ASPECTS OF DESIGNING GARMENTS FOR CHILDREN AFFECTED BY METABOLIC SYNDROME

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Abstract: *The work presents the results of the investigation of problem of designing garments for the children affected by the metabolic syndrome. The initial stage of investigation included the study of anthropomorphological and anthropometric particularities of children affected by metabolic syndrome. The investigation was aimed towards the structuring of a rational assortment of garments for the children with metabolic syndrome, determination of specific functions and requirements, as well as identification of recommended compositional-constructive and functional-constructive solutions. The assortment of products that may be offered to these children is limited. Also was identified the problem of providing these children with adequately dimensioned products. As a rule, the children are offered products of bigger sizes, products of other age groups in order to provide the necessary degree of freedom. The garments adequate to the body dimensions and shapes of the affected children provide for the possibility of physical activity, normal development and healthy lifestyle.*

Keywords: *metabolic syndrome, garments for children, design techniques.*

1 INTRODUCTION

In the recent decades the scientists and doctors are becoming more and more preoccupied by various metabolic diseases and disorders associated with obesity, collectively referred to as metabolic syndrome. Numerous researches of the metabolic syndrome at children and adolescents are being conducted. The increasing incidence of obesity at children and the growing number of metabolic disorders on the background of obesity made the research of metabolic syndrome at this age category very actual. At the same time the elaboration of a wardrobe for various activities and age groups of children affected by metabolic syndrome constitutes an actual problem for the industry specialists.

The design of products for children, including garments and footwear, must be based on the principle of uppermost comfort of wearing, maintenance of health and correct physical development. The solution of this design problem is impossible, unless the anatomic-morphological, psychological, growth and development particularities are accounted-for.

The assortment and the compositional and constructive-technological solutions of new models of garments for children are determined in accordance with the age particularities of children's organism that is in constant growth and development.

2 SELECTION AND ANALYSIS OF INITIAL DATA FOR THE DESIGN

In the scientific and practical works aimed at the solution of problems associated with raising the quality level and the competitiveness of industry-made products more and more attention is being paid to the ergonomic studies of the "man– object- environment" system.

The incomplete morphological and functional development of all systems and organs of adolescents, the process of continuous growth imply a lower resistance of organism to the unfavorable impact of the surrounding environment, including of the inadequately dimensioned clothing. The garments are in permanent direct contact with the child's body, therefore they must possess properties and shapes compliant with the anatomic-physiological and psychological particularities of the child's organism that are manifested during the wearing or during specific activities (playing, studying, etc.).

The manufacturing of garments at the industrial scale is done for common type bodies, while the individualized manufacturing requires specific data on the particularities of the wearers' external shapes.

Numerous morphological characteristics are used for specifying the external shape of the human body, such as the posture, conformance, proportions of body. Therefore, all the classification schemes of bodies may be divided into two big classes: anthropometric and morphological, determining the shape of body and its component elements. In the process of designing garments the most valuable are the anthropo-morphological classification schemes that reflect both the dimensions and the shapes of human body.

The particularities of external human body shape are determined by the posture to a significant extent. The classification of postures of children's and adolescents' bodies has been proposed by the Polish researcher N. Voleanschii, providing for the three complexes each consisting of three target groups depending on the vertebral column bend – cyphotic, balanced and lordotic.

The body conformance is determined by the combination of indicators characterizing the body dimensions, the development degree of skeleton, muscles, subcutaneous adipose tissues, shape of back, extremities and abdomen. Numerous specialists consider that the most successful body conformance classification scheme is the one elaborated by Stefco-Ostrovschii that distinguishes the pure, intermediate and undetermined conformance types. The pure types are divided into asthenic, thoracic, muscular and digestive ones.

According to the criteria proposed by the International Diabetes Federation in 2007, the metabolic syndrome is diagnosed at children and its main criterion is the central obesity at the perimeter of waist. The waist circumference is also one of the major dimensional indicators determining the product characteristics in the respective area. Additionally, it is used not only in the process of designing garments for children, but also in the determination of the body conformance group. The main dimensional characteristics defining the body type according to the contemporary dimensional typology for the children are: body height, circumference of bust and circumference of waist. By comparing the common type dimensional characteristics with the ones specific to sick children, it has been established that the obese children have higher waist circumference values:

- for the girls of the first conformance group in the interval of 63, 66, 69 cm compared to 51, 54, 57 and 60 cm proposed by the anthropometric standards and for the second group - 69, 72, 75 cm compared to the 57, 60, 63 si 66 cm;

- for the boys of the first conformance group in the interval of 66, 69, 72 and 75 cm compared to the 51, 54, 57, 60 and 63 cm proposed by the anthropometric standards and for the second group -72, 75, 78, 81 and 84 cm compared to 57, 60, 63, 66 and 69 cm.

