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The occurrence of defects in the lower limbs in children with polyarticular hypermobility

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SUMMARY

Introduction
Faulty posture, overweight and obesity are one of the most common health problems in Poland among children and adolescents. Although posture disorders are usually commonly diagnosed, the occurrence of polyarticular hypermobility is rarely taken into account when planning corrective exercises. The aim of the study was to assess the influence of hypermobility on the occurrence of lower limb defects.

Materials and methods
The study included 35 children (14 girls and 21 boys) aged 6-10 years with diagnosed in a Beighton test hypermobility. The control group also consisted of 35 children of the same age and the same number of girls and boys. Using the calipers and the goniometer, the valgus, varus or hyperextension of the knee joints, valgus and varus of the ankles as well as flat feet have been assessed. Then, the results obtained in the hypermobility and control group were compared.

Results
There were statistically significant differences ($p = 0.001$) in the occurrence of most defects of the lower limbs in children with hypermobility in relation to healthy ones. For knee valgus, the rho-Spearman correlation was $r = 0.611$; for deformity of the knees $r = 0.56$; for knee hyperextension $r = 0.52$; for flat feet $r = 0.628$; for valgity of feet $r = 0.555$. In the examined groups, no varus deformation was observed.

Conclusions
1.Hypermobility predisposes to the occurrence of lower limb defects in children. 2. There is an indication for performing screening tests in children of early school age and implementation of prevention programs for polyarthritis hypermobility.

Key words: hypermobility, defects of the lower limbs of children, physiotherapy, prevention

INTRODUCTION

Polyarticular hypermobility, generalized hypermobility is an increased range of mobility in the joints, in relation to the standard applicable in a given population. The reason for this condition are hereditary disorders in the connective tissue structure and the proportion of collagen. In contrast to the joint hypermobility syndrome (HS), polyarticular hypermobility is asymptomatic [1]. With age, the joints become less flexible, however, the damage and discomfort caused by hypermobility may persist [2]. The incidence of hypermobility is high and ranges from 3-35% depending on the scale it has been assessed, age, sex and ethnicity [3,4,5,6,7]. There are studies showing that hypermobility is much more common in children with genetic disorders [8].

The disadvantages of overweight and obesity are still one among children and adolescents of the most common health problems in Poland. Their prevention, early detection and the implementation of therapy is important from the point of view of the disadvantages of other diseases. In the case of, for example, valgus knees, other defects such as flat feet and valgus tarsal or lumbar scoliosis may occur, as well as patellar dislocation and a rocking walk. With age, in subsequent stages of the disorder, degenerative joint changes are also observed [9]. Studies by Maciałczyk-Paprocka et.al. showed bad body posture in 71.4% of over a thousand examined children aged 7-12 years [10]. In the area of lower limb defects, knee and clubfoot knees and flat feet are the most common [11]. Due to the widespread nature of the problem, screening is therefore necessary.

The main purpose of the study was to answer the question whether the defects of the lower limbs occur more frequently in children with polyarthritis hypermobility than in other children.

MATERIALS AND METHODS

The research was carried out in two elementary schools in Szczecin at the beginning of 2018. The criteria for inclusion in the study group were 6-10 years of age, absence of musculoskeletal diseases and written consent of the parents for testing. Exclusion criteria were chronic musculoskeletal diseases or lack of parental consent. The study group consisted of 35 children (N1 = 35) with known polyarticular hypermobility, aged 6 to 10 years (mean age: 8). In the control group, children of similar age were randomly selected (mean age: 8), in whom no hypermobility was previously noted (N2 = 35). Both groups contained the same number of girls and boys (14 girls and 21 boys).

The Beighton scale, which is illustrated in Table 1, was used to assess the occurrence of hypermobility. The test according to this scale consists in the assessment of the possibility of performing 9 movement tasks. All 9 tasks are related to the range of mobility in the joints, and 1 point is awarded for their performance (0 for non-performance). For hypermobility the result was ≥4 in the 9-point scale [12]. Prior to the measurements of the lower limbs, a survey of their shape and construction was carried out. The alignment in the frontal plane has been checked and sagittal as well as under unloading and loading conditions.

