



SAFETY ASPECTS OF KARATE AS PHYSICAL EDUCATION AND AN EXTRACURRICULAR ACTIVITY

Hiroyuki Imamura¹ⁱ,

Kentaro Tai²,

Kazuhide Iide³,

Yoshitaka Yoshimura⁴

¹Faculty of Health Management, Department of Health and Nutrition,
Nagasaki International University, Nagasaki, Japan

²Department of International Tourism, Faculty of Human Sociology,
Nagasaki International University, Nagasaki, Japan

³Department of Physical Education,
International Pacific University, Okayama, Japan

⁴Department of Food and Nutrition,
Beppu University, Oita, Japan

Abstract:

The present study reviewed karate injuries sustained during regular training, as well as competition, to examine the safety aspects of karate as physical education and an extracurricular activity. Karate injuries during regular exercise are usually minor, most commonly contusions, bruises, superficial scratches, sprains, and/or strains. The head/neck, and/or extremities were the most commonly injured regions. If karate is included as one of the activities in the school physical education curriculum, three hours or less per week training to practice basic techniques, prearranged-sparring, and kata, without free-sparring, is recommended. If free-sparring is allowed as practice in physical education classes and/or as an extracurricular activity, teachers or instructors should stress the importance of controlling the techniques and using noncontact forms of karate.

Keywords: karate, injury, karate training, karate competition, physical education, extracurricular activity

1. Introduction

A modern Japanese school system was started in 1872. At this time, martial arts were not included in the modern school education. The Ministry of Education and scholars of

ⁱ Correspondence: email himamura@niu.ac.jp

physical education claimed that martial arts were an inappropriate component of the curriculum because they were considered dangerous and lacked a unified program of instruction. Martial arts were considered as an extra-curricular activity (Nakamura, 1980, 1981). In 1911, judo and kendo were incorporated into the school physical education curricula (Tanaka, 1980) and martial arts became more important during World War I and II (Tanaka, 1981). During World War II, martial arts were encouraged as part of the war effort and became an independent subject apart from physical exercises (Nishimura, 1984). After World War II, martial arts were prohibited, but in 1953 they were restored to school curricula as sports (Imamura and Nakazawa, 1992)

Karate is derived from a martial art developed in Okinawa, Japan ([Chaabène et al., 2012](#); Funakoshi, 1973) and is one of the most popular martial arts practiced both in and outside Japan (Imamura, 2001). The World Karate Federation is recognized by the International Olympic Committee and karate will make its first appearance as an Olympic sport at the 2020 Summer Games in Tokyo, Japan (International Olympic Committee, 2017; Kurihara, 2017).

Some Japanese martial arts including judo, kendo, and karate became compulsory in the junior high school physical education curriculum in Japan from 2011 (Ministry of Education, Culture, Sports, Science and Technology, Japan, 2018), and many senior high school and university students practice karate as an extracurricular activity. In a previous study (Imamura et al., 2012), we reviewed the related literature to examine the physical fitness aspects of karate as physical education. The present study reviewed karate injuries during training and competition to further examine the safety aspects of karate as physical education and an extracurricular activity.

2. Karate training

Karate training involves basics, kata, and sparring. Basic techniques such as punching, blocking, and striking are practiced either in the stationary position or with body movement in various formal stances. Kata are set forms in pre-established sequences of defensive and offensive techniques and movements, and are performed alone against imaginary opponents. Movements in kata are very formal, systematic, and sometimes very slow, in prescribed stances and directions. Free-sparring is the execution of defensive and offensive techniques while freely moving against an opponent. To avoid injuries, free-sparring is not always practiced in a regular workout. Instead, there is prearranged-sparring, in which the prearrangement between participants allows one person to practice offensive and the other defensive techniques (Imamura et al., 1999). For safe practice in prearranged-sparring, the offensive techniques, such as punches and kicks, must be controlled or stopped before contact.

3. Injuries during regular karate training

Because participants may use combat techniques designed to cause harm, karate exercises are potentially dangerous (Woodward, 2009). However, it was reported that

training in martial arts (karate or ju-jitsu) decreases hostility (Daniels and Thornton, 1990, 1992).

