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Relations between the occurrence of hypermobility and gender in the group of children aged 6 - 10 years

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Summary:

Introduction: Hypermobility of joints in healthy people may be either acquired or manifest itself because of a congenital syndrome of a connective tissue disorders such as Marfan syndrome, osteogenesis imperfecta, or Ehler-Danlos syndrome. If the increased joint mobility does not have the characteristics of previously mentioned congenital syndrome, it may indicate the presence of articular hypermobility. Hypermobility may be otherwise called excessive joint laxity or increased joint mobility. This dysfunction is characterised by a wider range of movement in large and small joints in relation to the norms for age, gender and race - in the absence of rheumatic diseases. The aim of the study was to evaluate the relationship between hypermobility and gender of the 6-10 years old children.

Materials and Methods: The study was conducted in November and December 2017, in two primary schools in Szczecin. 66 children, whose average age was 7 years and 10 months, were examined. The Beighton scale was used to assess the prevalence of hypermobility. It consisted of 5 activities: Placement of hands flat on the floor during the forward bend with straight knees, passive hyperextension of the fifth finger beyond 90°, passive thumb adduction to the volar side of the forearm, hyperextension of the elbow and knee joints. The maximum number of points available was 9. Score of 4 points or more indicated the presence of hypermobility.

Results: The Beighton scale score of 4 or more was observed in 24 of 66 children . There were 10 boys and 14 girls. Among males, people with hypermobility accounted for 30.30% and among females for 42.42%.

Conclusions: The study shows that the occurrence of excessive joint mobility was higher in females than males. Also, the need for screening tests in that group of children was highlighted.

Keywords: hypermobility, sex, children, Beighton scale, physiotherapy

Introduction

Joint mobility decreases with age. It is at its highest point at birth, then it rapidly decreases throughout childhood. The changes slow down during adolescent years to finally become significantly slower in adult life [1-4]. In healthy people, hypermobility may be caused by intense workouts, as is often the case with ballet dancers, acrobats and athletes. It may also be one of the symptoms of congenital connective tissue disorders, for example: Marfan syndrome, osteogenesis imperfecta or Ehler-Danlos syndrome [5,6]. The excessive joint mobility is observed in a large number of adults and children without the occurrence of other clinical features commonly associated with the aforementioned congenital syndromes. Such cases are known in the literature as hypermobility, which is sometimes referred to as excessive joint mobility or laxity [3,5-7]. By definition, this is the increased mobility of large and small joints in relation to the norms for age, sex and race in the absence of systemic rheumatic disorders [5,8]. There are all kinds of scales to assess the increased joint mobility.

The most popular among them is the Beighton scale and Brighton criteria. Both are non-invasive, reliable and repeatable. Beighton scale is a 9-point scale, and consists of carrying out certain actions scored respectively. Obtaining 4 or more points indicates the presence of hypermobility [5,9-12]. Brighton criteria use the elements of Beighton scale. These criteria are divided into major and minor. Hypermobility is identified by the occurrence of at least 2 major criteria, 1 major and 2 minor criteria or 4 minor criteria [3,12]. People with excessive joint mobility are more likely to overstrain the musculoskeletal system, which can cause pain syndromes. Such individuals often suffer from dislocations, sprains or soft tissue injuries. There is also a greater risk of degenerative changes [4].

Objective of the study

The goal of the study was the evaluation of the occurrence of hypermobility in the studied group and the relationship between the prevalence of hypermobility and sex of the children.

Materials and Methods

The study was conducted in November and December 2017 in two primary schools in Szczecin. Children attended sports and general classes. Parents and facility management gave their written permissions before the study took place. The study group consisted of 66 children including 33 girls and 33 boys from classes I to IV. The average age was 7 years and 10 months. To determine the prevalence of hypermobility the Beighton scale was used. The test consisted of passive hyperextension of the fifth finger beyond 90°, hyperextension of the knees and elbows, passive thumb adduction to the volar side of the forearm, placement of hands flat on the floor during the forward bend with straight knees (Table 1). The maximum number of points available was 9. Obtaining 4 or more points indicated the presence of hypermobility [3,5,9-11].

Table 1. Beighton Scale

	Tested joint movement	Right side (0-1 points)	Left side (0-1points)
1	The possibility of placing hands flat on the floor during the forward bend		
2	Passive hyperextension of the fifth finger beyond 90°		
3	Passive adduction of the thumb to the palm side of the forearm		
4	Hyperextension of the elbow		
5	Hyperextension of the knee joint		
	Total		

Results

Hypermobility based on the Beighton scale was found in 24 children (Fig.1), which accounted for over a third of the respondents (36,36%). 10 of those were boys. They accounted for 41.67% of all people with hypermobility. 14 girls were making up 58.33%. Hypermobility boys constituted 30.30% in the male group (Fig. 2), while girls made up 42.42% in the group of females (Fig. 3). The relationship between gender and the presence of hypermobility was calculated using the chi – squared test. The results obtained were not statistically significant ($p = 0.31$), however, it may be presumed that this is due to the small size of studied group.