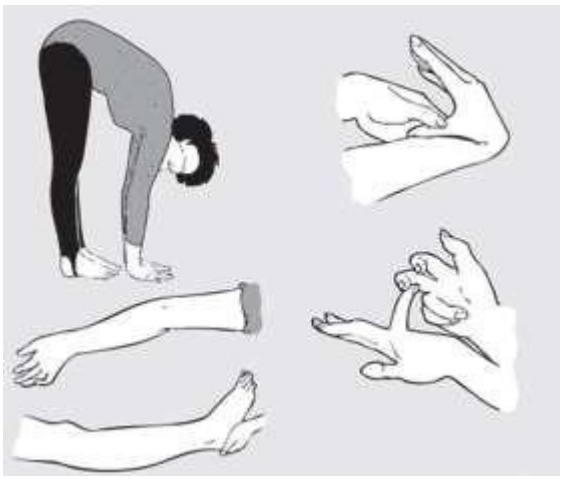
Evaluation of the shape of the knee joints in the frontal plane was made on the basis of the generally used method of measuring the distance between the relevant bone points, with straight knee joints, using a linear calipers. For valgus, it was the distance between the medial

malleolus at the straight knees, where the disadvantage was ≥ 5 cm. For varus deformity, the distance between medial femoral condyles, with straight feet, where even a small distance between the medial condyles was considered a defect [13]. A goniometer was used to measure the position of the tarsus towards the lower leg, which determined the inclination angle of the heel axis in relation to the shin axis [14]. The deviation value was considered to be valgus treble in the direction of pronation with a value ≥5 °, and for a varus, the deviation in the direction of the supination is also ≥ 5 °. Examination of the arch of the longitudinal foot consisted in measuring the height of the longitudinal arch h [mm] measured from the ground to the tuberosity of the navicular bone [14].

The obtained results were subjected to statistical analysis using the Statistica 13 program (Stat Soft, Poland).

	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 slope		
2	Passive hyperextension V finger above 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		

Picture 1: Beighton score



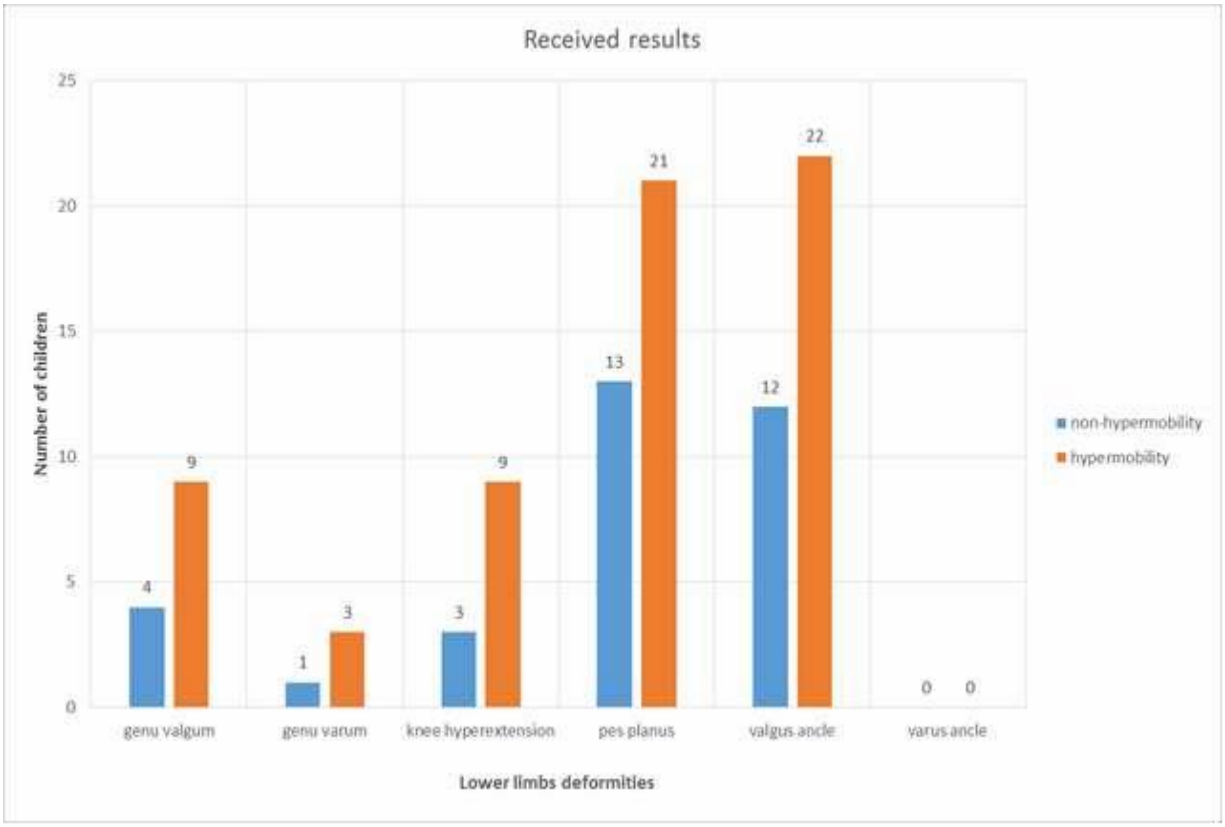
Picture 2: Joint hypermobility symptoms based on Beighton criteria [15]

Picture 3: Thumb adduction outward to the inner side of the forearm.