Karate injuries during regular exercise are usually minor (Demorest and Koutures, 2016; Destombe et al., 2006; Zetaruk et al., 2000a, 2000b; Ziaee et al., 2015), most commonly contusions, bruises, superficial scratches, sprains, and/or strains (Zetaruk et al., 2000a, 2000b; Ziaee et al., 2015). Zetaruk et al. (2000b) reviewed karate-related injuries in 114 participants and found no significant difference in sex. However, participants younger than 18 years of age had fewer injuries. Brown and black belts had a greater frequency of major injuries than the lower ranks. Furthermore, training more than 3 hours per week correlated with an increase in injuries, major injuries, and multiple injuries. Zetaruk et al. (2000a) conducted another study in children and adolescents, in which all injuries were minor, and no major injuries were reported. The authors suggested several possible explanations for the absence of significant acute traumatic injuries. The students of this karate school do not participate in tournaments and do not practice free-sparring. It was reported that most karate injuries during training occur during sparring practice (Yoshimura et al., 2003; Ziaee et al., 2015). Because 97% of participants trained 3 hours or less per week and major injuries were not reported in this study, the authors suggested that 3 hours of karate training poses a lower risk of significant injury for children at 16 years and under. The authors (Zetaruk et al., 2000a) also reported that the risk of significant injury in karate appears to be lower than in other popular children's sports. Karate may be safer (fewer major injuries) than other popular sports such as taekwondo, which originated in Korea (Zetaruk et al., 2005), soccer (Walters et al., 2014), and baseball ([Committee on Sports Medicine and Fitness Pediatrics](#), American Academy of Pediatrics, 2001).

4. Karate competitions rules

Karate competition held under the World Karate Federation rules has 2 modalities: sparring and kata. In sparring competition, attacks are limited to the head, face, neck abdomen, chest, back, and side. Three points are awarded for kicks to the face, head and neck, and any scoring technique delivered to an opponent who was thrown or fell of their own accord. Two points are awarded for kicks to the abdomen, chest, back and side. One point is awarded for any punch delivered to any scoring area. There are age categories for both sparring and kata: children 10-11 years; children 12-13 years; cadets 14-15 years; juniors 16-17 years; and seniors 18+ years. Because World Karate Federation sparring is considered noncontact, punches and kicks must be controlled or stopped before contact with the scoring area. A score is awarded when a technique is performed to a scoring area according to the following criteria: good form, sporting attitude, vigorous application awareness (zanshin), good timing, and correct distance (World Karate Federation, 2018). The correct distance, in senior competition, is a punch or kick somewhere between skin touch and 5 cm from the face, head, or neck. When contact is deemed by the referee to be too strong, it will be penalized. In cadet and junior competition, no contact to the head, face, or neck is allowed with hand techniques. Any

contact, no matter how light, will be penalized, but very light contact is allowed using kicks (World Karate Federation, 2018).

Kata performance judgement gives equal weight to both the major criteria: technical performance and athletic performance. Concentration, power, and potential impact must be displayed in the techniques, and strength, power, and speed as well as grace, rhythm, and balance must be demonstrated (World Karate Federation, 2018).

5. Injuries in karate competition

Previous studies on the injury profile of the Karate World Championships held by the World Karate Federation (Arriaza et al., 2009; Arriaza and Leyes, 2005; Arriaza et al., 2017) reported that the total injury rate was high (0.18 injuries per match (Arriaza et al., 2009) or 0.31 injuries per match (Arriaza and Leyes, 2005), but the injuries were mainly minor. Severe injuries were rare. One study (Arriaza et al., 2017) examined the incidence of concussion in 4 consecutive World Karate Championships (from 2008 to 2014) and reported that there was one concussion in every 1,156 fights. A high rate of minor injuries and low rate of major injuries were also reported in studies on national level competitions (Macan et al., 2006; Tuominen, 1995) and in studies limited to a certain karate style (Critchley et al., 1999; Halabchi et al., 2007). The head/neck, and/or extremities were the most commonly injured regions ([Čierna et al., 2018](#); Pieter, 2005).

