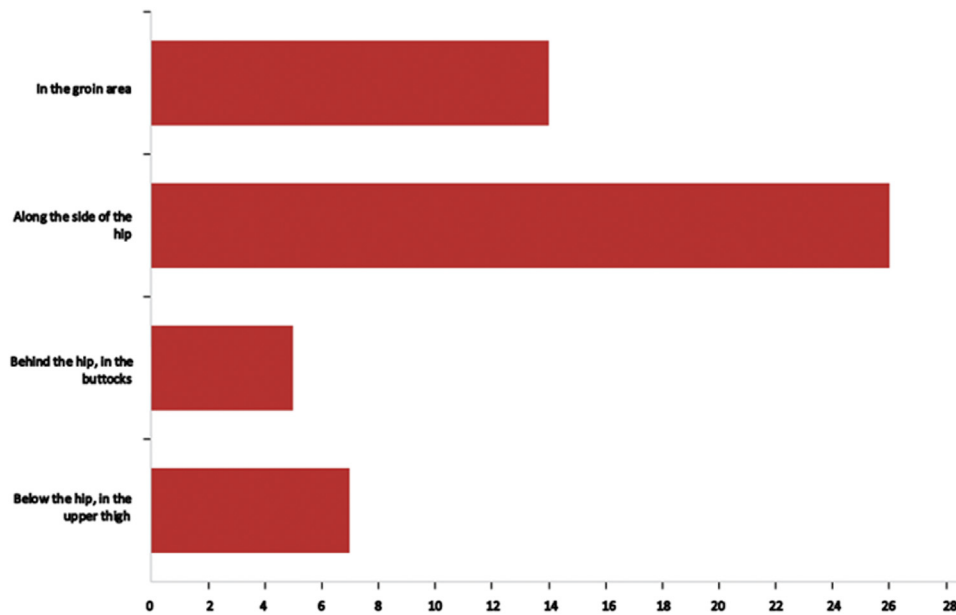


Fig 1. Location of hip pain while practicing karate. Number of responses by location.

while practicing karate. Of those who reported pain, 35 subjects had received treatment, although only 26 karate athletes had sought professional medical help and had a diagnosis. Of these 26, 10 were diagnosed with labral tears or FAI. The overall prevalence of FAI or labral tears of the hip in the symptomatic karate population in this study was found to be 18.5% (10/54), whereas the prevalence out of those with a medical professional diagnosis was 38.5% (10/26). The labral tear prevalence among symptomatic elite karate athletes who sought medical diagnosis was 33%. There was no statistically significant difference in the subjects with hip pain when compared between male and female participants ($P = .741$). In contrast, there was a statistically significant difference in the subjects with and without hip pain when compared between groups that were stratified according to the years of practice ($P < .0001$). It is possible that many symptomatic and asymptomatic athletes could still have FAI and/or labral tears but have not yet been diagnosed.

Overall, the literature cites greater rates of FAI and labral tears among martial artists. There exists a plethora of studies investigating specific martial arts.^{1-4,6,23,24} Capoeira is a Brazilian martial art that requires extreme movements of the hip to perform jumps and kicks, and a high prevalence of radiographic cam-type FAI was found among the skilled capoeira players.²⁴ It is important to note certain distinctions between karate and other martial arts in relevance to injury mechanism and prevalence. To start, karate differs from other martial arts in both basic training philosophy as well as technique prowess. Compared with Tae Kwon Do, which prioritizes kicks, karate employs

an equal emphasis on both kicking and striking technique. Juxtaposing karate to hapkido, grappling and joint locks that are intended to off-balance and put the opponent to the ground; are less common in karate. Moreover, the throwing techniques such as those seen in judo are also less common in karate. All of the aforementioned factors are important components when discussing hip loading and range of motion and injury concerns in the karate athlete.

Given the differences in martial arts, it is important to investigate the different styles. To our knowledge, there are very few studies that specifically look at FAI and labral tear rates in martial artists but do not specifically include karate athletes.^{23,24} Our study furthers this area of research by reporting rates of FAI and labral tears in both experienced as well as elite karate athletes. Our sample included 41 elite level athletes that competed at the greatest level of karate, some being representatives of the United States Karate Team. Among the 41 athletes, 20 have had hip pain (48.8%). Nine of 20 have visited a doctor for the pain (45%), with 2 being diagnosed with FAI/labral tear (22.2%) and 1 with solitary

Table 3. Age and Hip Pain in Karate Athletes

Age	Hip Pain	No Hip Pain	Total
10-12 years old	1	12	13
13-19 years old	15	57	72
20-29 years old	4	2	6
> 30 years old	34	53	87
Total	54	124	178

The χ^2 statistic = 13.1256. The P value is .004373. Two participants did not answer.