RESULTS

The results of the knee valgus tests showed a statistically significant difference (p = 0.001) in the occurrence of this defect in children with hypermobility in relation to children without this abnormality. In the study group knee valgus was found in 9 children, while in the comparison group in 4 children (rho-Spearman correlation: r = 0.611). The knee varus has been diagnosed in fewer children than knee valgus. It was three children from the study group and one child from the comparative group (rho-Spearman correlation: r = 0.56, significance level: p = 0.001). The hyperextension knees was found in 9 children with hypermobility and in 3 children without hypermobility (rho-Spearman correlation: r = 0.52).

Both in the test and comparison groups, flat feet (pes planus) and valgus ankles have been found in a significant number of children. In the group with hypermobility the flat foot had as many as 21 children (60%), and the valgity of the ankles 22 children (62.8%). The percentage of flatfoot and valgity of the ankles in the control group was 37% and 34%, respectively. (Rho-Spearman correlation for flat feet: r = 0.628, for valgus feet: r = 0.555). In both examined groups, no deformities of the ankle were found. Due to the unequal number of girls and boys in particular groups, the difference in the occurrence of hypermobility and lower limb abnormalities due to gender was not taken into account.



Picture 4: Results

DISCUSSION

It is worth noting that the concept of hypermobility is insufficiently systematized. This may be proved by the fact that many names refer to it in the literature, such as: mild excessive joint mobility syndrome, excessive laxity of ligaments, generalized hypermobility, generalized joint laxity, joint laxity syndrome. Colloquially, you can also find the term elastopathy. Guszczyn T. et al. [16] points to the difference between generalized joint laxity and joint laxity syndrome. Generalized joint laxity is characterized by the lack of occurrence of symptoms other than increased range of mobility. The synovial joint syndrome is accompanied by pain and non-articular symptoms [16]. In the work of Smits-Engelsman et al. Among nearly 200 children with a score of 5 or more on the Beigton scale 12.3% experienced joint pain [7]. In the literature, there are items regarding the influence of hypermobility on the occurrence of postural defects in children. Czprowski et al. Conducted a study evaluating the sagittal curvature of the spine in healthy children [1]. However, as we can read from Murray's work [6], the reduction of longitudinal arch is common in people with hypermobility, which is confirmed by the results obtained. The author draws attention to the difference between the height of the arch at rest and in the load, which under the influence of the weight significantly

decreases. These results are also consistent with what was obtained in our own research. Olshan et al. [17] while carrying out research on 239 people, stated more frequent occurrence of talipes in people with hypermobility. Therefore, there are indications that hypermobility has a significant influence on the shape and position of joints, in particular peripheral and underload. Noteworthy is the fact that as many as 8 out of 9 criteria in the previously mentioned Beigton scale, concern peripheral joints, and only one spine mobility. Comparing the frequency of occurrence of particular defects of the lower limbs in the examined group, one can notice a clear advantage of the defects of the ankles and the foot over the defects of the knees. There is also a certain convergence between the number of children with flat feet and valgus tarsal which suggests a connection between the emergence of these two pathologies. The flat feet problem in the hypermobility group it concerned 60% of children, and in the comparative group - 37%. If, therefore, to calculate the percentage of occurrence of this defect without division into groups, we get 48.5%. Kłoda M. et al. [18], conducted a study on a group of 286 children, which showed the presence of flat feet at the level of about 50%, which clearly corresponds to their own research.

Early detection of hypermobility is all the more important as there are more and more methods to reducing its symptoms, such as central stabilization and stabilization of peripheral joints, and improvement of proprioception [2,3,19]. The inclusion of tests diagnosing hypermobility for primary screening in children is therefore beneficial both from the point of view of treating the symptoms of hypermobility itself and the defects of its attendant posture.

CONCLUSIONS

1. Hypermobility predisposes to the occurrence of defects in the lower limbs in children.
2. There is an indication to perform screening tests in school children and the implementation of prevention programs in the direction of hypermobility.

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