

Research of Foot Sizes of Younger School Children for the Purpose of Identification of Static Deformations

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Abstract: The article deals with an urgent scientific task - the study of the size of the feet of primary school children in order to identify pathological abnormalities. Much attention is currently paid to improving the quality of light industry products, including improving their conformity to consumer figures. For this, it is necessary to know well the anatomical structure and features of the external shape of the human body, the patterns of variability in the size of the figures of adults and children and the principles of their standardization. Revealing the state of physical development of the figures of children is necessary for studying the anthropometric data of the child's population of the country, therefore, anthropological studies of the size of the feet of primary school children in order to identify pathological abnormalities are very important. At the same time, the physical development of a person, the general characteristics of the external shape, changes in the size and shape of the body depending on age, the features of the physique of children, the structure and changes in the foot of a person throughout his life were studied in detail. The main pathological changes in the structure and functions of the human foot are stated, the results of the research work carried out on the study of the footprint of primary school age pupils of the secondary school in Bukhara are presented. The number of children with a healthy foot and a foot with pathological abnormalities was identified, and appropriate recommendations were given to eliminate deficiencies in the structure of the foot.

Keywords: Physical development, morphology, dimensional characteristics, contact instruments, age-related changes, pathology, foot, planogram, flat feet, corrective devices.

INTRODUCTION

To improve the well-being of our people, huge tasks are set for the light industry. These tasks include increasing the output of high-quality, sound, competitive and relatively inexpensive products. The types of human activity are diverse, and each of them must correspond to a suit of a certain purpose and design. When designing clothes, the latest achievements of science,

technology and applied arts should be used to the maximum. The optimal design and compositional solutions should be chosen, corresponding to the creation of products with high aesthetic and utilitarian properties, meeting the needs and tastes of various ethno-social groups of consumers, and at the same time high profitability for the manufacturer. [11]

To increase the output of light industry products, accelerate the development of production and expand the range of new types of clothing, footwear, knitwear and other consumer goods. In mass production, clothes are made not for an individual consumer, but for figures of standard sizes (typical figures) of a limited number of sizes. In this regard, a difficult task must be solved to develop a system of size standards that, with a minimum number of typical figures, would ensure maximum satisfaction of the population with ready-made clothes. [8,15]

When developing an assortment of light industry products, it is necessary to take into account gender and age, profession, state of physical development and other characteristics of consumers. For this purpose, the ethnic composition of the population and the number of the most representative groups are specified in the economic regions and their administrative subdivisions. These data are necessary to identify the characteristics of the physical development of the population. One of the main ones is the grouping of consumers of products by gender and age [16]. For this purpose, the ethnic composition of the population and the number of the most representative groups are specified in the economic regions and their administrative subdivisions.

As the head of our state, Mirziyoyev Sh. M. is a physically developed, healthy generation - the guarantee of a prosperous state. [1]

Great importance is attached to the study of human physical development, i.e. the process of changing the size, shape of the body and functions of the human body throughout his life. In the physical development of a person, depending on age, a number of successive periods can be distinguished. During the formation of the organism, an increase in all signs of physical development is observed. Especially for the formation of the full physical development of a person, his correct development in childhood plays an important role [17]. It is known that the physical development of a person as a process of change and formation of morphological and functional properties depends both on heredity and living conditions, as well as on physical education from the moment of birth. Of course, not all signs of physical development are equally amenable to correction in childhood: the hardest thing is height (more correctly, body length), much easier - body weight and individual anthropometric indicators (chest circumference, hips, etc.). [2]

Much attention is currently paid to improving the quality of light industry products, including improving their conformity to consumer figures. For this, it is necessary to know well the anatomical structure and features of the external shape of the human body, the patterns of variability in the sizes of figures of adults, children and the principles of their standardization. [9]

The structure of the lower and upper limbs of all adults, determined by the bone skeleton, is the same. The sizes of the limbs even of people of the same age and sex group differ greatly. Preservation of the natural anatomical - morphological structure and the correct functioning of the limbs are possible while protecting them from harmful environmental influences

(trauma, temperature and humidity, etc.). Protective functions are performed by shoes, gloves and mittens. One of the indicators of the quality of these products is the correspondence of their size and shape to the size and shape of the foot and hand. [10]

While shoes and gloves were made for the individual consumer, problems with these quality indicators are significant. But in conditions of mass production, when products are made for an unknown consumer, the problem of matching the size and shape of the products and the foot has become very acute, since it is necessary to produce shoes and gloves of such sizes for which there is a public demand. [12]

These problems can be solved by mass measurements of feet and hands and grouping them by size, i.e. the development of a dimensional typology (highlighting a certain number of standard sizes for which you can create products for the population of the entire country). The number of standard sizes should be such that, on the one hand, satisfy the entire population with comfortable shoes and gloves, and on the other, do not complicate the organization of mass production of these products [18]. The main role in solving this problem is played by anthropometry - one of the main methods of anthropological research, which consists in measuring the human body and its parts. Anthropometry deals with the teachings of the typical, not the individual. [13]

Revealing the state of physical development of the figures of children is necessary to study the anthropometric data of the child's population of the country, therefore, anthropological studies of the size of the feet of children of primary school age in order to identify pathological deviations are very important.

REVIEW OF THE LITERATURE

Only extensive and systematic anthropological data on the size and shape of the human body can provide a solid scientific basis for constructing dimensional standards. Long-term studies of anthropologists Bunaka V. V., Ignatieva M. V., Zenkevich P. M., Bashkirova P. N., Kurshakova Y. S. and the entire staff of NIIA MSU made it possible to build dimensional standards for any type of products that best meet the needs of the population. On the basis of mass anthropometric surveys carried out by the Scientific Research Institute of the Moscow State University in 1956-1960, a dimensional typology was first created and dimensional anthropological standards for the figures of the adult and child population of the country were developed.