Table 4. Sex and Hip Pain in Karate Athletes

Sex	Hip Pain	No Hip Pain	Total
Male	33 (29.4%)	79 (70.5%)	112
Female	21 (31.8%)	45 (68.2%)	66
Total	54 (30.3%)	124 (69.7%)	178

The χ^2 statistic = 0.1089. The *P* value .741425943621. Two participants did not answer.

labral tear (11.1%). Other diagnoses included: hip bursitis, hip flexor strain, groin pull, and hip arthritis. To our knowledge, this sample included the largest number of elite karate athletes in recent literature and highlights the importance of injury identification in both groups.

Our study findings are significant when compared to studies on similar populations. Kang et al.¹¹ reported that martial arts were significantly associated with labral tears and FAI. Their study investigated Tae Kwon Do and Hapkido athletes only, which demonstrated that 64% of symptomatic martial artists had cam-type FAI. Mas Martinez et al.²³ concluded in their study that flexibility sports (martial arts) were significantly associated with rim chondral injuries and ligamentum teres tears. Mariconda et al.²⁴ noted significant positive association between having an alpha angle of more than 60° (suggesting cam-type FAI) and the presence of groin pain (*P* = .002) among skilled capoeira players. Presumably, a certain percentage of patients without diagnosed FAI may have symptomatic labral tears due to well recognized etiologies other than FAI, such as hip microinstability or traumatic injury.²⁵⁻²⁷ The present study found that 10 of 26 (38.5%) respondents who sought medical attention were diagnosed with FAI or labral tears. It is likely that of the 27 subjects with hip pain yet to seek medical consultation, a similarly high number of patients with FAI and labral tears would be identified.

Philippon and Schenker⁹ reported a 40% prevalence of FAI (2 of 5) in symptomatic martial artists at the elite level, in their study. The present data suggest elite-level karate athletes have a prevalence of FAI and labral tears at 22.2% and 33.3%, respectively. This fact highlights the need to routinely evaluate elite level martial artists

Table 5. Years Practiced and Hip Pain Among Karate Athletes

Years	Hip Pain	No Hip Pain	Total
≤5 years	3	17	20
6-10 years	23	70	93
11-15 years	11	16	27
16-20 years	5	9	14
21+ years	12	12	24
Total	54	122	178

The χ^2 statistic is 69.506. The *P* value is <.00001. Two participants did not answer.

Table 6. Elite level and Hip Pain in Karate Athletes

Level	Hip Pain	No Hip Pain	Totals
Elite	20	21	41
Nonelite	34	103	137
Total	54	1243	178

The χ^2 statistic = 8.5741. The *P* value is .00341. Two participants did not answer.

for possible intra-articular hip pathology as a source of pain. Lee et al.¹⁶ demonstrated that soccer and martial arts were the 2 sports most highly associated with FAI. Specifically, these authors concluded that 31.7% of marital artists in their twenties were symptomatic for FAI, whereas 75% of martial artists in their teen years were symptomatic for FAI. Our study evaluated karate athletes who had hip pain and sought medical help with a reported diagnosis. While our study included 70 teenagers, 15 (22%) of whom had hip pain, there were no confirmed diagnoses of FAI or labral tears; there were 6 individuals in their twenties, 4 with reported hip pain (66.6%) and 2 diagnosed with FAI and labral tear (33.3%). A greater prevalence of hip pain in those subjects who were 19 years and older in our study, could be due to other confounding factors such as participation in different sports, previous hip injuries, et cetera. While this could just be the normal distribution to have a greater prevalence of hip pain in 19-year-old and older subjects, it would be beneficial to compare this prevalence rate with that of the general population.

