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Pediatric martial arts injuries presenting to Emergency Departments, United States 1990—2003

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Summary Although an estimated 6.5 million United States (US) children aged 6—17 practiced a martial art in 2004, there have been no nationally representative studies comparing pediatric injuries among the three most popular disciplines, karate, taekwondo, and judo. Describe pediatric martial arts injuries presenting to a representative sample of US Emergency Departments (EDs) from 1990 to 2003. We reviewed all martial arts injuries captured by the US Consumer Product Safety Commission's (CPSC), National Electronic Injury Surveillance System (NEISS). An estimated 128,400 children ≤17 years were treated in US EDs for martial arts-related injuries from 1990 to 2003. Injured tended to be male (73.0%) and had a mean age of 12.1 years. Most injuries were attributed to karate (79.5%). The most common mechanism of injury was being kicked (25.6%), followed by falling (20.6%) and kicking (18.0%). The majority of injuries occurred to the lower leg/foot/ankle (30.1%) and hand/wrist (24.5%). The most common injury diagnoses were sprains/strains (29.3%), contusions/abrasions (27.8%), and fractures (24.6%). Participants in judo sustained significantly higher proportions of shoulder/upper arm injuries than karate (IPR = 4.31, 95% CI: 2.84—6.55) or taekwondo (IPR = 9.75, 95% CI: 3.53—26.91) participants. There were also higher proportions of neck injuries sustained by judo participants compared to karate (IPR = 4.73, 95% CI: 1.91—11.70) or taekwondo (IPR = 4.17, 95% CI: 1.02—17.06) participants. Pediatric martial arts injuries differ by discipline. Understanding these injury patterns can assist with the development of discipline-specific preventive interventions.

Abbreviations: US, United States; EDs, Emergency Departments; CPSC, Consumer Product Safety Commission; NEISS, National Electronic Injury Surveillance System; IPR, injury proportion ratios

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Introduction

The popularity of martial arts is on the rise, with United States (US) pediatric participation increasing by 28.2% in the 5-year span from 2000 to 2004.[1] In 2004, an estimated 6.5 million US children aged 6–17 practiced some form of martial art.[1] Many view the marital arts as a good form of exercise for children as well as a way to teach them discipline, control, and respect.[2,3] While research supports these benefits,[4] involvement in the marital arts can also expose participants to a risk of injury.[5]

While several studies have examined injuries sustained by martial arts participants, most have focused on a specific marital art,[6–13] on one injury diagnosis,[12,14–17] on a specific body part injured,[18–21] or on injuries occurring during tournament play.[9,12,22–25] Few studies have examined marital arts injuries among pediatric participants[12,19,25–27] or looked at national data[28] or data over time.[2] There appear to be no prior studies comparing injuries among pediatric karate, taekwondo, and judo participants. Although each falls under the label of martial arts, these disciplines are distinct. Karate makes use of stances, punches, kicks, and knee/elbow strikes, with grappling and throwing utilized as talent progresses.[29] Taekwondo employs strikes and blocks while emphasizing high kicks.[30] Judo is known for throwing, grappling, pinning, joint locks, and choking techniques.[31]

The objective of this study was to describe the epidemiology of pediatric martial arts-related injuries presenting to US Emergency Departments (EDs) from 1990 to 2003 using a nationally representative database, comparing karate, taekwondo, and judo-related injuries. Identifying patterns of injuries among different martial arts disciplines can help decrease injury rates by facilitating the development of discipline-specific preventive interventions.

Methods

Data were obtained from the US Consumer Product Safety Commission's (CPSC), National Electronic Injury Surveillance System (NEISS), which collects information on injuries presenting to US EDs at a network of 100 hospitals. At NEISS hospitals (a stratified probability sample of hospitals with at least six beds and a 24-h ED) trained coders review all ED records daily and enter demographic, injury, and treatment information into the NEISS database. Each case is assigned 1 or 2 CPSC-specific product codes that designate what products or activities were involved with the injury.[32]

We evaluated all martial arts related injuries (product code 3257) sustained by children $\leq$17 years of age presenting to EDs in NEISS hospitals from 1 January 1990–31 December, 2003. The NEISS dataset provides patient demographic information and information on the injury, including the injured body region, diagnosis, disposition, and a brief narrative describing how the injury occurred. Variables of interest included child's gender, age, body region injured, diagnosis, mechanism of injury, disposition, type of martial art, location (e.g. at home, school, etc.), and type of activity (e.g. competition, organized class, play, etc.). The 26 CPSC body region codes were categorized into 10 body regions: head, neck, face, trunk, shoulder/upper arm, elbow/lower arm, hand/wrist, upper leg/knee, lower leg/foot/ankle, and other. Injury diagnoses were derived from the CPSC diagnosis codes and were categorized as strain/sprain, laceration, fracture, contusion/abrasion, dislocation, concussion, and other.

Data were analyzed using SPSS 13.0 while adjusting for sample weights and the stratified survey design as recommended by the CPSC for NEISS data to produce national injury estimates. National annual estimates were calculated via 3-year rolling averages to help account for sub-stratums containing fewer than 25 unweighted cases. As an example of this calculation, the estimated number of injuries occurring in 1991 was calculated by averaging the estimated number of injuries occurring in 1990–1992. National estimates and percentages were calculated to compare body region and injury diagnosis by type of martial art.

Linear regression was used to assess annual injury trends, with p-values < 0.05 considered statistically significant. The complex samples module of SPSS was used to assess categorical variables by calculating injury proportion ratios (IPR) with 95% confidence intervals (CI) that accounted for the complex survey design. For example, the calculation for comparing the proportion of shoulder injuries between judo and karate is as follows:

$$\text{IPR} = \frac{\text{national estimated number of judo shoulder injuries/national estimated total number of judo injuries}}{\text{national estimated number of karate shoulder injures/national estimated total number of karate injuries}}$$