Much attention is currently paid to improving the quality of clothing, including improving the fit of clothing to consumer figures (good fit). Therefore, every design engineer must have sufficient information about the object for which the clothes are created - about the person. For this, it is necessary to know well the anatomical structure and features of the external shape of the human body, the patterns of variability in the size of figures and the principles of their standardization.

To solve the problems facing the garment industry, it is necessary to continue research on dimensional anthropometric standardization. The directions of this work should be: geographic zoning of the scales of standard sizes and heights; substantiation of differentiation in the selection of leading features for the production of certain types of light industry products, the widespread use of stereophotogrammetry to study the features of the external

shape of the human body - physique, posture - necessary to improve existing and newly developed anthropometric standards and mannequins for clothing. [14]

To conduct anthropological studies of the size of the feet of children, a literature review was carried out regarding the research work. In the literature "Dimensional typology of the population of the CMEA member countries, authors Kurshakova Y. S. and others are given the "Methodology and program of measurements necessary for the design of clothing", where the main anthropological points, marking of the starting points and the order of measurements are highlighted. Information about anthropometric instrumentation is given. The program and measurement technique are given, which correspond to the recommendations of standardization. The program and method for measuring additional features are presented. In the fourth section of this literature, a comparative anthropometric characteristic of the adult and child population of the CMEA member countries is carried out. In the fifth section, dynamic anthropometry and the possibilities of its application are presented, where a description of dimensional characteristics and measurement techniques is given.

In the literature "Laboratory workshop on the design of clothing" edited by Koblyakova E. B., the following are given: the anatomical structure of the human body, where knowledge on the anatomical structure of the motor apparatus of the human body (skeleton and muscles) is consolidated; The dimensional characteristics of the human body are studied, where the technique of measuring the dimensional characteristics necessary for the design of mass-produced clothing is mastered. This chapter provides an introduction to the methodology of anthropometric research, a sketch of the location of the main anthropometric points and measurement schemes, the calculation of the main static parameters of the total dimensional characteristics of the body, analysis of the results of work, and the formulation of conclusions. The following are methods for studying the shape of the body surface using the stereophotogrammetric method, anthropological measurement programs are analyzed. The characteristics of the external shape of the human body are studied, where the type of proportion of the body is determined, the type of physique is determined, the characteristics of the shape of the upper and lower extremities are studied. When familiarizing with the dimensional standards of the human body in the literature, the principles of constructing the dimensional standards in force in the industry for measuring the human body of typical figures are studied.

In the literature of the authors Dunaevskaya T. N. "Dimensional typology of the population with the basics of anatomy and morphology", the first chapter is devoted to the elements of human anatomy and morphology. The definitions of the concepts of anatomy, morphology, which are part of the science of anthropology, are given, in the first chapter the skeletal system - the human skeleton is described in detail, in the second paragraph - the muscular system is described in detail, in the third paragraph the general characteristics of the external shape of the human body - the trunk, neck, upper and lower limbs. In the fourth paragraph, the main morphological features that determine the external shape of the human body are studied. In this literature, methods for studying the size of a person's body are studied, methods of anthropometric studies, concepts of the main anthropometric points, anthropometric planes, information about anthropometric devices, and measurement programs are given. The third chapter shows the patterns of variability and frequency

distribution of variants of anthropometric features.

In the literature of the authors, Kochetkova T. S. and Klyuchnikova V. M. "Anthropometric and biomechanical foundations of designing leather goods" noted that in the footwear and leather haberdashery branches of the light industry, it is planned to expand and update the range of products, improve their quality, and increase the production of new types of products. One of the indicators of the quality of leather goods is the correspondence between their sizes and the shape of the foot and hand. Therefore, for the correct selection of the parameters of the designed product, the design engineer must have sufficiently complete information about the object for which the product is being created, i.e. about a human. When creating the design of shoes, gloves and mittens, it is necessary to know the anatomical and physiological structure of the upper and lower extremities, the laws of the sizes of feet and hands.

In the literature, the first section is devoted to the anatomical and physiological foundations of the structure of the upper and lower extremities, where the definitions are given: anatomy, physiology, morphology as a science. This section contains the following chapters: axes and planes of the human body; the structure of the human body, the skeleton and its functions, general concepts, the skeleton of the upper extremities, the skeleton of the lower extremities, the main pathological abnormalities in the structure and functions of the foot. Muscular system, general concepts; muscles of free lower extremities, vascular and nervous system, information about the spinal cord, smut, brain, skin. The second section is devoted to the main provisions of the anthropological study of feet and hands, man; method of anthropometric research; anthropometric instruments; measurement programs; patterns of variability and distribution of anthropometric signs, corrective dependence between anthropometric signs. The third section is devoted to the main provisions of the biomechanics of free lower limbs.

In the literature of the author Liokumovich V. Kh. "Designing shoes" in the first part: Information necessary for designing shoes - the first chapter contains a brief historical overview, the second chapter is devoted to the formation of the range and quality of shoes. The third chapter provides brief information about the foot: the structure and function of the foot, the foot as an organ of support and movement, the shape and size of the foot, which details the size of the foot, mass measurement of feet, individual measurement of the feet, change in the size of the foot. The fourth chapter lists the requirements for shoes. The second part shows the development of the shoe design.

In the work of the author of the research work Maksimov N. V. on the topic "A method for determining the approximate height of a person by a single trace of his foot", the relationship between the size of the foot and the height of a person is determined.

In the work of the author of the research work Polyakova E. L. on the topic "Method for determining the shape of a human foot", the sole in orthopedic shoes was improved. At the same time, quantitative information was obtained on the height of the relief of the plantar surface of the examined foot in the required sections.