Regarding other sports, Larson et al.²¹ looked at the prevalence of FAI in collegiate football players and concluded that 90% of both symptomatic and asymptomatic players had FAI. Equally, Kolo et al.²⁸ investigated hip injuries in professional ballet dancers and concluded that out of 30 dancers, 47.5% of them had labral tears. The overall prevalence of FAI or labral tears in the symptomatic karate population in this study was found to be 18.5%, whereas the prevalence out of those with a medical professional diagnosis was 38.5%. The labral tear prevalence among symptomatic elite karate athletes who sought medical diagnosis in our study was 33%. It can be inferred that more use of the lower body for kicking and pivoting can lead to higher rates of injury across all sports. Similarly, less loading of the hips to leverage the opponent while performing throws and

Table 7. Elite level and Labral Tears in Those Who Sought Medical Diagnosis

Level	Labral Tear	No Labral Tear	Totals
Elite	3	6	9
Nonelite	3	15	18
Total	6	21	27

The χ^2 statistic =.9643. The *P*-value is 0.326109.

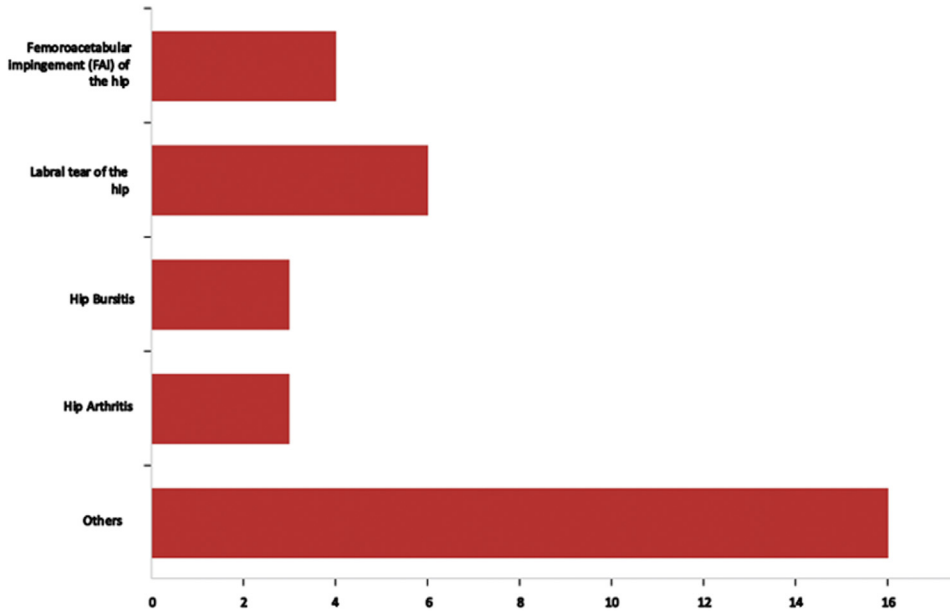
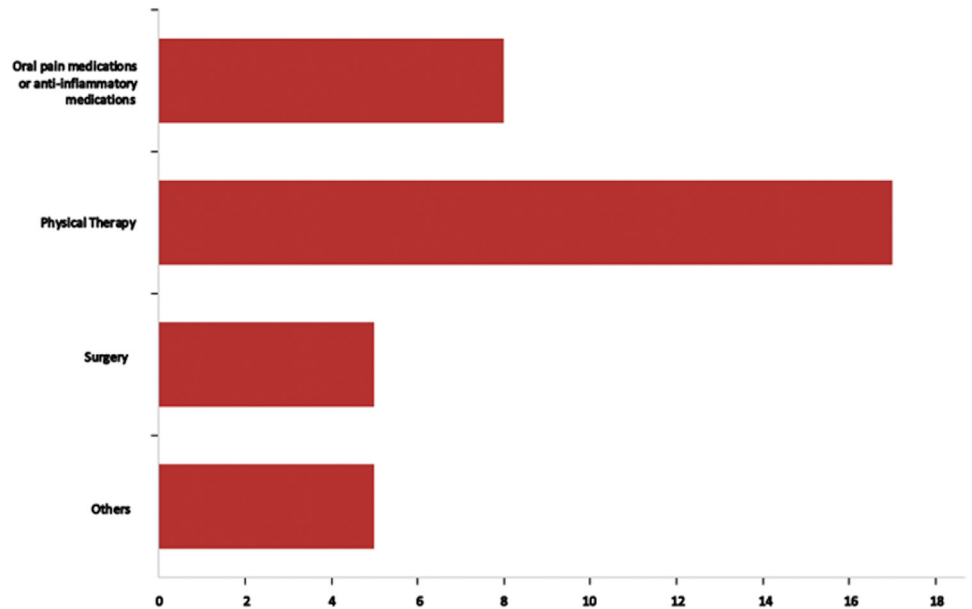