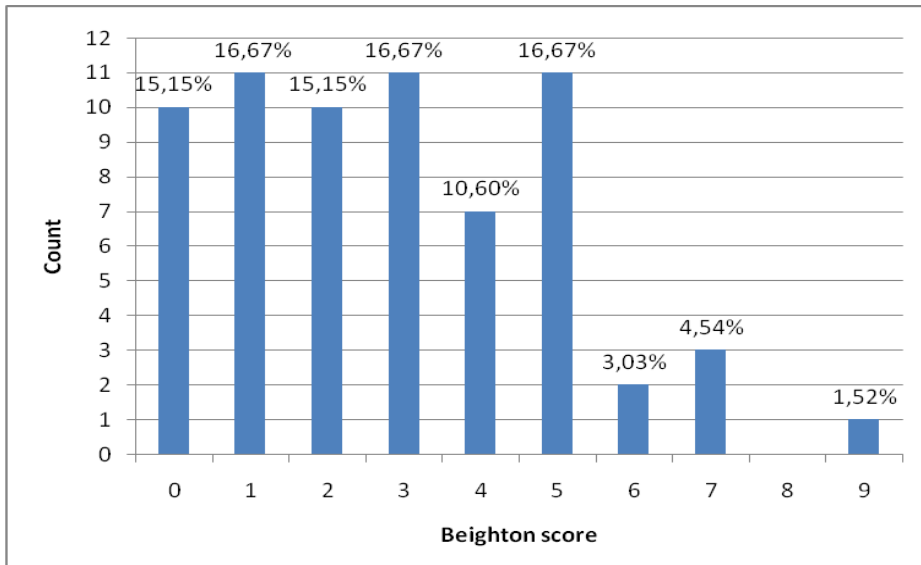


Fig. 1. Distribution of the Beighton score of school-aged children

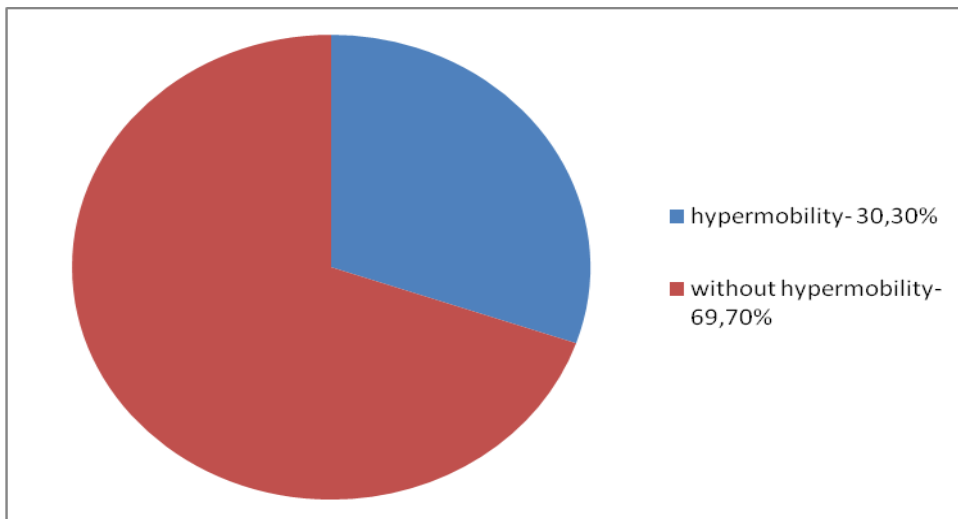


Fig. 2. Number of boys with hypermobility

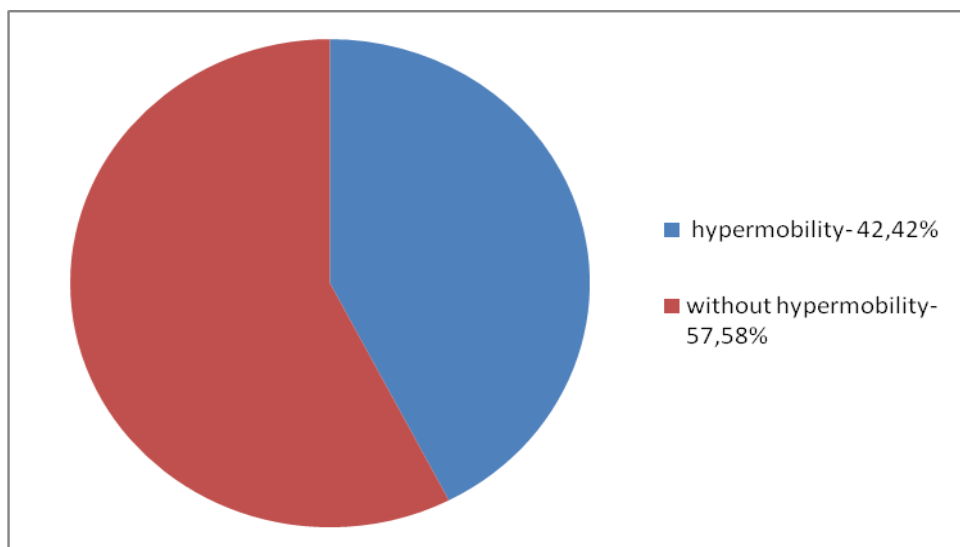


Fig. 3. Number of girls with hypermobility

Discussion

There is a significant impact of gender in the occurrence of hypermobility. The literature provides many references to the fact that joint hypermobility is more common in females. Gedalia et al. conducted research among American high school students aged 5-17 years, detecting excessive joint mobility in 12% of patients. It applied more often to the girls (18%) than to boys (7%). The percentage of children with hypermobility decreased with age [13,14]. In Europe, a similar study was conducted on children aged 5-14 years. The measurements were performed on a group of 2,432 children in Greece. The results were similar to those obtained by the researchers of the American students: 10.76% for girls and 7.1% for boys. For children under the age of 8, the proportion of hypermobility was 11.4% and for older 7.6% [14,15]. Studies on a group of 1,389 Danish schoolchildren at the age of 13-16 that examined the risk factors for back pain also verified the presence of hypermobility. Hypermobility was found in 141 out of 718 of the girls (19.64%) and in 54 out of 671 boys (8.05%) [16]. The prevalence of hypermobility was also tested on a group of 778 children in Lithuania. A statistical significance of the differences in the ranges of movement was found between the girls, which achieved higher scores in all tested movements than the boys ($p = 0.05$) [17]. In Sweden, after examining 1,845 children at the age of 9,12 and 15, the authors also confirmed greater prevalence of hypermobility in girls than boys in each of the selected age groups [18]. A similar study was done in the UK on a group of 6022 children. The average age of respondents was 13.8 years. The hypermobile girls accounted for 27.5% in the female group and hypermobile boys for 10.6% in their group [19]. In Brazil, the study

was conducted on 1,120 children aged 4-7 years. Here, as in the other examples, more cases of hypermobility were recorded in girls (68.8%) than in boys (60%) [20]. In Turkey, the study was conducted on a group of 861 people aged 13-19 years. Increased joint mobility was detected in 101 people, or 11.7% of the respondents of which 31 (7.2%) were boys and 70 (16.2%) girls. The differences between gender were identified as particularly significant ($p = 0.00005$) [21]. Studies of the same type also tested 500 students in Rawalpindi and Islamabad in Pakistan. The age of the respondents ranged from 8 to 17 years old. As in previous cases, hypermobility was reported more commonly in girls than boys, respectively 33.5% and 29% [22]. Only in the study of 829 Indian children aged 3-19 years conducted in Mumbai, practically equal occurrence of hypermobility among both girls and boys was found (respectively 58.5% and 58.9%) [23]. The results of the own study on a group of children from Szczecin schools coincide with the majority of the available research on the topic.