In the work of the author of the research work Atroshchenko E. S. on the topic "A method of studying the elastic properties of the human foot", the characteristics of the elastic properties of the foot and its shock-absorbing ability are determined. The work relates to the field of

medicine, namely to functional diagnostics, and can be used to characterize the mechanical strength of the foot and its shock-absorbing ability.

In the work of the author of scientific research work Ivanov A. N. on the topic "The path of footprints and the signs and features of a person displayed in them", the footprints were studied when examining the scene of the incident to solve the crime of persons, to judge some of their signs: gender, approximate height, age and weight, physical disabilities.

As you know, children rarely complain of pain due to pathological abnormalities of the foot, however, in adulthood, they cause a lot of problems and even suffering. The health of the feet is the health of the whole organism, therefore, early diagnosis and the use of means for the prevention and treatment of pathological abnormalities is extremely important. Moreover, children's and teenage feet lend themselves well to correction, which cannot be said about the feet of an adult.

Based on the conducted literary review, it can be concluded that anthropological studies have not been carried out on this topic. Considering the above tasks facing the light industry, the implementation of research work on the topic: "Study of the size of the feet of primary school children in order to identify static deformations" is relevant, since identifying the state of physical development of children's figures is necessary to study the anthropometric data of the child population of the country.

METHODOLOGY

Age morphology aims to study the age-related patterns of variability of the human body, and in particular, the change in the size and shape of the body and its parts with age. Among the adult population, anthropologists distinguish the following groups (Table 1).

In adolescence, girls grow less intensively and mainly due to the lengthening of the trunk. The formation of the primary (maiden) mammary gland ends, the size of the buttocks of the muscle layer increases. The proportions of the body are close to the proportions of the body of an adult woman.

Age has a significant impact on all physiological processes and morphological characteristics of a person. The proportion of fat in total body weight changes especially intensively. Subcutaneous fat tends to increase with age, but in women the size of the subcutaneous fat fold is 1.5-2 times greater than in men.

Table 1
Characteristics of age groups

Age groups	Men	Characteristic	Women
Adolescence	17	A sharp decrease in gains in body length, and then a complete cessation (in women)	16
Average age 1 period	22	In men, complete cessation of growth in length	21
Average age 2 period	36	Decreased performance	36

Elderly people	61	Senile traits appear	55
Old age	75		75
Centenarians	Over 90 years old		

Most of the theories reflecting the aging process are associated with thirty years of age, traditionally considered at times the prime of a person, at least from a physiological point of view. However, today there is a general belief that by this age the destruction has already begun and even manifests itself externally, which is only a superficial reflection of the deep changes taking place inside the body. During this period, the hair begins to thin, the nails grow more slowly, the first wrinkles appear.

Features of the physique of children. There are several methods of dividing the periods of childhood into separate segments. Experts distinguish the following periods of child development:

- the neonatal period (before the umbilical cord falls off);
- breast period (before the appearance of the first milk tooth - ½ year);
- toddler age (until the time the child learns to walk - 1-1.5 years);
- preschool age (before the appearance of the first permanent tooth - 6 years);
- primary school age (until the first signs of puberty - up to 9 years old for girls and 11 years old for boys);
- adolescence (until the final physical maturation - the appearance of menstruation in girls - 14-15 years old, and in boys - mature sperm);
- the period of adolescence (until the end of the growth process up to 18 years for girls and up to 20 years for men).

One of the main age-related changes in children is growth and proportional changes in the body. V. V. Bunak and later researchers established a three-phase nature of changes in body length. In the first phase, from birth to three years, there is a significant drop in the growth rate, in the second phase from 3 to 9 years, the growth rate is almost stable, and in the third stage, there is at the beginning a sharp increase in the growth rate, and then its rapid decline.

The proportions of the child's body are unstable throughout the entire period of childhood. Particularly sharp differences are observed in body proportions. So, in a newborn, the head is 1/4 of the length of its body, and in a girl it is 1/8. The neck and chest of a newborn are short, the abdomen is convex and sharply elongated, the legs are shorter than the arms. During the period of the child's growth, different parts of the body grow unevenly. The fastest growing is the legs of the arms. By adulthood, the length of the legs increases 5 times, and the length of the arms - 4 times. The trunk grows less intensively. Its length increases only 3 times. The size of the head only doubles during this period.

The main pathological abnormalities in the structure and functions of the foot. Confidence and gracefulness of gait, fast running and light jumps, the ability to stay in an upright position for a long time is due to the unique arched foot structure. The arch structure of the foot is absent in all mammals and is a characteristic feature for humans due to upright posture. And, as a curved foundation causes a skew of the entire building, changes in the

shape of the foot cause disturbances throughout the human body. The structure of the human foot, in particular its arch, is largely due to the support of the ligaments and muscles, which do not allow the arch to flatten, and help in the amortization function of the foot. But if the muscles and ligaments of the feet stop working and become weak, then the normal shape of the foot is disturbed - it settles and flattens.

Static deformations of the feet. The causes of static deformations of the feet can be conditionally divided into external and internal. External overloads include overloads associated with the profession, wearing irrational shoes, the negative influence of the external environment. Among the internal causes, the factors of the mercenary - constitutional predisposition, the primary weakness of the muscular apparatus are of decisive importance. [3]

In the classification of pathological conditions of the feet from excessive static load, G.N. Kramarenko proposes to highlight functional failure or static deformities. Static deformations include longitudinal flat feet, transverse flat feet and hammer-shaped fingers. The most common pathology of the musculoskeletal system in school-age children is flat feet. Flat feet is a deformity of the foot, characterized by the drooping of its arches. Flat feet is one of the pathologies of the foot, it is a flattening of the arches of the foot and a partial or complete loss of all of its spring (shock-absorbing) functions. Flat feet are typical mainly for people with congenital connective tissue weakness. The foot functions well as a single complex; when the load acting on, it is completely balanced by strong ligaments and muscles. If there is a weakening of the musculo-ligamentous apparatus, then the normal form begins to be disrupted - the foot settles, becomes flat, one of its main functions is lost - springy (spring) (Figure 1). Depending on the etiology, foot deformity can be congenital and acquired.