Fig 2. Diagnoses of hip pain in karate athletes. Number of responses for each potential diagnosis (other diagnoses: hip flexor strain [5], hip tendonitis [4], groin pull [1], growth plate injury [1], internal snapping hip [1], iliac crest strain [1], hip dysplasia [2], and iliotibial band syndrome [1]).

grappling can lead to differences seen between martial arts. Without a doubt, the results of the present study differ from previous literature. Ideally, performing such a survey at a major competition would be a better mechanism, as a trained provider could validate the results while allowing assessment of a larger sample of elite karate athletes to help draw more meaningful conclusions.

This study identified notable differences in the FAI/labral tear prevalence rates in karate athletes as causing hip pain compared with other martial arts. The anonymous survey that was used in this study ruled out any possibility of observer induced bias. We believe that the data presented here will be useful for treating orthopaedic surgeons, sports medicine specialists, karate instructors, coaches, athletes, and trainers alike.

Fig 3. Recommended medical treatment in karate athletes with hip pain. Number of responses for each treatment recommended (surgery types were arthroscopic labral repair or total joint replacement, whereas other treatment options were acupuncture, rest, stretching, and steroid injections).



Limitations

Our study is not without limitations. We intended to establish the prevalence of hip pain from FAI and labral tears in karate athletes practicing at an organization based on a survey questionnaire that has potential recall bias. It is possible that there is likely to be a selection bias in the form of increased responsiveness from the athletes with hip pain answering the survey questionnaire via e-mail. The present study only analyzed those karate athletes who responded to the survey questionnaire having hip pain and sought medical help with a reported diagnosis for prevalence estimation. Moreover, we had little information as to who made the diagnosis or how accurately the condition was diagnosed. It is possible that many symptomatic and asymptomatic athletes could still have FAI and/or labral tears but have not yet been diagnosed. As stated earlier, the undiagnosed population with hip pain in this sample could affect prevalence. A further limitation may be that this is based on a single state-wide survey and therefore may not be generalizable to the rest of the United States (or globally). Lastly, additional prospective studies would be needed to further evaluate and diagnose such individuals to corroborate the findings from this study.

Conclusions

The prevalence of hip pain in karate athletes in this survey was lower compared to athletes of other martial arts and kicking sports. No differences in the percentage of injuries were found between sex and years practiced, however a higher incidence of hip pain was found between elite status and age group. When evaluating hip pain in the karate population, orthopedic surgeons should maintain an index of suspicion for FAI and hip labral tears.

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Appendix Table 1. Survey

-
1. Do you have hip pain?
 - a. Yes
 - b. No

 - 1a. If yes, where is the pain located?
 - a. Groin
 - b. Outer hip
 - c. Buttocks
 - d. Upper thigh
 2. How old are you?
 - a. Number
 3. How tall are you (inches ex. 5 feet = 60 inches)?
 - a. Number
 4. How much do you weigh (lbs.)?
 - a. Number
 5. Gender?
 - a. Dropdown
Options – Male, Female, Prefer not to answer
 6. How long have you been practicing martial arts (years)?
 - a. Number
 7. What belt level are you currently?
 - a. Dropdown
Options – white, red, orange, yellow, blue, green, low purple, high purple, 3rd kyu brown, 2nd kyu brown, 1st kyu brown, 1st degree black, second degree black, 3rd degree black, 4th degree black and higher
 8. Do you compete at the elite level? (WKF events, WSKA, more than 2 NKF events per year, Pan Am games etc.)
 - a. Yes
 - b. No

 - 8a. If yes, what type of events? (Multi-select)
 - a. WKF
 - b. WSKA
 - c. NKF
 9. Have you ever visited a doctor for hip pain?
 - a. Yes
 - b. No

 - 9a. If yes, have you ever received a diagnosis of any of the following (multi-select)
 - a. Femoroacetabular impingement (FAI) of the hip
 - b. Labral tear
 - c. Piriformis syndrome
 - d. Hip bursitis
 - e. Hip arthritis
 - f. Other –
 10. Have you been treated for any hip condition?
 - a. Yes
 - b. No

 - 10a. If yes, what type of treatment have you had?
 - c. Oral pain medications
 - d. Physical therapy
 - e. Surgery (open or arthroscopic)
 - f. Other –

 - 10b. If yes to surgery, what type?

 End Survey