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The relationship between polyarticular hypermobility and the incidence of injuries in children aged 6-10 years

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SUMMARY

Introduction. The polyarticular hipermobility is a disorder in the connective tissue. It is a frequent disorder observed in school-aged children, with a more frequent occurrence in the female sex. Because of the increased elasticity of the soft tissues, children with hypermobility are more likely to suffer from injuries. The aim of the study is to assess the relationship between polyarticular hypermobility and the incidence of injuries in the group of children aged 6-10 years.

Material and methods. The study group consisted of 102 children aged 6-10. All of them are students from primary schools in Szczecin. The study was conducted using a available 9-point Beighton scale. Polyarticular hypermobility according to Beighton test is diagnosed after getting at least 4 points of maximum 9. The evaluation of 4 or more points was received by 35 children, and they constituted the test group (n_1). The control group (n_2) consisted of 35 randomly selected children with no identified polyarticular hypermobility. 21 children from examined groups (n_1, n_2) had a history of injury.

Results. There were no statistically significant correlation for the incidence of injuries in children with hypermobility and children without hypermobility ($p = 0,603$). There is no statistically significant correlation between the class profile and the occurrence of an injury in the study group ($p = 0,245$)

Conclusions

1. Injuries are a common occurrence among children in early school age.
2. The incidence of injuries in the group of children 6-10 years is not dependent on polyarticular hypermobility.
3. Polyarticular hypermobility predisposes to sports (swimming, gymnastics, acrobatics).

Keywords: polyarticular hypermobility, injuries, Beighton scale, children, physioprevention

Introduction

Joint hypermobility syndrome (JHS) is a disorder of conective tissue. It is manifested by increased range of motion in the joints compared to standards that include gender and age and musculoskeletal pain [1,2]. The physiological mobility in human joints depends on age. Immediately after birth, it is the largest, and decreases over the years [3]. More often polyarticular hypermobility is diagnosed in school-age children than adults. Sources say that the prevalence in children is 8-39%. This dysfunction is more common in girls than in boys [4, 5].

One of the symptoms of hypermobility are pain disorders oft he joints. This is the main reason for reporting to the pediatrician. There are no available diagnostic tests that confirm polyarticular hypermobility. In order to exclude the occurrence of genetic diseases, it is advisable to perform additional diagnostics. These diseases include Ehlers-Danlos and Marfan syndrome [4, 5, 6, 7, 8, 9, 10]. There are non-invasive functional tests, that can be

used to determine hypermobility. There are, among others, Beighton and Brighton scales. The first one is a 9-point scale, including measurement of mobility of selected joints. Obtaining 4 or more points is the basis for diagnosing joint hypermobility syndrome. The second one contains questions about pain in joints or spine lasting longer than 3 months, marfonoid appearance and abnormalities concerning the skin (stretch marks, excessive stretch) [5, 11, 12].

Physical activity is a very important element of a child's life. In children with hypermobility incorrectly selected physical activity can lead to serious injuries. In hypermobility syndrome, all tissues are characterized by extreme flexibility (eg. ligaments, tendons, joint capsule), which increases the possibility of dislocation during on injury or normal physical activity. It leads to sublimations, sprains or dislocations [2, 13, 14, 15].

If the child has hypermobility, physical activity should be selected appropriately. It is important to stay in touch with a physiotherapist who, after carrying out appropriate diagnostic tests, will instruct the individually tailored exercises. In the case of polyarthritis hypermobility, exercises to stabilize the joints, in the closed kinematic chain and pri-reorection are indicated. Only such activities can prevent the consequences resulting from the described disease entity [16, 17, 18, 19].

Aim

The aim of the study was to evaluate the relationship between polyarticular hypermobility and the incidence of injuries in the group of children aged 6-10 years. The relationship between polyarticular hypermobility and the number of injuries and class profile were also evaluated.

Materials and methods

The study involved 102 children from two primary schools in Szczecin. Children attended sports or general class. Before performing the study, written consent was obtained from parents and school management. A physical examination was carried out, which involved the assessment of the presence of hypermobility using the Beighton scale (Table 1). Polyarticular hypermobility according to Beighton test is diagnosed after getting at least 4 points of maximum 9. A group of 70 people was selected for the study.