Congenital flat feet is quite rare (3% of cases) and is a consequence of intrauterine malformations of the structural elements of the foot. As a rule, other disorders of the skeleton are found in such children. Treatment of this type of flat feet should be started as early as possible.

Traumatic flat feet. Injuries and fractures of the ankles, ankle, calcaneus and tarsal bones, damage to soft tissues that strengthen the arches of the feet, become the causes of post traumatic flat feet.

Paralytic flat feet. Previous polio can cause paralytic flat feet. As a result, paralysis of the tibial and other muscles of the foot occurs.

Rachitic flat feet. Rickets is a disease that disrupts the normal formation of human bones, including the bones of the foot. The fragile bones of the foot and weakened muscles and ligaments cannot withstand the loads of the body, as a result of which the foot deforms and the formation of flat feet.

Static flat feet. Static flat feet occurs most often - in 82.1% of cases. It develops for the following reasons:

- hereditary predisposition (congenital weakness of the ligamentous apparatus), such a foot is often called "aristocratic";
- weakness of the muscles and ligaments of the foot and lower leg due to a decrease in muscle strength during physiological aging, with low physical activity and lack of training in persons of "sedentary" professions;

- overweight - in most very obese people, the arches of the foot do not support their excessive weight, and leg pain is usually combined with back pain;
- uncomfortable, irrational footwear - the constant wearing of high heels or on a rigid platform so perverts the biomechanics of a normal step that it almost fatally leads to this disease;
- long-term loads on the legs (long standing, regular wearing of weights, etc.); often they are associated with a person's professional activities ("all day on my feet"), this also applies to housekeeping. [4]

Pain with static flat feet increases in the evening, but weakens after rest, sometimes swelling is observed in the ankle. Severe pain appears when the body has already run out of strength to ensure normal movement. By this time, both knee and hip joints have time to suffer, pathological posture has time to develop. All this can lead to a disastrous outcome - arthrosis and scoliosis as a result of dysfunction of the support system.

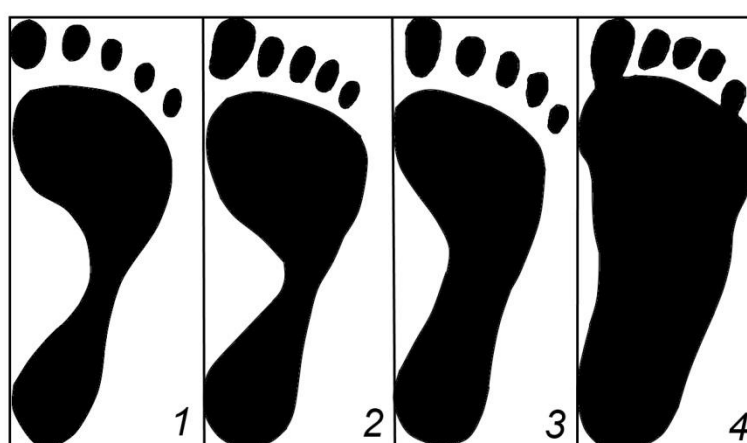


Fig 1. Prints of normal (1, 2, 3) and flat (4) feet

Symptoms of flat feet. How do you recognize this insidious disease? There are a number of characteristic symptoms that may indicate existing flat feet:

- your shoes are worn out and worn from the inside;
- legs get tired quickly when walking and working on legs;
- there is fatigue and pain in the legs by the end of the day, cramps, a feeling of heaviness, swelling;
- swelling in the ankle area;
- inability to wear shoes with heels;
- the leg seems to have grown - you have to buy shoes one size larger (especially in width);
- the foot has become so wide that it is impossible to put on your favorite shoes.

Causes of flat feet. The most common causes of flat feet include:

- poorly fitted shoes (narrow pointed shoes, high heels and platforms);
- hereditary predisposition: genetic abnormalities in the development of ligaments, muscles and bones of the foot and congenital weakness of the musculo-ligamentous apparatus;
- injuries: foot injuries, fractures of the ankle and heel bone, bruises and cracks in cartilage, ligament ruptures, damage to muscles and ligaments that strengthen the arch of the foot;
- diseases: rickets and, as a result, weakness and softness of bones, which are very easily

deformed, complications after poliomyelitis - paralysis of the muscles of the sole and lower leg;

- insufficient physical activity, and as a result, weakness of muscles and ligaments - "sedentary" work;
- excessive physical activity - "standing" work, hobby for running and jumping sports. [7]

Features of the development of flat feet in children. Most often, children have longitudinal flat feet. It is known to be congenital and acquired.

The congenital form of the disease is rare and is a consequence of intrauterine malformations, it is detected already in the hospital. In most cases, one foot is affected, but sometimes both are affected. The critical moment in the development of flat feet is the age from 8 months to 1.5 years, when the child begins to learn to walk. At this point, it is important for parents to prevent incipient deformities of the foot, given that it is very problematic to establish reliably whether a child has congenital flat feet or not, before the age of 5-6 years. In all children under 2 years of age, the longitudinal arch of the foot is flat.

