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Injuries among Young Florida Athletes Playing Sports in Recreational Leagues

Yingwei Yang, MS; Karen D. Liller, PhD; Barbara Morris, DHSc; Jessica Fillion, BS, ATC; Omonigho M. Bubu, MD, PhD

ABSTRACT

The purpose of this study was to identify the injury rates and mechanisms of sports injuries among 5-11-year-old athletes, and to provide preliminary guidance for decreasing injuries in this population. A total of 1511 athletes ages 5-11 playing football, soccer, baseball and softball participated in our research. One certified athletic trainer (ATC) used Reporting Information Online (RIO) to collect the data on athletic exposure, injuries and injury mechanisms weekly during the 2016-2017 season in Hillsborough County, Florida. A total of 18 injuries occurred in practices or competitions. Football had the leading rate of injuries for both competitions and practices (1.18 and 0.68, per 1000 athlete-exposures respectively). Most injuries occurred during competition (66.7%) and the leading types of injuries were concussions (22.2%) and fractures (22.2%). The leading injury mechanisms were contact with another person (33.3%) and playing apparatus (33.3%). It is advantageous to have ATCs on site for initial injury evaluation and post injury management. Future studies should include additional study venues to provide more evidence on children's sports injuries.

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BACKGROUND

Injuries related to sports and recreation are a substantial public health problem (Liller, 2012). Although physical activities promote positive physical, intellectual and social development, children and adolescents who participate in sports activities are exposed to various injury risks (Bayt & Bell, 2016; Vriend, Gouttebauge, Finch, van Mechelen, & Verhagen, 2017). Sports related injuries are common. Based on the national estimate for sports-related injuries presenting to US Emergency Departments (ED), 74.7% of the injuries resulting from football, basketball, soccer and baseball occurred among children aged 5–18 years during 2001–2013 (Bayt & Bell, 2016).

Several popular sports have high injury rates among youth. Football is a popular youth sport in the United States but has a high risk for injuries, especially concussions (Dompier et al., 2015; Kerr, Lynall, Mauntel, & Dompier, 2016; Kerr et al., 2015; Pfister, Pfister, Hagel, Ghali, & Ronksley, 2016). Soccer is currently the most popular and fastest-growing sport worldwide. It is a high-intensity sport with frequent changes in movement, velocity, and direction as well as high impact and direct contact between players, increasing the risk of injury (Faude, Rossler, & Junge, 2013). Softball is one of the most

popular female sports in the US, with more than 2 million female athletes (Lear & Patel, 2016). A high incidence of injury has been reported among young softball players, with a large proportion of injuries occurring in position players rather than pitchers (Smith et al., 2015). Baseball is also one of the most popular sports in US and worldwide. Although there is a decline in the rate of baseball-related injuries, facial injuries remain a common resource for ED visits (Carniol et al., 2015). Compared with older athletes, children who play baseball have a higher frequency of injuries in practice (Rice & Congeni, 2012).

Previous research on sports injuries has largely been focused on high school and collegiate athletes. When studies include child athletes, the age range is often broad (i.e., 5-18 years of age), making information regarding children and youth players less clear (Faude et al., 2013; Keays, Friedman, & Gagnon, 2016). For these child athletes, many sports/recreational activities are informal and not organized for reporting injuries, so both incidence and recovery data for this group are based on estimates (Conder & Conder, 2015). No effective prevention strategies can be properly developed without the knowledge of the mechanisms related to these injuries. To address this need, we conducted an

epidemiologic analysis of recreational sports injuries among children ages 5-11 who play football, soccer, baseball and softball in Florida.

Purpose

The purposes of the study were to identify the injury rates and mechanisms of sports injuries among child athletes, and to provide initial information for the development of sports injury prevention guidelines for this population.

METHODS

Participants

A large venue that provided access to many sports for children in Hillsborough County, Florida was selected as the data collection site for this study. The researchers had previous experience with the site and have partnered with the Hillsborough County Athletic Association for the research. This site provides major sports for children, has a long sports history, and excellent playing fields. We selected the sports of baseball, softball, football, and girls' and boys' soccer for this research as they had the greatest number of players. A total of 1511 athletes ages 5-11 participated in soccer (N = 877), baseball (N = 386), softball (N = 154), and football (N = 94).

Instruments

Reporting Information Online (RIO), a national Internet-based sports-related injury surveillance system, was used to collect all time-loss injury data. RIO captures athletic exposure (number of athletes at each practice and number of athletes at each competition per week), injury (body site, diagnosis, severity, etc.) and injury event (mechanism, activity, position/event, field/court location, etc.) ("High School RIO™: Reporting Information Online"). Data were collected weekly by a certified athletic trainer (ATC). Injuries included in RIO are defined as follows:

- Occurred because of participation in competition and practice in recreational leagues;
- Required medical attention by a team physician, certified athletic trainer, personal physician, or emergency department/urgent care facility;
- Resulted in restriction of the athlete's participation for one or more days beyond the day of injury; and
- Any fracture, concussion, dental, or heat injury regardless of whether it resulted in restriction of the athlete's participation.

