

Prevalence of Sport Injuries among Middle School Children and Suggestions for Their Prevention

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Abstract. [Purpose] The purpose of this study was to determine the incidence of injuries of children participating in sports, and to present advice on injury prevention. [Subjects and Methods] The study subjects were 445 children involved in sports with a mean age of 12.74 ± 1.03 years, a mean height of 156.56 ± 10.82 cm, and a mean weight of 45.39 ± 10.29 kg; 52.8% of the study subjects were male, and 47.2% were female. The subjects were surveyed using a questionnaire developed by the author. [Results] The highest incidence of sport injury was in the foot-ankle region, and the lowest incidence was in the hip-femur region. The incidences of injuries to the neck, shoulder, elbow, hand, wrist, superior dorsal region, waist, hip-femur region, knee, and foot-ankle regions weren't statistically significant. [Conclusion] This study established that children participating in competitive sports are at risk of injury. The causes of injuries were examined to propose preventive measures to minimize their occurrence and severity. It should not be overlooked that injuries can occur more easily among children because their musculoskeletal system is not fully developed, and coaches should be educated in the appropriate training intensities for children.

Key words: Children, Sport injuries

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INTRODUCTION

Participation in sport activities promotes health, and reduces the risks of developing chronic diseases such as hypertension, heart disease, cancer and diabetes¹⁾; however, it also carries the risk of injury²⁾. Soft tissue, bone, ligament, tendon, and nerve injury can occur in athletes of all ages³⁾. Among children, there is a risk of injury at the epiphysis, the growth plate of the bone, because the musculoskeletal system is not fully developed⁴⁾. Moreover, injury may occur in children with an immature musculoskeletal structure due to imbalance between muscle strength and flexibility⁵⁾. Sport injuries and disabilities generally occur at the knee, ankle, hip, shoulder, elbow, and wrist joints, or the vertebrae³⁾. Sport injuries are common at the ankle and the knee⁶⁾.

Age, gender and the type of sport activity affects the incidence of injury³⁾. To prevent injuries among athletes, it is necessary to examine the history of athletes' injuries, and to perform a physical evaluation before they participate in sports⁷⁾.

Historically, the most common reason for participating in sports has been health, but recently, sporting success has surpassed health as the major reason for participation in sports. Athletes strive for success in sports, especially during the periods of adolescence and youth. These are

also periods of individuals' physical development. Because muscle, bone and tendon structures are still immature in the development period, sport injuries frequently occur in this period. This study was undertaken to survey the incidence and regions of sport injuries during young persons' period of physical development, with the aim of presenting advice on the prevention of sports injuries among young people.

SUBJECTS AND METHODS

Permission for this study was received from the Mehmet Akif Ersoy University Ethics Commission (Number: 79325306-020-2072). The study subjects were 445 middle-school students attending a school affiliated to the Ministry of National Education. The participants' had a mean age of 12.74 ± 1.03 years, a mean height of 156.56 ± 10.82 cm, and a mean weight of 45.39 ± 10.29 kg; 52.8% of the study subjects were male, and 47.2% were female. All of the study subjects participated in sports and were performing training 3 times a week. A questionnaire developed by the author was used to collect data. The questionnaire had two sections. The first section was used to collect demographic data, and the second section was used to determine the incidences and regions (neck, shoulder, elbow, hand, wrist, superior dorsal region, waist, hip-femur region, and ankle-foot region) of sport injury. The subjects of the survey were athletes competing in football, handball, basketball, volleyball, badminton, athletics and swimming events organized by the School Sports Federation. The survey was conducted after the completion of the competition season. SPSS 15.0 for Windows was used for statistical analyses. Data are presented using descriptive statistics, and were analyzed using the chi-squared test.

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Table 1. Comparison of injury incidences across sports

	D.S	Neck	Shoulder			Elbow			Hand-wrist			Superior dorsal	Waist	Hip-femur	Knee	Foot-ankle
			rt	lt	rt-lt	rt	lt	rt-lt	rt	lt	rt-lt					
Football	f	17	13	3	3	6	5	2	15	9	3	8	7	3	20	35
	%	10.1	7.7	1.8	1.8	3.6	3.0	1.2	8.9	5.4	1.8	4.8	4.2	1.8	11.8	21.0
Handball	f	5	3	1	0	1	5	0	5	3	1	1	1	1	6	11
	%	7.8	4.7	1.6	0.0	1.6	7.8	0.0	7.8	4.7	1.6	1.6	1.6	1.6	9.4	17.2
Basketball	f	2	1	1	1	3	0	1	2	1	0	3	1	0	4	8
	%	4.1	2.0	2.0	2.0	6.1	0.0	2.0	4.2	2.1	0.0	6.3	2.1	0.0	8.3	16.7
Volleyball	f	12	6	3	2	1	1	1	2	4	2	6	12	3	6	12
	%	12.4	6.2	3.1	2.1	1.0	1.0	1.0	2.1	4.1	2.1	6.3	12.6	3.2	6.4	12.4
Badminton	f	4	1	0	3	2	0	0	3	0	0	2	3	1	3	6
	%	13.8	3.4	0.0	10.3	6.9	0.0	0.0	10.3	0.0	0.0	6.9	10.3	3.4	10.3	20.7
Athleticism	f	1	1	1	0	0	0	0	0	0	0	0	1	0	1	2
	%	5.3	5.3	5.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.3	0.0	5.3	10.5
Swimming	f	1	3	1	0	0	0	0	1	0	0	0	1	0	1	2
	%	6.3	18.8	6.3	0.0	0.0	0.0	0.0	6.3	0.0	0.0	0.0	6.3	0.0	6.3	12.5
Total	f	42	28	10	9	13	11	4	28	17	6	20	26	8	41	76
	%	9.5	6.3	2.3	2.0	2.9	2.5	0.9	6.3	3.9	1.4	4.6	5.9	1.8	9.3	17.3
Significance	X ²	4.09	22.28			19.60			14.22			4.36	13.09	2.94	2.80	4.32
	P	0.663	0.220			0.356			0.715			0.627	0.042	0.816	0.833	0.632