In 2000, the World Karate Federation changed the rules of karate competition in an effort to reduce injury rates (Macan et al., 2006), and the new rules were implemented from 2001 (Arriaza et al., 2009). To prevent injury, the rules were stricter about prohibited behaviors for competitors, including excessive force used in blows to permitted areas, to forbidden areas (throat, arms, legs, groin, joints, and instep), and dangerous or prohibited throwing techniques. Any illegal behavior results in a warning or penalty (Macan et al., 2006). Arriaza et al. (2009) compared the injury incidence of the Karate World Championships before and after the stricter rules were introduced and reported that the global injury incidence was almost double under the old rules (0.31 per fight) compared to the new stricter rules (0.18 per fight). The authors suggested that the most important factors in decreasing the injury rate were the willingness of referees to stop dangerously rough play, and aggressively penalize competitors who participated without proper regard for safety, as well as the outlawing of certain uncontrollable methods of attack, and the strict application of the existing rules for competition. Macan et al. (2006) reported similar results for competitors younger than 18 years, although the overall relative risk of injury for competitors older than 18 years was not significant. The authors reported that the new stricter rules in the younger categories were meticulously implemented by referees, and this may have had a significant impact on injury prevention. [Čierna et al. \(2018\)](#) reported that the total injury rate in junior competitions was lower compared with elite adult athletes, and higher compared with younger elite athletes. Arriaza et al. (2016) also reported that cadets (14-15 years old) had a low injury rate and could be safely promoted. [Čierna and Lystad](#)

(2017) reported that adolescent athletes (12-17 years old) were at a higher risk of injury compared with children.

6. Recommendations

If karate is included as one of the activities in the school physical education curriculum, three hours or less per week training to practice basic techniques, prearranged-sparring, and kata, without free-sparring, is recommended. If free-sparring is allowed as practice in physical education classes and/or extracurricular activities, teachers or instructors should stress the importance of controlling the techniques and using noncontact forms of karate.

7. Conclusions

Although many injuries were reported during karate training as well as competition, most appear to be minor, and major injuries were rare. Thus, karate can be safely practiced in the physical education classes and/or extracurricular activity.

About the Authors

Corresponding author:

Professor Hiroyuki Imamura, PhD

Faculty of Health Management, Department of Health and Nutrition, Nagasaki International University, 2825-7 Huis Ten Bosch, Sasebo-shi, Nagasaki 859-3298, Japan.

e-mail: himamura@niu.ac.jp

His research interests include physiological studies on human function in various sports, health related physical activities and nutrition, and epidemiological studies on risk factors of adult diseases. He is a member of the Japan Sports Nutrition Association, the Japanese Society of Nutrition and Dietetics, and the Japan Society of Health Evaluation and Promotion.

Lecturer Kentaro Tai, MS

Department of International Tourism, Faculty of Human Sociology, Nagasaki International University, 2825-7 Huis Ten Bosch, Sasebo-shi, Nagasaki 859-3298, Japan.

e-mail: kentaro1658@gmail.com

His research interests include philosophy of sports and teaching methods in physical education. He is a member of the Japan Society of Physical Education, Health and Sport Sciences, the Society for Studies of Physical Arts, and the Japanese Academy of Budo.

Professor Kazuhide Iide, PhD

Department of Physical Education, International Pacific University, 721 Kannonnji, Seto-cho, Higashi-ku, Okayama 709-0863, Japan.

e-mail: k.iide@ipu-japan.ac.jp

His research interests include physiological studies on human function in various sports, health related physical activities and nutrition, and injury prevention in various sports. He is a member of the Japan Society of Physical Education, Health and Sport Sciences and the Japanese Academy of Budo.

Professor Yoshitaka Yoshimura, PhD

Department of Food and Nutrition, Beppu University, 82 Kitaishigaki, Beppu-shi, Oita 874-8501, Japan.

e-mail: yoshi70@nm.beppu-u.ac.jp

His research interests include physiological studies on human function in various sports, health related physical activities and nutrition, and epidemiological studies on risk factors of adult diseases. He is a member of the Japan Society of Physical Education, Health and Sport Sciences.