Procedure

One ATC used RIO to capture the injury data from July 2016 to May 2017. Data were sent to the researchers from the RIO office weekly. The

University of South Florida Institutional Review Board approved this study.

The ATC was experienced with the use of data collection systems including RIO. During the summer months preceding formal data collection, she had the opportunity to practice with the system and interact with RIO's main office for guidance.

Data Analysis

No identifiers were available to the researchers. A series of descriptive data analyses were performed to determine (1) injury rates, defined as the ratio of unweighted case counts per 1000 athlete exposures; (2) the diagnosis of injury; and (3) injury mechanism. All analyses were conducted with SAS 9.4.

RESULTS

Overall Injury Exposure Rate

During the 2016-2017 sports season, 18 injuries occurred in practices or competitions. The median age of the injured athletes was 10 years. Football had the leading rate of injuries for both competitions and practices (1.18 and 0.68, per 1000 athlete-exposures respectively). Softball, girls' soccer and boys' soccer also had relatively high injury rates in competitions (Table 1).

Injury Epidemiology

Most injuries occurred in males (66.7%) and took place during competition (66.7%). The leading types of injuries were concussions (22.2%) and fractures (22.2%), followed by contusions (16.7%), and ligament sprains (16.7%). The head/face (22.2%) was the most frequently injured body part, followed by the ankle, elbow, knee, shoulder, and thigh/upper leg (11.1% for each) (Table 2).

The leading injury mechanisms were contact with another person (33.3%) and playing apparatus (33.3%), followed by playing surface (22.2%). Most injuries were new (88.9%). More than half of injured athletes returned to play within 21 days (55.6%), and none of them required surgery. All the injuries were initially assessed by the onsite ATC, and managed by general physicians-pediatricians (55.6%) and/or the ATC (22.2%).

Concussions

Three concussions happened in competition during the season. Of the three concussions, one took place in girls' softball during a game, due to contact with a thrown ball. The athlete was hit in the back of the head when she was running onto the field. Two concussions occurred in boys' soccer during competitions when players were chasing a loose ball and collided. A fourth concussion took place in girls' soccer during practice and was reported to the ATC but without details.

Other Injuries

A total of 14 injuries were not reported in RIO because the injured athletes returned to play within one day, and therefore did not meet the RIO criteria. However, the ATC did interface with the athletes due to the injuries. Among the 14 cases, most injuries happened in soccer (N = 9; 64.3%), followed by baseball (N = 3; 21.4%). The most commonly injured body parts were head/face (42.9%), arm/hand (21.4%) and ankle (14.3%). Table 3 provides information about these injuries.

DISCUSSION

Our study is unique in that it specifically explored sports injuries among child athletes ages 5-11 years old playing in recreational leagues. The overall injury exposure rate for these athletes was low. Studies conducted in Australia (Spinks, Macpherson, Bain, & McClure, 2006) and European countries (Froholdt, Olsen, & Bahr, 2009; Rössler, Junge, Chomiak, Dvorak, & Faude, 2016) also found low injury rates for children younger than 12 years of age. However, young athletes were at particular high risk for football-related injuries. This may be due to the level of exposure at a time of major physiological change

(Kerr et al., 2015). Our finding of the head/neck as the most frequently injured body part was also observed by other researchers (Keays et al., 2016). Our results also showed that the leading injury mechanisms were contact with another player and playing apparatus, which is consistent with previous studies (Maher, Hutchison, Cusimano, Comper, & Schweizer, 2014; Zuckerman et al., 2016).

A source of treatment and care for these young athletes early on is the ATC. ATCs are highly skilled health professionals who are well trained in the evaluation of athletic injuries, and the agreement between athletic trainer assessment and physician diagnosis is high (Lombardi et al., 2016). ATCs not only ensure the proper care of injured athletes, but also play an important role in injury prevention, by integrating athletes, parents and coaches into the injury management process (Kerr et al., 2016; Lombardi et al., 2016). A study targeting the high school athletic population showed that athletes with access to an athletic trainer have more knowledge of injuries than those without such access (Wallace, Covassin, Nogle, Gould, & Kovan, 2017).