Table 1. Beighton scale

Tested joint movement	Right side (0-1 points)	Left side (0-1 points)
1. Passive hyperextension V finger above 90^o		
2. Passive adduction of the thumb to the palm side of the forearm		
3. Hyperextension of the elbow		
4. Hyperextension of the knee joint		
5. The Possibility of placing hands flat on the floor during the forward slope		

Test group (n_1) consisted of 35 children with hypermobility assessed on the Beighton scale. In this group there were 14 girls (40%) and 21 boys (60%). 16 children learned in the general class and 19 in the sports class (Fig. 1). The mean age in the test group was ~8 years. The full group characteristics are presented in Table 2.

Table 2. Characteristics of the test group (n_1)

n_1	min.	max.	M
age (years)	6	10	~8
weight (kg)	19,7	56,2	31,87
growth (cm)	121	156	134,4
BMI	12,01	27,55	17,58

min.= minimum, max. = maximum, M= arithmetic mean

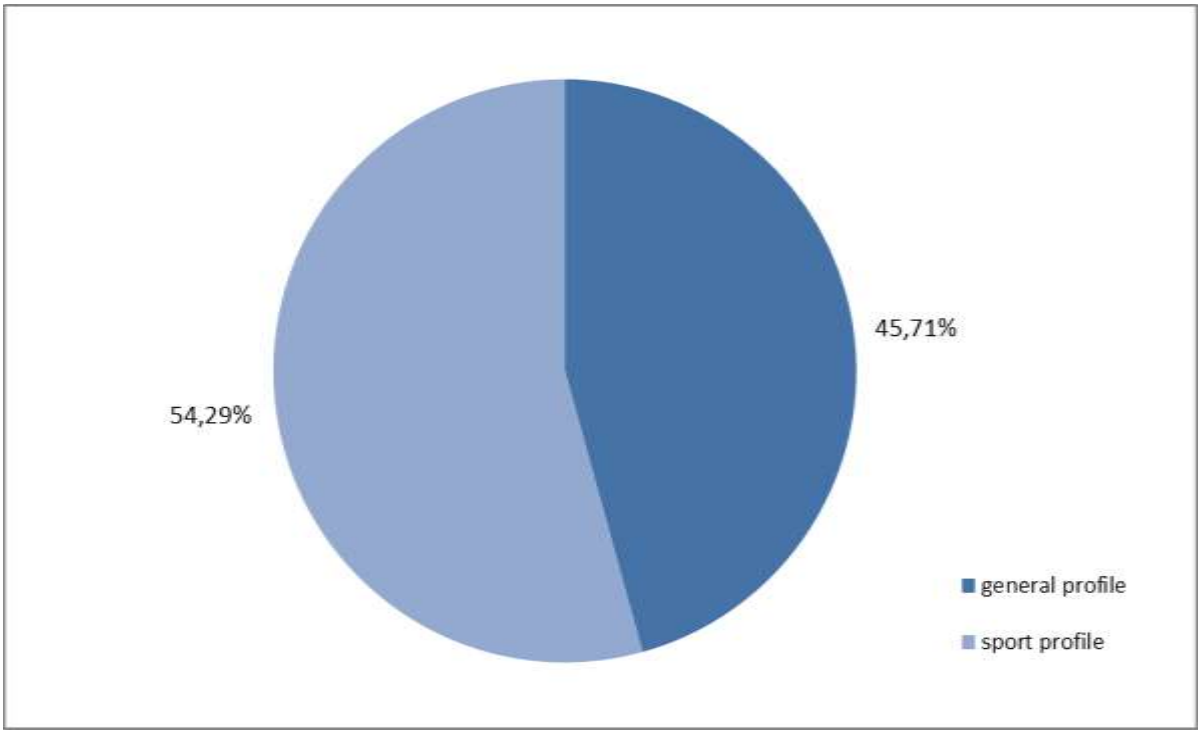

Fig.1. Number of children with hypermobility in the general and sports class (n_1)

The control group was randomly selected 35 children with a score less than 3 points on the Beighton scale. The control group (n_2) consisted of 12 girls (34,29%) and 23 boys (65,71%) and their average age was ~8 years. There were 6 children in the general class and 29 in sports (Fig. 2). Table 3 presents the full characteristics of the group.

