



Original Research

Pediatric Dance Injuries: A Cross-Sectional Epidemiological Study

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Abstract

Objective: The purpose of this study was to analyze characteristics of dance injuries evaluated by sports medicine physicians. **Design:** A cross-sectional epidemiological study of a 5% random probability sample of patients presenting for sports medicine evaluation between January 1, 2000, and December 31, 2009. **Setting:** Sports medicine clinic of a tertiary-level pediatric medical center. **Patients:** A total of 181 pediatric dancers (171 female and 10 male; 14.8 ± 2.0 years of age) with 222 injuries. **Main Outcome Measures:** Injury diagnoses, location, type, and treatment. **Results:** Forty-six injury diagnoses were recorded in this random sample of pediatric dancers, with the most common being tendonitis/tendinopathy, patellofemoral pain syndrome, apophysitis, ankle impingement syndrome, and hip labral tear. Most of the injuries occurred in the lower extremities, with knee and ankle injuries being the most common. Injury classification by type revealed that joints were the body structure most likely to be injured, followed by soft tissues, skeletal elements, and growth plates. The most frequent joint injury was patellofemoral pain syndrome. The most frequent soft tissue injury was tendonitis/tendinopathy. The most common skeletal injury was a pars stress reaction/spondylolysis. The most common physal injury was apophysitis. Dancers were treated mainly with physical therapy, surgery, or physical therapy, in addition to orthotics. **Conclusion:** Pediatric dancers experienced significant, and occasionally rare, injuries that may have long-term health consequences. Although injuries occurred mostly in the lower extremities and involved mainly joints, the most common specific diagnosis was tendonitis/tendinopathy. There is still much to learn about the management of dancers, and there is a need for further research into injury prevention, diagnosis, and treatment.

Introduction

It is estimated that approximately 3.5 million children receive dance instruction from dance specialists in the United States [1]. For those who aspire to attain an advanced or professional level of dance proficiency, dance is an art form that requires intense training starting at an early age. Because of this incredible physical demand, dancers have a high rate of injury [2-4]. One study by Hincapie et al estimated the lifetime prevalence of musculoskeletal injuries to be 26%-51% for university or pre-professional dancers and 40%-84% for professional dancers [4].

Although adult dancers experience various musculoskeletal injuries in their careers, the pediatric dancer may be more vulnerable to injuries due to the physiological growth process [5,6]. Several epidemiological studies report that the injury incidence rate of young dancers ranges around 0.77-1.55 per 1000 dance

hours [7-10]. This incidence is higher than the 0.51-0.62 per 1000 dance hours noted for both adult professional ballet dancers and professional modern dancers [11-13]. Although the reported frequency of fractures and anterior cruciate ligament (ACL) injuries are much greater with pediatric sports [14-16], the overall rates of injury for young dancers appear to be at least comparable to those for other high-risk pediatric athletic activities. For example, O'Kane et al note injury rates of 1.30-1.80 per 1000 hours in youth club gymnasts [17]. Furthermore, the rate of serious injury is also significant for young dancers, although this is less than that of gymnasts. A retrospective study reported that between 1991 and 2007, a total of 113,084 children and adolescents were treated in a U.S. emergency department because of dance-related injuries [2]. In comparison, another study estimated that 425,900 children and adolescents were treated over a 16-year period in U.S. emergency rooms for gymnastics-related injuries [18].

A number of studies of dance students and professional dance company members have demonstrated that most dance injuries are overuse in nature, comprising 55%-88% of injuries [4,7-9,11,12]. Foot and ankle injuries are usually the most commonly reported injury, but injuries involving the low back, hip/groin, knee, and leg also occur with great frequency in both pediatric and adult dancers [7,8,11,12]. Gamboa et al studied elite pre-professional ballet students between 9 and 20 years of age and found that the highest percentage of total injury occurred in the foot/ankle (53.4%), followed by the hip (21.6%), knee (16.1%), and back (9.4%) [8]. Another study by Shah et al noted that professional modern dancers reported the ankle (18%), lower back (17%), knee (16%), and foot (10%) as the most commonly injured body areas [12].