Experts consider this condition to be physiological, because the bone tissue in babies is soft and elastic [19]. When children start to stand up (at 7 - 9 months) and walk independently (at 10 - 12 months), the function of the shock absorber is taken over by the "fat pad", which is located on the children's sole under the skin. At 2 - 3 years, the bones gain a sufficient amount of minerals, the articular surfaces acquire normal outlines, the ligaments become stronger, and the strength of the muscles allows you to stay on your legs longer. Up to 3 - 4 years old, if the child does not complain of pain in the legs, develops normally and shows normal physical activity, there is no need to worry about flat feet. The formation of the bones of the foot continues until about 5-6 years of age. Only during this period we talk about the presence or absence of flat feet in the child - already the very one about which one should worry. It is at the age of 4 to 7 years, when the ossification points are not closed, that it is easier to prevent or correct the development of foot deformities and form a correct gait and prevent disruption of the entire musculoskeletal system, including the spine. [5]

Anthropometry of the foot. For all the elementary nature of the anthropometric method, the simplicity of its technique only the apparent dimensions of the human body, including the foot and hand, depend on the position of the measured one. Therefore, the feet are measured in a position where the human body is located strictly vertically with equal support on both feet. The distance between the feet should be 20 cm.

The position of the measuring instrument, fixture, or the position of the foot and hand in the anthropometric device must exactly match the requirements of the procedure. Compliance with the measuring technique is a prerequisite for obtaining comparable and accurate data. Measurements are usually taken on the exposed right foot and hand. Before proceeding with measurements, anthropometric points and lines are applied to the leg and brush with a ballpoint hand. These points and lines should correspond to clearly defined and easily fixed anatomical points of the skeleton (roughness, tubercles, bone processes, etc.), soft tissues or skin formations. [5]

One of these points are the classic points of anthropometry, and the others are the starting points for measuring the features necessary for designing products and building a dimensional typology.

The following points are marked on the leg (Figure 2): the most protruding point 9 of the heel on the tubercle of the calcaneus; center 1 of the inner ankle; 7 folds of the foot; point 10 of the maximum height of the longitudinal arch (tuberosity of the scaphoid); point 6 of the middle of the foot; the most protruding point 2 of the first metatarsophallic articulation (internal bundle); point 11; located above the center of the first metatarsophalangeal joint; front point 3 of the foot on the first (or second) toe - the farthest from the most protruding point 9 of the heel, the deepest point 15 of the second interdigital space; the deepest point 16 of the third interdigital space; point 4 of the end of the fifth finger; the most protruding point 5 of the fifth metatarsophalangeal articulation (point of the outer bundle); center 8 of the outer ankle; the bottom point 17 of the heel rounding; point 15, located at the level of the lower edge of the gastrocnemius muscle; point 13 in the place of greatest development of the posterior muscle group of the lower leg; point 14 under the kneecap in the place of the greatest narrowing of the lower leg.

All measurements are carried out in certain anthropometric planes. Dimensions lying in one sagittal and one horizontal, but different frontal planes, are called longitudinal, or lengths (for example, foot length, toe length, length to the end of the little finger, etc.). Dimensions lying in one horizontal and one frontal planes, but different sagittal ones, are called transverse (for example, foot width, hand width, etc.). Measurements can be carried out on the surface of the leg or hand, obtaining girths in certain sections.

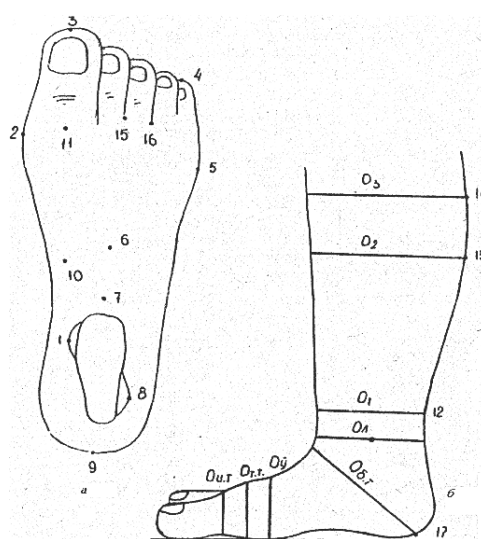


Fig 2. Schemes of marking the anthropometric points of the foot and lower leg

Determination of pathological abnormalities by footprint - plantogram. The plantogram of the foot allows one to judge the state of its longitudinal and transverse arches (the degree of their flattening). One of the indicators of the state of the longitudinal arch is the coefficient K, which characterizes the state of the middle part of the foot (Fig. 3).

To determine this coefficient, it is necessary to draw a line F3, passing through point F, the middle of the heel print support and point 3, the deepest point of the third interdigital space. This line divides the foot into outer and inner parts.

A tangent is drawn to the outside of the print through points B (head of the fifth metatarsal bone) and C (the most prominent point of the heel print). From point A (the extreme rear

point of the heel print), a perpendicular is lowered to the continuation of the BS line. The length of the print is measured from point E to the end of the first or second finger (point H'). From point E along the BS line, lay the segment $EV = 0.46 \text{ Dotp}$ and restore the perpendicular to the tangent BS from point V.

The coefficient K is determined by the formula $K = JG / VZ$, where JG is the width of the painted part printed along the line VZ; VZ is the width of the outer part of the longitudinal arch.

Functional insufficiency of the feet is characterized by rapid fatigue of the lower extremities, soreness of the feet, legs, swelling of the soft tissues of the feet, instability of the joints of the feet under load (twisting the foot when walking, running), and a decrease in endurance to static loads. No visible changes (lowering of the longitudinal arch) are detected.