Table 3. Characteristics of the control group (n_2)

n_2	min.	max.	M
age (years)	7	10	~8
weight (kg)	22,7	40,5	31,54
growth (cm)	120	145	133,4
BMI	14,79	23,9	17,75

min.= minimum, max.= maximum, M= arithmetic mean

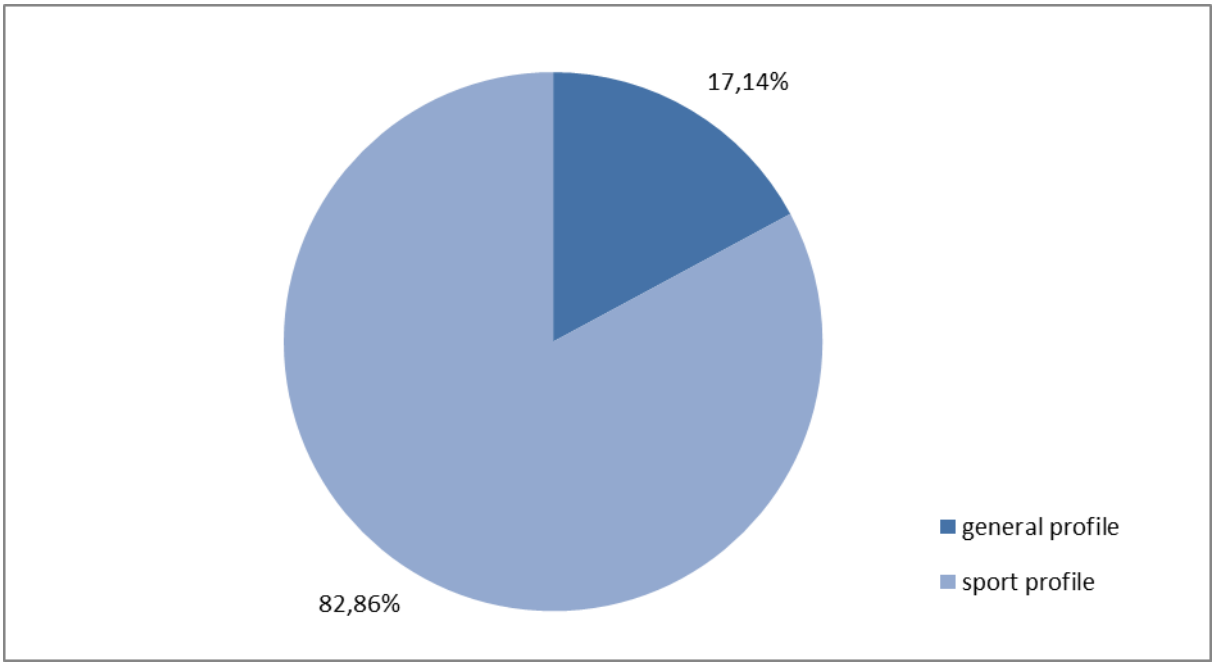

Fig. 2. Number of children without hypermobility in the general and sports class (n_2)

Analysis of the relationship between polyarticular hypermobility in the group of children aged 6-10 years and the incidence of injuries was carried out using the Fisher test. The frequency of injury has been expressed as a percentage. A statistically significant result was assumed $p \leq 0,05$.

Results

The analysis of the data shows that in the group of 70 children, 21 (29,58%) experienced an injury in the past. In the study group (n1) it was 9 children (25,71%) and in the control group (n2) 12 children (34,29%) (Table 4). Injuries that children have experienced are sprains, breaks and cracks. After the Fisher test, no statistically significant differences were found for the incidence of injuries in the hypermobility children (n_1) and control group of children without hypermobility (n_2). p= 0,603

Table 4. Incidence of injury in the test group (n_1) and control group (n_2)

Traumatism	n_1	n_2
Injury (%)	25.71	34,29
No injury (%)	74,29	65.71

Among the 22 students in general class, 7 of them (31,82%) experienced an injury in the past. However, in the sports class of 48 students, 14 (29,17%) were injuried. Statistical analysis showed no statistical significance in the analyzed parameters. From this it follows that the profile class doesn't not have a statistically significant impact on the occurrence or absence of injury among children aged 6-10 years (p= 0,245).

The study showed that in the sports classes there are more children with polyarticular hypermobility. This relationship is statistically significant, p= 0,019, but this requires confirmation by further studies on a larger group children. The percentage of children with hypermobility in sports class is 54,29%, and in the general class 45,71%.

Data analysis shows that children with hypermobility who learn in a sport class are less likely to be injured (Table 5). This may be related to greater knowledge about the sport or exercises held to prepare for training. This requires further study.