Regarding injury diagnosis, Solomon et al described the most frequent diagnoses in adult professional ballet dancers as soft tissue injuries such as sprains, strains, and tendinopathy [19-21]. In younger dancers between 10 and 21 years of age, Leanderson et al reported that the most common overuse injury was tendinosis pedis, whereas the most common traumatic diagnosis was ankle sprain [9]. The 3 leading diagnoses noted in a study by Ekegren et al of pre-professional ballet students 15-19 years of age were tibial tenoperiostitis, ankle synovitis/impingement/bursitis, and ankle tendon injury [7].

Currently, there are few empirical data on the exact nature of pediatric dance injuries presenting for physician evaluation. A potential reason is that many dancers are not seeking treatment of injuries from physicians or not seeking medical advice in general [12,22-24]. In their study of doctor-dancer relationships, Air et al found that physicians were thought of as third-line providers for dance-related injuries, well behind dance teachers and physical therapists, and only marginally higher than dance colleagues [22]. In addition, McNeal et al found that, in contrast to professional dancers, who nearly all sought medical advice or treatment, 15%-30% of young and pre-professional dancers did not seek medical attention at all for their injuries [24]. Many factors may contribute to this phenomenon, including the "culture" of dancers, limited access to medical care by physicians, as well as assumptions made by dancers about physicians not being helpful or understanding of their needs as performing artists [12,22,23]. Because of all of the elements as a whole, it has been challenging to report the nature of dance injuries in this population. Therefore, the objective of this study was to analyze dance injuries in children and adolescents 5-17 years of age who were evaluated by sports medicine physicians at a tertiary-level pediatric medical center. Specifically, we aimed to provide detailed data on injury diagnoses, location, type, and management.

Methods

Data and Participants

Institutional review board approval was obtained before study commencement. Medical charts of patients presenting for new evaluation to the pediatric sports medicine clinic of a large tertiary-level academic institution between January 1, 2000, and December 31, 2009, were collected (Figure 1). A 5% probability sample was randomly drawn using the "sample" command in Stata (StataCorp, College Station, TX) from the total number of patient visits by children and adolescents 5-17 years of age. Six research assistants performed a medical chart review to determine the total study patient population. Not all participants could be included in the chart review due to the time constraints and funding limitations.

Data for patients who were participating in any dance discipline at the time of injury were extracted and included in the final analyses by research assistants (Figure 1). The following exclusion criteria were used, sequentially: injury was sustained outside of organized sports or dance participation; collected data were incomplete; prospective participant had a pre-existing or coexisting disorder that might be a risk factor for injury; incorrect medical record number was recorded; diagnoses were not clearly specified; and injury was sustained during organized sports (nondance activity).

Demographic data and injury characteristics including diagnoses, locations, types, and treatments were extracted and used in data aggregation and analysis. Of note, we included multiple injuries in the data aggregation and analysis if more than one diagnosis existed at the time of the initial evaluation. In this case, the physician who performed the evaluation was asked to identify the primary diagnosis for the presenting complaint, and subsequently documented secondary and/or tertiary diagnoses as needed. Each injury was analyzed separately, as long as the data set was complete in all outcome measures within the scope of the current investigation.

The treatment codes were aggregated to 1 code per patient, with the most aggressive treatment recorded. In other words, if the patient received surgery along with physical therapy and/or orthotics, surgery was recorded as the treatment for the injury.

Data Analysis

Because multiple research assistants were involved in an extensive chart review and data reduction process to determine the final study population, intercoder reliability was determined using Krippendorff α [25].

The dance injury data itself was initially compiled and sorted by frequency of diagnoses and location of injury. We then stratified the diagnoses based on "body

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