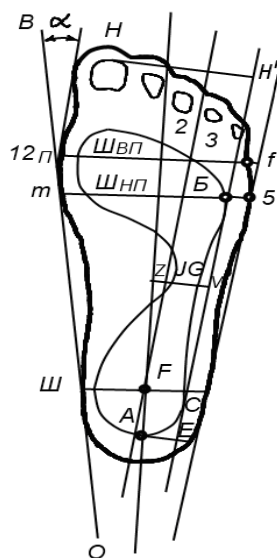


Fig 3. Plantogram of the foot

Static deformations of the feet in violation of their shape and function can be expressed in three degrees:

I - poorly expressed longitudinal flat feet. It is characterized by the lowering of the longitudinal arch, mainly under load, fatigue in the legs, the coefficient of the middle section of the foot $K = 1.21 - 1.3$;

II - moderately pronounced longitudinal flat feet. It is characterized by a decrease in the longitudinal arch without load and even more with a load, the coefficient of the middle section of the foot $K = 1.31 - 1.5$. The gait loses its elasticity, smoothness;

III - pronounced longitudinal flat feet. It is characterized by a decrease in that the externally longitudinal arch is not defined. The supporting surface of the foot is significantly increased in comparison with the supporting surface of a healthy foot, the coefficient of the middle part of the foot is $K \geq 1.51$, walking is painful, difficult, and the ability to work is sharply reduced.

To determine the angle of deflection of the big toe on the plantogram, a tangent IIIm is drawn to the inner side of the dimension through the two most convex points of the inner contour, and point III is located on the contour of the widest section of the heel print (the head of the

first metatarsophalangeal joint). The angle of deflection of the thumb α is formed by the continuation of the line III_m and the tangent line H_m of the thumb line drawn from point m. Normally, the angle of deflection of the thumb should not exceed 12°. Transverse flat feet can also be expressed in three degrees:

I – poorly expressed transverse flat feet. It is characterized by a deviation of the first toe outward at an angle of up to 29°, a slight flattening of the forefoot due to the fan-shaped divergence of the metatarsal bones;

II – moderately pronounced transverse flat feet. It is characterized by a deviation of the first toe outward at an angle of up to 39°, callousness of the skin under the heads of the middle metatarsal bones;

III - pronounced transverse flat feet. It is characterized by a pronounced fan-shaped divergence of the metatarsal bones, a deviation of the thumb outward at an angle of more than 40 °, corns under the heads of the metatarsal bones.

Often there is an abnormal structure of the foot in the form of a hammer-shaped fingers: the fingers are bent at the interphalangeal joints, resembling the shape of a hammer. At the same time, they protrude upward and experience strong friction against the shoes.

RESULTS

Most people unreasonably consider flat feet to be a non-serious disease that causes only slight discomfort, and the pain when walking is attributed to uncomfortable shoes. However, flat feet is a very serious and insidious pathology that accelerates the wear and tear of almost the entire musculoskeletal system. The foot is one of the most important human organs; it is the distal part of the lower limb. Functionally, the foot is an organ that works as a supporting and spring apparatus for various positions and movements of the body, for example. when standing, walking, running, jumping, etc. A feature of the structure of the human foot is the presence of the so-called arches of the foot. It is a sophisticated spring structure that perfectly distributes the load when walking. The longitudinal and transverse arches of the foot are the very springs and levers due to which this living mechanism works. The arch performs a very important function - it compensates for the pressure on the limbs. The foot functions normally as a single complex- when the load acting on, it is completely balanced by strong ligaments and muscles. If there is a weakening of the musculo-ligamentous apparatus, then the normal shape begins to be disrupted - the foot settles, becomes flat, one of its main functions is lost - spring (spring). In this case, shaking when walking is forced to compensate for the spine, as well as the joints of the legs (ankle, knee, hip). By their nature, they are not intended for this function, therefore they cope with it rather poorly and quickly fail. Many people know pain in the back and legs, when the calves in the evening seem to be filled with lead. But not many people know that the cause of these phenomena is flat feet. Flat feet is a disease that constantly reminds of itself by rapid fatigue when walking, pain in the feet, hips, lower legs, and lumbar spine. [6]

In order to conduct anthropological studies of the size of the feet of children of primary school age, students of the third grade A, school No. 32 in Bukhara were selected. To carry out the research work, footprints (plantogram) were taken from each child. Further, each plantogram was processed according to the method of K. I. Chentsova.

Determined the coefficients - K, - as an indicator that allows you to judge the state of the arches of the foot. The degree of development of flat feet among students was revealed. Further measurements of the foot and lower leg were carried out, the results were entered in the table. The obtained result of the size of the foot was compared with the average. Using the length - D of the foot, obtained during measurement, according to the regression equations, the values of the main dimensional characteristics of the foot were calculated, recorded in the table and compared with those obtained during measurement. Based on this analysis, a conclusion was made about the correspondence (or inconsistency) of the dimensions obtained during measurement with the average, i.e. calculated by the regression equation.

Processing and analysis of research results, sizes of children's feet. After conducting anthropometric studies of the size of the feet of 28 pupils of children of the school number 32 in Bukhara, the results of measurements and plantograms were processed. The following research result was obtained:

1. The number of children with hollow feet is 0.
2. The number of children with normal feet is 16, including: 8 boys, 8 girls.
3. The number of children with reduced vault is 6 people, including: 4 boys, 2 girls.
4. The number of children with the first degree of flat feet is 3 people, including: 1 boy, 2 girls.
5. The number of children with the second degree of flat feet is 0.
6. The number of children with the third degree of flat feet is 3 people, including: 2 boys, 1 girl.

A diagram was built based on the results of the work (Fig. 4). Studying the data of dimensional characteristics and comparing them with the average ones, one can come to the conclusion that some dimensional characteristics are not very accurate, since there is a big difference in the numbers of deviations. To obtain the most accurate data, it is necessary to continue the research using the most advanced measuring devices and instruments, and at least 120-150 children in the sample group were examined.