References

1. [Arriaza R](#), [Cierna D](#), [Regueiro P](#), [Inman D](#), [Roman F](#), Abarca B, Barrientos M, Saavedra A, 2017. Low risk of concussions in top-level karate competition. [British Journal of Sports Medicine](#) 51(4):226-230. doi: 10.1136/bjsports-2016-096574.
2. [Arriaza R](#), [Inman D](#), [Arriaza A](#), [Saavedra MA](#), 2016. Low Risk of Injuries in Young Adolescents Participating in Top-Level Karate Competition. [American Journal of Sports Medicine](#) 44(2):305-308. doi: 10.1177/0363546515615577.
3. [Arriaza R](#), [Leyes M](#), 2005. Injury profile in competitive karate: prospective analysis of three consecutive World Karate Championships. [Knee Surgery, Sports Traumatology, Arthroscopy](#) 13(7):603-607.
4. [Arriaza R](#), [Leyes M](#), [Zaeimkohan H](#), [Arriaza A](#), 2009. The injury profile of Karate World Championships: new rules, less injuries. [Knee Surgery, Sports Traumatology, Arthroscopy](#) 17(12):1437-1442. doi: 10.1007/s00167-009-0856-3.
5. [Chaabène H](#), [Hachana Y](#), [Franchini E](#), [Mkaouer B](#), [Chamari K](#), 2012. Physical and physiological profile of elite karate athletes. [Sports Medicine](#) 42:829-843. doi: 10.2165/11633050-000000000-00000.
6. [Čierna D](#), [Barrientos M](#), [Agrasar C](#), [Arriaza R](#), 2018. Epidemiology of injuries in juniors participating in top-level karate competition: a prospective cohort study. [British Journal of Sports Medicine](#) 52(11):730-734. doi: 10.1136/bjsports-2017-097756.
7. [Čierna D](#), [Lystad RP](#), 2017. Epidemiology of competition injuries in youth karate athletes: a prospective cohort study. [British Journal of Sports Medicine](#) 51(17):1285-1288. doi: 10.1136/bjsports-2017-097603.
8. [Committee on Sports Medicine and Fitness.Pediatrics](#). American Academy of Pediatrics, 2001. Risk of injury from baseball and softball in children. [Pediatrics](#) 107(4):782-784.

9. [Critchley GR](#), [Mannion S](#), [Meredith C](#), 1999. Injury rates in Shotokan karate. [British Journal of Sports Medicine](#) 33(3):174-177.
10. [Daniels K](#), [Thornton EW](#), 1990. An analysis of the relationship between hostility and training in the martial arts. [Journal of Sports Sciences](#) 8(2):95-101.
11. [Daniels K](#), [Thornton E](#), 1992. Length of training, hostility and the martial arts: a comparison with other sporting groups. [British Journal of Sports Medicine](#) 26(3):118-120.
12. [Demorest RA](#), [Koutures C](#); [Council On Sports Medicine And Fitness](#), 2016. Youth Participation and Injury Risk in Martial Arts. [Pediatrics](#). 138(6). pii: e20163022. Epub 2016 Nov 28.
13. [Destombe C](#), [Lejeune L](#), [Guillodo Y](#), [Roudaut A](#), [Jousse S](#), [Devauchelle V](#), [Saraux A](#), 2006. Incidence and nature of karate injuries. [Joint Bone Spine](#). 73(2):182-188.
14. Funakoshi G, 1973. *Karatate Do Kyohan (The Master Text)* Tokyo, Japan: Kodansha, 3-14.
15. [Halabchi F](#), [Ziaee V](#), [Lotfian S](#), 2007. Injury profile in women shotokan karate championships in Iran (2004-2005). [Journal of Sports Science and Medicine](#). 1;6(CSSI-2):52-57.
16. Imamura H, 2001. Training intensities of karate exercises. *American Journal of Medicine and Sports* 3: 300-303.
17. Imamura H, Miyahara K, Oda K, Kojima N, Matsuo K, Tai K, Yoshimura Y, Iide K, 2016. Calcaneal bone status in elite karate practitioners. *Journal of Athletic Enhancement* 5:4 doi: 10.4172/2324-9080.1000236
18. Imamura H, Nakazawa AT, 1992. Philosophy and history of Japanese martial arts: idealism or pragmatism? *Journal of Asian Martial Arts* 1(4):50-62.
19. Imamura H, Yoshimura Y, Iide K, Tai K, 2012. Karate as physical education: aspect of physical fitness. *Nagasaki International University Review*, 12:87-94 (in Japanese).
20. [Imamura H](#), [Yoshimura Y](#), [Nishimura S](#), [Nakazawa A.T](#), [Nishimura C](#), Shirota T, 1999. Oxygen uptake, heart rate, and blood lactate responses during and following karate training. [Medicine & Science in Sports & Exercise](#) 31(2):342-347.
21. International Olympic Committee. IOC approves five new sports of Olympic games Tokyo 2020. <https://www.olympic.org/news/ioc-approves-five-new-sports-for-olympic-games-tokyo-2020> (accessed 3 August 2018).
22. Kurihara S, 2017. Karate will make its first appearance at the Tokyo Olympic. *Research Journal of Karatedo* 17 • 18:1 (in Japanese).
23. [Macan J](#), [Bundalo-Vrbanac D](#), [Romić G](#), 2006. Effects of the new karate rules on the incidence and distribution of injuries. [British Journal of Sports Medicine](#) 40(4):326-330.
24. Ministry of Education, Culture, Sports, Science and Technology (MEXT), 2018. *Courses of Study, Section 7 Health and Physical Education, Japan* (in Japanese).
25. Nakamura T, 1980. The method of teaching modern budo military arts: a study on the process of its establishment (1). *Research Journal of Budo (martial arts)* 12:30-37.