rt=Right; lt=Left; rt-lt=Right-Left

Table 2. Comparison of injury incidences between contact and non-contact sports

	D.S	Neck	Shoulder			Elbow			Hand-wrist			Superior dorsal	Waist	Hip-femur	Knee	Foot-ankle
			rt	lt	rt-lt	rt	lt	rt-lt	rt	lt	rt-lt					
Contact	f	24	17	5	4	10	10	3	22	13	4	12	9	4	30	54
	%	8.5	6.0	1.8	1.4	3.5	3.5	1.1	7.9	4.6	1.4	4.3	3.2	1.4	10.6	19.4
Non-Contact	f	18	11	5	5	3	1	1	6	4	2	8	17	4	11	22
	%	11.2	6.8	3.1	3.1	1.9	0.6	0.6	3.7	2.5	1.2	5.0	10.7	2.5	7.0	13.7
Total	f	42	28	10	9	13	11	4	28	17	6	20	26	8	41	76
	%	9.5	6.3	2.3	2.0	2.9	2.5	0.9	6.3	3.9	1.4	4.6	5.9	1.8	9.3	17.3
Significance	X ²	0.851	2.515			5.02			4.493			0.130	10.177	0.670	1.620	2.31
	P	0.356	0.473			0.170			0.213			0.719	0.001	0.413	0.203	0.128

rt=Right; lt=Left; rt-lt=Right-Left

RESULTS

The results of injury occurrence and region are presented for each sport in Table 1. The foot-ankle region showed the highest incidence of injury, and the hip-femur region had the lowest. Foot-ankle injuries were highest among football, handball and basketball players. Volleyball players showed the highest incidence of waist injuries, swimmers showed the highest incidence of shoulder injuries, and badminton players showed the highest incidence of neck injuries. While the incidence of injuries across regions was similar, except for those of the elbow, wrist and dorsal region, there were differences among the regions that suffered injury in different sports. Waist injury incidences showed significant differences among sports ($p < 0.05$), but there were no significant differences among sports in injuries to other regions ($p > 0.05$).

As shown in Table 2, 19.4% of contact sport injuries and 17.3% of non-contact sport injuries were ankle-foot injuries. The incidence of foot-ankle injuries was the highest among all injury regions in both contact and non-contact sports. The other regions of injury in contact sports were, in order of the highest first, the shoulder, hand-wrist and knee, while in non-contact sports, they were the neck, waist and knee. The incidence of injury to the waist showed a significant differences ($p < 0.05$) between contact and non-contact sports; however, no significant difference ($p > 0.05$) was found between the two types of sport for injury to any other region.

DISCUSSION

While participation in sport is good for children’s health, it carries the risk of injury. To prevent sport injuries among

children, it is necessary to determine the incidence and location of injury for each particular sport, and devise additional training to prevent the occurrence of injury.

In the athletes participating in this study, the foot-ankle region was the body region showing the highest incidence of injury, and the hip-femur region showed the least. Also, the regions showing the highest incidence of injury differed across specific sports, and between contact and non-contact sports. For example, the ankle-foot region showed the highest incidence of injury in both contact and non-contact sports. However, the shoulder, hand-wrist region and knee showed the next highest incidences of injury, in declining order, in contact sports, and the neck, waist and knee in non-contact sports. Incidence of injury in some regions was 0.9%, while in other regions it was 17.3%.

Various injuries can occur in sporting events, even when precautions for prevention have been taken. Nevertheless, it is notable that the vast majority of injuries occur, not during competitive events, but during training⁸⁾. During training, rules aren't applied in trial events used for training as in competitive events. Also, the use of protective materials and equipment is often neglected during training. This situation may lead to the occurrence of injury. It is necessary to make both athletes and their trainers aware of the situation, and encourage them to wear appropriate protection during training.

Heavy sport workouts can damage the muscles³⁾. Also, children participating in heavy sport workouts may be forced to exceed their physical limits⁹⁾. During workouts it is necessary to avoid pushing children beyond their physical limits or damaging their muscles. Damage to the muscle, bone or joints of children during their development period may result in serious injury, and it could result in even greater injury if it happens frequently.

In a previous study, it was reported that injury incidence increased with weekly training time, and the number of years participating in a sport¹⁰⁾. The optimal training time for a child's age and the type of sport should be determined, as a preventive measure for sport injury. The relationship between training time and incidence of injury is important. It is thought to be the reason underlying the increase in the number and severity of injuries.

It is known that factors such as age, height and body weight are related to injuries¹⁰⁾. These factors should be considered when conducting training performed by children.

Workouts that would damage muscles should also be avoided. Adopting preventive measures to the occurrence of injury may contribute to a decline in the incidence of injuries. Well-motivated athletes may ignore severe pain in order to improve their performance³⁾. If such pain is ignored, it may result in serious injury in the future. It is necessary to teach children that they shouldn't perform training when they are injured or have severe pain, and it should not be overlooked that the quality of life of athletes experiencing pain is lowered¹¹⁾. Injuries are important events which affect not only the injured region, but also training and athlete's daily lives.

When the musculoskeletal system is not fully developed, it is possible that a child might experience a sport injury. Injuries not only force children to withdraw from sports, they also lower a child's quality of life. Preventive training should be performed after determining the likely regions of sport injuries. In addition, coaches should be made aware of injuries that could possibly occur during training for children, as well as the dangers of inappropriate training intensities.

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