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ERGONOMIC STUDIES OF DYNAMIC CONFORMITY OF CLOTHING FOR JUNIOR HIGH SCHOOL CHILDREN

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Abstract: The article deals with the results of research to improve children's clothing based on the principles of ergonomic design. The dynamic effects established as a result of ergonomic studies allow to determine reasonable and rational free-fitting additions for shoulder and waist clothes for children of junior high school age, which can be recommended for use in the design of children's clothing assortment.

Keywords: children’s clothing, ergonomic, dynamic, projection, significant, contribute, dynamic, conformity, condition, movement.

INTRODUCTION

The task of ergonomics is to create such working conditions for humans that would contribute to the preservation of health, increase labor efficiency, and reduce fatigue throughout the working day. Ergonomic indicators characterize the static and dynamic conformity of clothing to the size and body of a person. Children are the most mobile members of the population. Being within the walls of an educational institution takes a significant part of their time, and the movements of most boys and girls are characterized by emotionality and diversity. On how comfortable and convenient is the child's clothing depends on his well-being, and, consequently, on the perception of the material studied. Creators of school clothes almost throughout the history of school uniforms tried to make it both comfortable and fashionable.

Increased market requirements for competitiveness and quality of garments lead to increased attention to ensuring the dynamic conformity of all types of clothing [1]. As is known, the most important external manifestation of the physiological side of a child's active activity is movement. Effective implementation of typical movements largely depends on the correct posture of the child. Even the most relaxed posture is not a state of absolute rest, as it involves the activity of tonic muscles. The state of the posture, its comfort depend mainly on two things: on the position of the center of gravity and the area of support and on the amount of tension of the tonic muscle groups, which prevents the violation of the appropriate location of body parts [2]. It should be noted that the dynamic comfort of matching clothing for children's products is particularly important. It should be taken into account that children of different ages have peculiarities of movement organization (degree of muscle development, which determines the amplitude of movements, etc.), which ultimately affect the values of changes in body size of children in the dynamics.

MATERIALS AND METHODS

Previous work on the study of movements of preschool children and high school students [3], [4] do not allow us to use their results in designing clothes for younger students because of their age-specific psychophysiological features. Thus,

despite the results achieved in the field of ergonomic design of children's clothing, the task of improving design parameterization methods taking into account age and ergonomic dynamics of dimensional body features for primary school children is still relevant. In the first stage of the work performed, a study of the postures and movements of primary school children during an active working day at different times of the year was carried out.

The main stages of performing movements, including squats, bends, etc., were recorded in detail on photographs and video clips taken during the experiments in the street, at school, and at home. As a result of comparative analysis, all movements were typed and classified into two main groups: those performed in the standing posture and those performed in the sitting posture. In turn, each of these groups includes movements that can be grouped into three subgroups: upper limb movements, lower limb movements and torso movements. As a result, 12 characteristic postures and movements were identified.

Classified typical movements of children of this age group were recorded in the form of ergonomic diagrams. At the second stage of the research, dynamic increments (effects) of dimensional features, which are initial information when calculating design parameters of shoulder and waist clothes for children, were analyzed, as they influence the value of free-fitting additions. It is established that the following dimensional features change their parameters most frequently: T104, T47, T36, T33, T45, T* (distance from waist line to the knee), T** (arm girth at the elbow). At the same time, for a number of dimensional features, a significant increase in values is revealed, and therefore, the parts of the clothing adjacent to these areas of the body will experience stretching deformations and even tearing.

RESULT AND DISCUSSION

The following structural parts of clothing parts are subjected to maximum dynamic stresses: back length, back width, sleeve width at the level of the depth of the rim, seat height, hip circumference, knee circumference, chest width, elbow zone of the sleeve and knee zone of the pants. Thus, the need arose to determine the value of dynamic gains (effects) on the established dimensional features.

At the third stage of research, measurements of certain dimensional features and parameters of the figure in statics and dynamics were carried out. In addition to the dimensional features necessary for the ergonomic study, the following figure parameters were determined: deviation of the body from the vertical axis (γ); angle between shoulder and forearm α); angle between hip and shin (p); angle between torso and hips (z); hand position during different movements (δ). From all obtained values of , p, γ, z and δ, the minimum, maximum and average values were chosen, which provide the necessary reliability of the research results. In order to determine the change of dimensional features during the above mentioned poses, a figure close to a typical one simulated these movements, observing the selected values of α, p, γ, z and δ.

At the same time, the determination of dimensional features was performed using the contact measurement method. In order to estimate the change of

dimensional features, the dynamic effect was determined, and the results of measurements and calculations are presented in Table 1.

Dimensional designation /constructive segment	Dimensional feature value in statics, cm	Dynamic increment to the dimensional feature when performing ergonomic poses, cm					Selected dynamic effect, cm	Percentage of dynamic growth
		№ 1	№ 2	№ 3	№ 4	№ 5		
To build a design								
T36//36-16/	27,6	-2,4	-1,3	-3,2	-6,1	-5,2	0	0
T39//11-31/	13,0	0,1	0	0,3	-0,1	-0,1	0,3	2,3
T45//35-37/	21,8	0,5	1,2	-4,3	-4,5	-3,6	1,2	5,5
T47// 31-33/	24,6	2,9	2,6	5,9	5,7	4,8	5,9	23,9
T33 //13-43-93/	46,0	2,8	-1,4	2,1	1,2	-0,8	2,8	6,1
T22 //78-78/ /	24,8	0,2	0,8	0,6	1,8	1,3	1,8	7,2
T27//441-940/	47,8	0,2	0,1	0,1	3,4	-1,9	3,4	7,1
To control								
T43	29,2	2,5	3,0	2,8	4,0	3,1	3,0	10,3
T31	10,0	0,2	-0,1	0,3	0,1	-0,1	0,3	3,0

CONCLUSION

Analyzing the data, the authors found that one dimensional feature is characterized by several values of dynamic growth, so there is a need for a differentiated choice of allowance values. It is recommended to choose the maximum values of the allowance corresponding to dynamic effects, because they most fully show by what value the dimensional feature can change when the child performs various movements during the active day.

1 shows that the following dimensional attributes undergo the greatest change: T47, T43, T27, and the dimensional attributes T36, T31, and T39 undergo the least change. Dynamic increments (effects) allow optimizing the seam allowance values in the design of children's clothing, which is especially important when using CAD.

The dynamic effects, established as a result of the ergonomic research, allow determining reasonable and rational design allowances for shoulder and waist clothes for children of primary school age, which can be recommended for use in designing children's clothing assortment and improving information support of CAD.

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