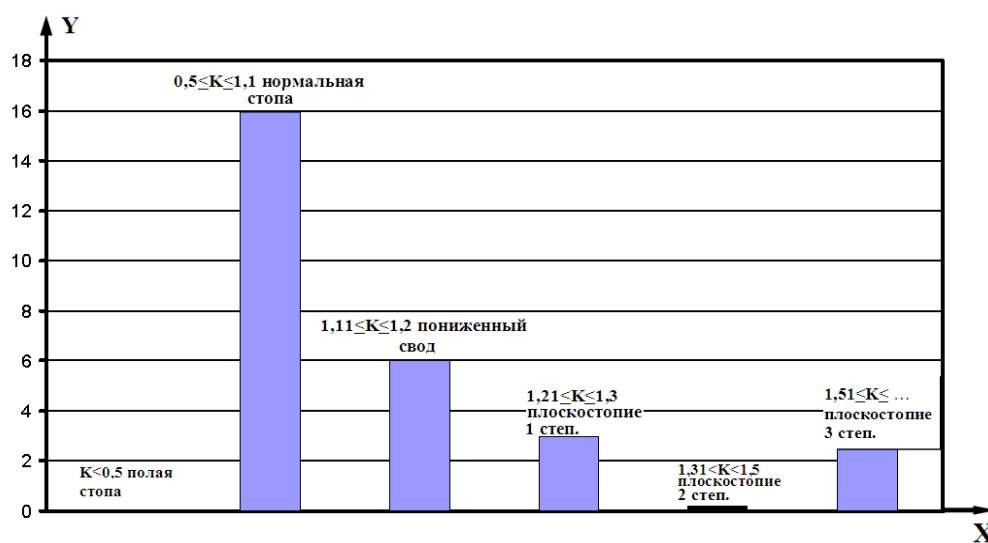


Figure: 4. Diagram of the results of processing plantograms

On the X-axis are the indicators of the K coefficient, which characterizes the condition of the

arches of the foot. On the Y-axis - the number of children under study is placed.

CONCLUSION

As you know, children rarely complain of pain due to flat feet, however, in adulthood, it causes many problems and even suffering. The health of the feet is the health of the whole organism, in this regard, early diagnosis and the use of means for the prevention and treatment of flat feet is extremely important. Moreover, children's and teenage feet lend themselves well to correction, which cannot be said about the feet of an adult.

In this scientific work, a research work was carried out on the topic: "Study of the size of the feet of primary school children in order to identify static deformations." To carry out the work, the anthropometric data of students of grade 3 A of school No. 32 in Bukhara was determined. The class includes 15 boys, 13 girls, years old: 9 - 10. The resulting footprints - plantograms were processed according to the method of K. I. Chentsova. As a result, the following data were revealed. In the class, children with a normal foot make up 16 people - 57%, including 8 boys, 8 girls, with a foot with a low arch is 6 people - 21%, including 4 boys, 2 girls; with a foot having longitudinal flat feet of the first degree is 3 people - 11%, including 1 boy and 2 girls; with a foot having longitudinal flat feet of the third degree is also 3 people - 11%, including 2 boys and 1 girl. Thus, we can conclude that in this class, children with pathological abnormalities of the foot are 22% and 21% with a low arch of the foot.

It is quite difficult to treat this seemingly simple disease. In addition, you need to know that the moment will never come when a person can breathe a sigh of relief: well, I am cured! Especially with advanced pathology. Flat feet are a lifelong illness. Complete cure of flat feet is possible only in childhood. In adults, with the help of special rehabilitation measures, the development of the disease can only be slowed down, not allowed to develop into more severe pathologies. The earlier the signs of the disease are detected, the less the foot deformity, the more favorable the conditions for stopping the progression of flat feet and its correction.

Treatment should be comprehensive, aimed at relieving pain, strengthening the muscles and ligaments of the foot in order to stop the progression of the deformity and prevent the development of complications. To relieve pain, medications and physiotherapy procedures are used. The treatment is based on special therapeutic exercises, which must be carried out at home every day. Therapeutic gymnastics trains muscles, strengthens the ligamentous apparatus, forms the correct walking stereotype.

To improve blood circulation and normalize muscle tone, massage of the feet and lower legs, foot baths are useful. A special role in the treatment and prevention of the progression of flat feet is assigned to orthopedic insoles, which are prescribed already at the first degree of pathology. They help relieve painful areas of the foot and correct the identified deformities at the initial signs of flat feet, return the foot to a normal position and take on the functions of a shock absorber. They are made to order according to an individual foot impression after examination, taking the foot dimensions and establishing the degree of flattening of the arch. When the form of flat feet is neglected, special orthopedic shoes are made in the form of shoes with lacing, solid sole and lateral support of the foot. An orthopedist will help you to find all these simple devices. Correct selection of footwear is of no less importance in the

prevention of flat feet. Undoubtedly, fashionable high-heeled shoes look very nice on the foot, but do not wear them everyday. Otherwise, it may happen that after a while you will be doomed to wear only orthopedic shoes. The best shoes are made of soft leather with flexible soles, a low heel (3-4 cm), a wide toe, no platforms, and a leather upper. Sneakers - too (unless, of course, it's a fake). Do not wear shoes that are overly wide and loose. It causes chafing, inflammation and calluses. But it is even more harmful to wear tight shoes - in addition to calluses, it leads to curvature of the fingers, impaired circulation and ingrown nails. Shoes should fit the foot like a second skin.

Flat feet is a very serious and insidious pathology that accelerates the wear and tear of almost the entire musculoskeletal system. The main goals of therapeutic measures for flat feet are aimed primarily at strengthening the muscles and ligaments, since their weakening is the main reason for the appearance of flat feet. If possible, use conservative treatment, apply it in cases where the disease is not started and has not reached grade 3. The third degree of flat feet, unfortunately, almost does not lend itself to conservative treatment, and patients are forced to resort to surgical intervention, in which the ligaments are cut, the curvature of the big toe is removed and the arches of the foot are corrected.