The frequency of occurrence of an increased range of motion of joints decreases with age. This is due to the aging process and not because of the regression of pathological connective tissue. It should be noted that it is difficult to analyze the data due to the lack of uniform diagnostic criteria. The criteria for diagnosis of articular hypermobility used by the authors of the aforementioned works are not identical in different groups of patients [4]. A significant observation is that in virtually every study besides the group of Indian children, the girls had a higher percentage of occurrence of excessive joint mobility than boys.

Hypermobility is associated with many ailments, which may involve different organs, but most relate to the musculoskeletal system. Such symptoms are for example joint and muscle pain, sometimes with effusion and edema. The instances for occurrence of these problems is difficult to explain, especially when beyond the increased joint mobility there are no other abnormal changes in the organs of movement such as soft tissue damage, papyrus skin, mitral valve prolapse, frequent dislocation or sprain of the joints, premature osteoarthritis, chronic single-joint or polyarticular inflammation which mimics rheumatoid arthritis. In such cases, the causative agent considered is stimulation of nociceptive receptors, which are insufficiently supported by collagen fibers with an incorrect structure [5,24]. Sometimes the authors point out that hypermobility is one of the reasons for overstraining the motor system, which can lead to the appearance of pain syndromes [5,25]. People with excessive joint laxity are more prone to injuries such as sprains, dislocations or joint displacements caused by too intense exercise or even daily activities [3,4,7]. It could be assumed that at a later age children who are diagnosed with hypermobility will have health problems similar to those mentioned

above. Education and early detection of joint hypermobility are important in order to most effectively counteract the negative effects. Various methods are described in the literature for the alleviation or even elimination of pain associated with hypermobility. The most popular among them are physical therapy, kinesiotaping, stretching, balneotherapy and hydrotherapy [5,26].

Conclusions

Polyarticular hypermobility syndrome is more common in girls than in boys. Contrary to appearances, this is a fairly common condition that is not difficult to detect at all. There is a need to standardise the diagnosis of hypermobility. The Beighton scale works well in this respect, because of its simplicity and speed of conduct, and no need to use additional equipment. Still, very often this test is not used, causing the hypermobility to remain undetected until the appearance of pain or other problems. People with polyarticular hypermobility have a greater predisposition to injuries caused by physical activity. Because of the possibility of early diagnosis of hypermobility the introduction of screening tests should be considered.

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