Table 5. Injury in the group of children with hypermobility (n_1) depending on the class profile

n_1= 35	General profile (n= 16)	Sports profile (n= 19)
Injury	6	3
No injury	10	16

The subject study showed that the most common type of injury in the study group was joint sprains (14,29%), and in the control group bone breaks (25,71%) (Fig. 3, Fig. 4).

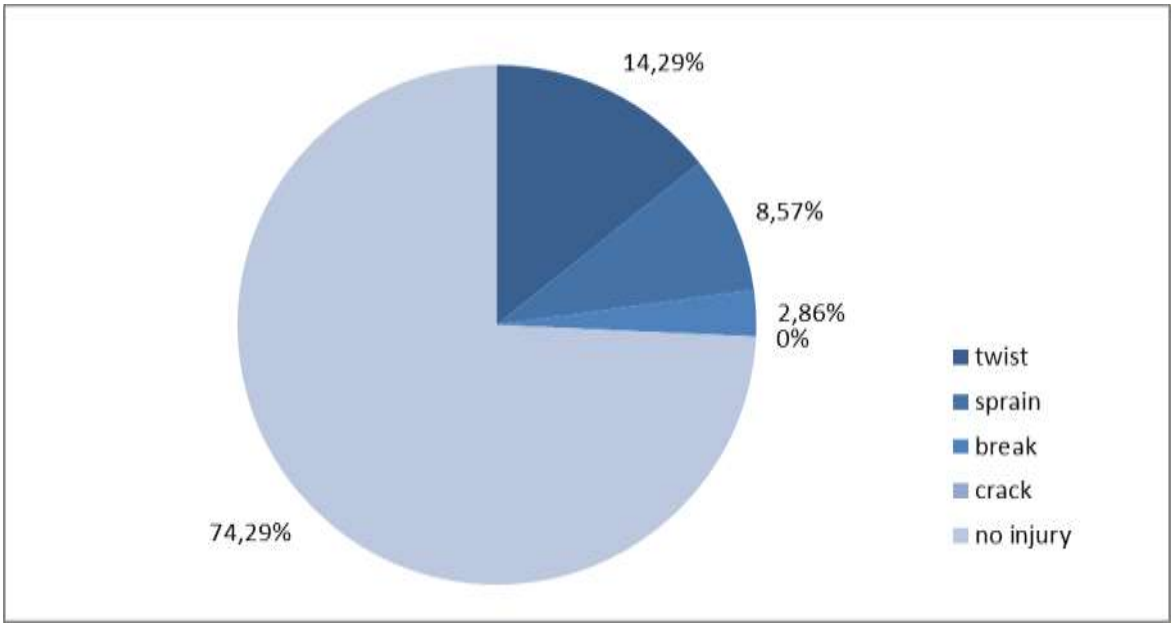

Fig. 3. Types of injuries in the study group (n_1)