The significant prevalence of foot deformities, most often static flat feet, reduces the ability of people to work. Prevention and treatment of foot deformities associated with flat feet are of great national importance. To prevent the appearance of foot deformities, it is necessary to wear shoes of a rational design, observe a labor regime, rational working and living conditions, perform physical exercises and massage, and use corrective devices (Fig. 5). With flat feet, curvature of the thumb, milky fingers and other deformities, corrective devices are used. Their purpose is to protect the feet and toes, feet from the progression of deformation, relieve the muscles and ligamentous apparatus from overload (by mechanical, passive support of the longitudinal and transverse arches) with them to protect the painful areas of the feet with deformed toes, calluses, corns, constant abrasions.

Corrective devices are simple, can be easily manufactured in large quantities and individually. They are a complement to normal shoes.

One of the types of corrective devices for flat feet are instep supports. Their task is to bring the heel out of the pronation position and support the arches of the foot during muscle fatigue. Considering that muscle failure occurs only when the muscles are overworked, the instep supports should be located below the highest point of the vault, so that the vaults rest on it only during the period of fatigue. The instep support can relieve pain and prevent the development of deformity. According to the purpose, the instep supports are divided into instep supports to maintain the longitudinal vault, maintain the longitudinal and transverse vaults, and maintain the transverse vault. Depending on the materials used, the instep supports can be divided into hard - leather with a metal plate, elastic - with a leather insole and various layouts in the inlet (leather and cork), made of plastic or rubber.

If the heel part of the shoe cannot withstand the load of the foot and bends, rigid instep supports are used - the metal plate does not deform and firmly holds the arches of the foot. However, the use of these instep supports leads to a limitation of the function of the muscles of the foot, the appearance of an inelastic gait. In addition, the instep takes up a lot of space in the shoes and spoils the stockings. The Central Institute of Traumatology and Orthopedics

named after N.N. Priorova developed elastic plastic instep supports. They do not need to be sheathed with leather as they do not cause sweating.

Instep supports in the form of small prophylactic inserts are used to maintain the longitudinal arch. Inserts are inserted into the insole pocket. The instep support for the longitudinal and transverse vaults, in addition to lifting the longitudinal vault, support the transverse vault.

With transverse flat feet and significant spreading of the feet, it is sometimes necessary not only to support the transverse arch, but also to tighten the foot in the middle. In such cases, it is recommended to use cuffs made of bandage rubber or rubber bands with gaskets sewn in to maintain the transverse arch. For transverse flat feet, leather insoles with a soft foam bulge can be used to support the transverse arch.

When the thumb is tilted, a coil-shaped spacer is inserted between it and the second finger, which tilts the thumb inward. To increase the deflection of the thumb, spongy rubber, porous plastic, cotton wool are placed in the hole of the gasket.

The third degree of flat feet is a pronounced deformity of the foot, which during the work of the musculoskeletal system is accompanied by disorders of a different nature (arthrosis, osteochondrosis, scoliosis and herniated intervertebral discs). It becomes the cause of deformation of the fingers - they acquire a hammer-like shape. The sharper the deformity is, the more the thumb deflects outward. Often, patients only at this stage go to the doctor. After all, pain in the feet, legs, which are almost always edematous, and in the knee joints is felt constantly. The lower back often hurts, a painful headache appears. With III degree flat feet, the ability to work is significantly reduced, even a calm, short walking is difficult. A person can no longer move in ordinary shoes. In children, it is much easier to correct deformities of fingers, including hammer-like ones. A device in the form of a polyurethane foam comb with holes for fingers is used. The device is laid from the back on the bases of the fingers, and the teeth are between the fingers. The toes are pressed against the top of the shoe.

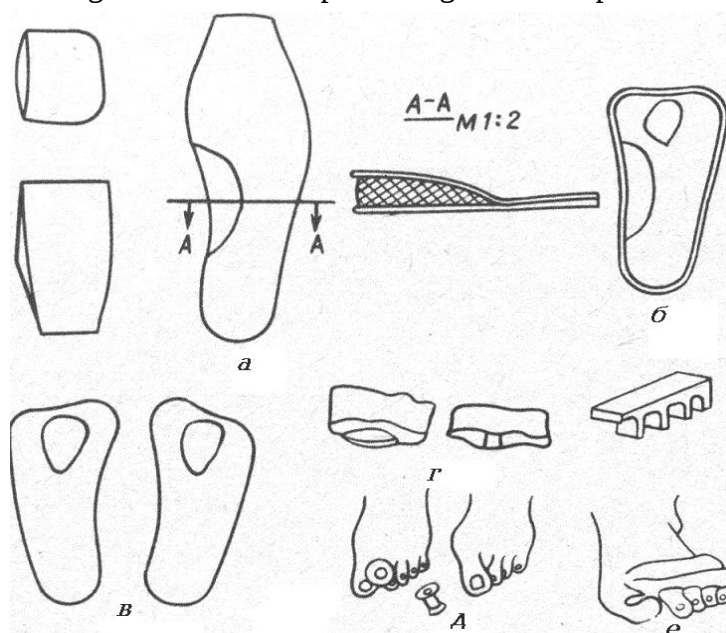


Figure: 5. Corrective devices for foot deformities

Manual therapy, remedial gymnastics, acupuncture, limitation of static load, laser therapy, the use of insoles and orthopedic shoes play an important role in conservative treatment. Children with identified pathological abnormalities are advised to consult doctors and orthopedic institutions, order the appropriate corrective devices such as special insoles and shoes. For further recovery, it is recommended to perform specific exercises and receive appropriate treatment.

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