Table 1. Sports-related Injuries in Competitions and Practices among 5-11-year-old Athletes Playing in Recreational Leagues in Hillsborough County, Florida (N= 18)

Sports	Competitions			Practices		
	Athletic Exposures	Injuries	Injury Rate (per 1000)	Athletic Exposures	Injuries	Injury Rate (per 1000)
Football	847	1	1.18	2923	2	0.68
Softball	3192	2	0.63	3004	1	0.33
Soccer (Girls)	2982	2	0.67	4730	1	0.21
Soccer (Boys)	5016	3	0.60	8058	2	0.25
Baseball	9446	4	0.42	6995	-	-

Table 2. Injury Diagnoses and Injured Body Part by Type of Exposure in RIO (N = 18)

Diagnosis	Competition		Practice		Overall	
	N	%	N	%	N	%
Concussion	3	16.67	1	5.56	4	22.22
Fracture	4	22.22	0	0	4	22.22
Contusion	1	5.56	2	11.11	3	16.67
Ligament sprain	2	11.11	1	5.56	3	16.67
Dislocation	1	5.56	0	0	1	5.56
Heat illness/injury	1	5.56	0	0	1	5.56
Laceration	0	0	1	5.56	1	5.56
Separation	0	0	1	5.56	1	5.56
Injured Body Part						
Head/face	3	16.67	1	5.56	4	22.22
Ankle	1	5.56	1	5.56	2	11.11
Elbow	2	11.11	0	0	2	11.11
Knee	2	11.11	0	0	2	11.11
Shoulder	0	0	2	11.11	2	11.11
Thigh/upper leg	0	0	2	11.11	2	11.11
Hand/finger/thumb	1	5.56	0	0	1	5.56
Mouth/teeth	1	5.56	0	0	1	5.56
Nose	1	5.56	0	0	1	5.56
Other	1	5.56	0	0	1	5.56

Note.

RIO = Reporting Information Online

Table 3. Other Injuries Reported by the ATC but not in RIO (N = 14)

Sports	Body Part	Injury
Soccer (Girls)	Head	Fell backwards
Soccer (Girls)	Left eye/cheek	Off balance but no concussion
Soccer (Girls)	Ankle	Strain
Soccer (Girls)	Left Bicep	Contusion
Soccer (Girls)	Right hip and upper thigh	Pain in tensor <i>fascia latae</i> region
Soccer (Boys)	Nose	Hit from ball
Soccer (Boys)	Right Lower Leg	Calf contusion
Soccer (Boys)	Head	Hit the ground but no concussion
Soccer (Boys)	Chin and Nose	Pain but no concussion
Baseball	Finger	Contusion
Baseball	Right Bicep	Contusion
Baseball	Upper Lip	Laceration
Football	Ankle	Strain
Softball	Left Scapula	Contusion

Note.

RIO = Reporting Information Online

Limitations

Although our study describes sports injuries among child athletes, limitations exist. First, the data are not generalizable beyond our setting as other more diverse settings may show different results. Secondly, the data analysis is limited due to the low number of injuries. Also, we were not able to measure children's family characteristics (e.g. parents' education level, socioeconomic status), which may have an important role in children's sports injuries in terms of prevention and medical care.

IMPLICATIONS FOR PUBLIC HEALTH PRACTICE

With the assistance of the ATC involved with this study, the following guidelines, based on our study population, are proposed to reduce the injury morbidity among child athletes.

- All football players should wear appropriate helmets (Emery et al., 2017; Greenhill et al., 2016). New technical equipment, such as the neck collar, may provide additional protection, by reducing internal injury to the brain (Myer et al., 2016). Age-specific policies and prevention strategies should be developed to reduce football-related injuries (Clifton et al., 2017).
- Soccer athletes should be trained with skills to identify hazards and make a quick response to avoid injury-risk behaviors (Emery, Hagel, & Morrongiello, 2006; Faude et al., 2013). "Awareness" of an oncoming collision in soccer was the primary strategy associated with a decreased risk of prolonged symptom recovery (Zuckerman et al., 2016).
- Use of faceguards could reduce the risk of facial injuries among child baseball and softball athletes (Carniol et al., 2015; Marshall, Mueller, Kirby, & Yang, 2003). Children who play

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baseball and softball should be required to wear face masks in practices and competitions.

- ATCs are critical to initial injury evaluation and post-injury management. As recommended, ATCs should be present at every organized sport event and work closely with physicians or pediatricians to help athletes recover from injuries (Broglio et al., 2014). Recreational leagues need to pursue enlisting the support of ATCs for treatment and prevention of injuries and should work with the local colleges and universities to acquire trainees in athletic programs at potentially no cost.
- Guided by ATCs or other professionals, coaches and parents should also participate in injury prevention. Coaches must be educated in many aspects of injuries, including prevention, mechanism, recognition and referral and appropriate return to play (Broglio et al., 2014). Parents should provide their children with safe protective equipment and help educate children on safe playing behaviors (Emery et al., 2006; Faude et al., 2013).

Conclusion

Our findings show preliminary evidence of the types of sports injuries among children ages 5-11 who play in recreational leagues in Hillsborough County, Florida. Overall, the injury exposure rate for the athletes was low. However, children were at a relatively high risk for football-related injuries. Further study of these injuries using more sophisticated study designs and additional study venues will allow for a better understanding and continued development of prevention guidelines.

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