26. Nakamura T, 1981. The method of teaching modern budo military arts: a study on the process of its establishment (2): on unified style. *Research Journal of Budo* 13:10-18.
27. Nishimura K, 1984. Original budo and reconstituted budo as policy. *Research Journal of Budo (martial arts)* 16:1-8.
28. [Pieter W](#), 2005. Martial arts injuries. [Medicine & Sport Science](#) 48:59-73.
29. Tanaka S, 1980. The value orientation of budo in school physical education curricula: some arguments about kokuritsu taiiku kenkyujo (The Government Institute for Research in Physical Education) and the school budo at the end of the Meiji Era. *Research Journal of Budo* 12:9-16.
30. Tanaka S, 1981. Changes of value orientation about school kendo. *Research Journal of Budo* 13:19-27.
31. [Tuominen R](#), 1995. Injuries in national karate competitions in Finland. [Scandinavian Journal of Medicine and Science in Sports](#). 5(1):44-48.
32. [Walters BS](#), [Wolf M](#), [Hanson C](#), [Mor N](#), [Scorpio RJ](#), [Kennedy AP Jr](#), [Meyers JO](#), [Coppola CP](#), 2014. Soccer injuries in children requiring trauma center admission. [The Journal of Emergency Medicine](#) 46(5):650-654. doi: 10.1016/j.jemermed.2013.11.081.
33. Woodward TW, 2009. [A review of the effects of martial arts practice on health](#). *Wisconsin Medical Journal* 108:40-43.
34. World Karate Federation, Kata and Kumite Competition Rules Effective from 1.1.2018. www.wkf.net/pdf/WKFCCompetitionRules2018.pdf (accessed 3 August 2018).
35. Yoshimura Y, Imamura H, Okishima K, Mishimura S, 2003. Injuries in collegiate karate athletes. *Research Journal of Budo (martial arts)*, 36(1):39-44. (in Japanese).
36. [Zetaruk MN](#), [Zurkowski D](#), [Violan MA](#), [Micheli LJ](#), 2000a. Safety recommendations in Shotokan karate. [Clinical Journal of Sports Medicine](#) 10(2):117-122.
37. [Zetaruk MN](#), [Violan MA](#), [Zurkowski D](#), [Micheli LJ](#), 2000b. Karate injuries in children and adolescents. *Accident Analysis & Prevention* 32(3):421-425.
38. [Zetaruk MN](#), [Violán MA](#), [Zurkowski D](#), [Micheli LJ](#), 2005. Injuries in martial arts: a comparison of five styles. [British Journal of Sports Medicine](#) 39(1):29-33.
39. [Ziaee V](#), [Shobbar M](#), [Lotfian S](#), [Ahmadinejad M](#), 2015. Sport Injuries of Karate during Training: An Epidemiologic Study in Iran. [Asian Journal of Sports Medicine](#). 6(2):e26832. doi: 10.5812/asjasm.26832.

Creative Commons licensing terms

Authors will retain the copyright of their published articles agreeing that a Creative Commons Attribution 4.0 International License (CC BY 4.0) terms will be applied to their work. Under the terms of this license, no permission is required from the author(s) or publisher for members of the community to copy, distribute, transmit or adapt the article content, providing a proper, prominent and unambiguous attribution to the authors in a manner that makes clear that the materials are being reused under permission of a Creative Commons License. Views, opinions and conclusions expressed in this research article are views, opinions and conclusions of the author(s). Open Access Publishing Group and European Journal of Physical Education and Sport Science shall not be responsible or answerable for any loss, damage or liability caused in relation to/arising out of conflict of interests, copyright violations and inappropriate or inaccurate use of any kind content related or integrated on the research work. All the published works are meeting the Open Access Publishing requirements and can be freely accessed, shared, modified, distributed and used in educational, commercial and non-commercial purposes under a [Creative Commons attribution 4.0 International License \(CC BY 4.0\)](https://creativecommons.org/licenses/by/4.0/).