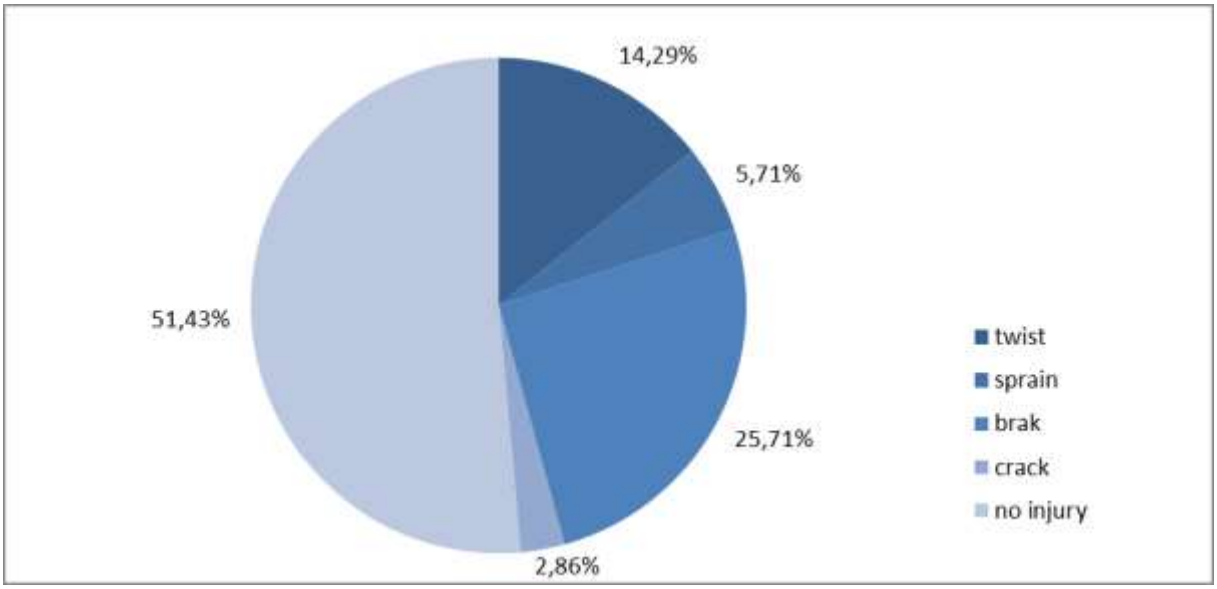

Fig. 4. Types of injuries in the control group (n_2)

Among 35 children from the study group and 35 children from the control group, injuries in the past occurred in 25.71% and 34.29%. The occurrence of polyarticular hypermobility in children is a predisposing factor for the training of specific sports (e.g. swimming, gymnastics, acrobatics). An important element may be the introduction of diagnostic tests before choosing a class profile.

Discussion

There are a number of international publications on the incidence of injury in people with hypermobility. The study shows that hypermobility does not affect the incidence of injuries among children. Injuries often occur during sports and everyday activities. Myer et al. investigated the relationship between hypermobility and ACL injury in young women practicing sports. Among 19 women with ACL injury, 8 showed knee hyperextension (42%), 7 had an excessive elbow joint extension (37%), 13 of 19 women were able to passively pass the thumb to the palmar surface of the forearm (68%) and 6 women managed to passively pass the V-metacarpophalangeal joint >90^{o} (32%). The authors showed that passive knee hyperextension may contribute to an increased risk of ACL injury [20].

In one of the UK universities, research was conducted into the dependence of injuries on rugby players with hypermobility. Among 45 examined men in 9 of them (20%) hypermobility was determined based on the Beighton scale. The results did not show a statistically significant difference in the incidence of injuries in players with or without polyarticular hypermobility (p= 0,938). In rugby players with excessive mobility of the joints is not observed a higher incidence of injury (p= 0,722), and they do not have a tendency to increase the risk of injury. Most often the injury came within the ankle and knee joint [21].

Studies conducted in Australia by Smith et al. concerned the incidence of injuries in 200 girls aged 6-16 years playing volleyball. Hypermobility was assessed based on the Beighton scale. 21% girls with a score of 0-2 points had an injury, in the group with the score of 3-4 points there were 37% of them and in the group with the score of 5-9 points 43%. These differences were statistically significant (p <0.025). Girls playing volleyball with the score of 3-4 points. on the Beighton scale, they were 3-4 times more likely to suffer from injuries (p = 0.015), and female players with a score of 5-9 points - 3 times more often compared to girls without hypermobility (0-2 points). In this study, the authors showed that excessive joint mobility had a significant impact on the incidence of injuries in girls playing volleyball [22].

Briggs et al. conducted research on ballet dancers. The study included 93 people (55 women and 38 men). In 18 women (33%) and 12 women (32%) polyarticular hypermobility was diagnosed. The injury occurred in 50% of women with hypermobility and in 21% of women without hypermobility (p= 0,037). Among males, 42% of hypermobility suffered an injury and 8% without hypermobility (p= 0,02) [23].

96 girls aged 16-18 took part in the study conducted by Berwecki et al. To assess the occurrence of hypermobility, the Beighton scale and the Bulben scale were used. The

incidence of hypermobility among the examined girls was 28% when assessed using the Beighton scale and 45% when assessed by the Bulben scale. When assessing the occurrence of injuries, 70% of those tested with hypermobility according to the Beighton scale suffered injury in the past and 72% with the rating of Bulben. It was found that people with polyarticular hypermobility show greater susceptibility to the occurrence of injuries than those with normal range of mobility [24].

In summary, analysis of the literature data and the results obtained in this study do not show specific relationship between polyarticular hypermobility and the incidence of injuries. Early diagnostics of hypermobility and proper preparation for training are important to reduce the risk of injuries.

Conclusions

1. Injuries are a common occurrence among children in early school age.
2. The incidence of injuries in the group of children 6-10 years is not dependent on polyarticular hypermobility.
3. Polyarticular hypermobility predisposes to sports (swimming, gymnastics, acrobatics).

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