This fact imposes the search of compositional-constructive solutions capable of providing for the anthropometric correspondence of garments in the area affected by the mentioned syndrome.

These requirements provide objective information on the properties of primary importance at certain stages of design. In the process of designing the contemporary industrial products they have to comply with all the necessary requirements and must implement all the functions, bearing in mind the material and time costs of manufacturing that in their turn depend on the consumption, design, manufacturing and selling conditions.

Good knowledge of the group of wearers, of their activity conditions, needs and interests, as well as of the functions of garments allows to determine the main requirements to the garments at the user level, the characteristics of materials and construction of products.

In the normal conditions of exploitation of usual clothing the most important indicator is the temperature, as namely the temperature affects the basal metabolism that maintains the thermal equilibrium.

The children's bodies are characterized by the body area and mass of blood circulating throuth the relatively large epithelial tissues, as well as by the higher intensity of metabolic processes, by the imperfect thermal regulation mechanism and higher thermolytic effect that easily induce hypo- and hyperthermic conditions.

The organism of the child affected by the metabolic syndrome is predisposed to overheating. This fact imposes the choice of adequate garments that must be of light fabric, freely cut, with transformable constructive elements. These may provide for a better natural ventilation with simultaneous removal of metabolic products.

The ergonomic requirements include the totality of criteria imposed to the correspondence properties with the anatomic-physiological and psychological requirements of children, as well as to the convenience and safety of wearing by optimization of physical and psychic load. The ergonomic requirements characterize the

degree of accommodation of the product with the child and are based on the ergonomic properties of the „man– product– environment" system.

The hygienic requirements determine the inoffensive conditions of human activity and are regulated by the sanitary-hygienic norms. This group of requirements is of top priority for the children's garments, as the protection reactions of the children are not so strong compared to the adults.

In order to provide compliance with the psycho-physiological requirements, the products are not to impose any unpleasant sensations in perception. The perception of material at touch depends on its action over the skin. The new and silky materials are perceived as convenient ones, as they do not exert a potential risk of damage to the epithelial tissue. The hard seams, materials and sub-assemblies, thick fabric with asperities are more likely to generate negative emotions.

The blood circulation disorders at children affected by metabolic syndrome often result in the appearance of exanthemas on skin. In order to avoid exanthemas, the clothing must not provoke discomfort by friction, displacement on the body surface or pressure. The clothing chosen in accordance with the sizes and shapes of children's bodies provide for reasonable freedom of physical activity, normal development and healthy lifestyle.

The personality formation requirements are associated with the educational functions of clothing. This group contains requirements to the formation of skills and abilities, aesthetic taste and psycho-physiological development.

Therefore, there must be a high level of agreement between the product and wearer, his/her age group and psychomotor development. The products intended for children must comply with the requirements of continuous psychomotor development based on the specific dimensional and model particularities.

The models of garments for children also must comply with the aesthetic requirements that are met by assuring correspondence between the suit as a system, physiognomy and age group of the child, as well as between the elements making-up the suit, the colors and used materials.

The commercially available products manufactured based on the dimensional standards for the common type bodies, when purchased for the children affected by metabolic syndrome are either too narrow and affect the blood circulation or do not correspond to the age group. As a rule, the products of bigger dimensions are proposed, or the products for the next age groups, so as to provide for the necessary degree of freedom.

The anthropometric correspondence is the basis of the design stage. Therefore, a justified choice of design method and solutions of comfort is necessary. It means that the main problem of design is reduced to a totality of interdependent processes affecting the changes in the object of design.

The design stage itself begins with the selection of dimensional adequacy assurance methods for the subsequent period of wearing. For this purpose one may use the dynamic or morphological transformation tools and methods. The combined variant may also be used – in some sectors the growth dynamics is compensated by additions, in other cases – by application of morphological transformations.

3 PRINCIPLES OF DESIGNING GARMENTS FOR THE CHILDREN AFFECTED BY METABOLIC SYNDROME

The object of experimental study was the dress with semi-adjusted silhouette for girls aged 6,5...11,5 years. The basic structures for this type of product have been elaborated by the CAER garment design method. The dimensional characteristics of children's bodies approved by the state standard GOST 17916-86 applied in the Republic of Moldova. This normative act provides for 5 conformance groups for the common body types of girls with a height of 134 cm and bust perimeter of 68 cm. The basic structures of the dress are obtained for the first, third and fifth conformance groups.

In order to identify the deviations occurring in the designed basic structures the author used the comparative analysis of resulting contours by their juxtaposition. The waist line in transversal direction and the symmetry lines of frontal and back reference elements in longitudinal dimension have been chosen as juxtaposition lines. The waist line has been chosen due to the fact that is the main level line clear in configuration, having a strictly determined position, providing for a close contour on the body, being at the same time

interconnected with any point of human body, preserving its functions in the process of determining the position of constructive and template points.

The front and rear reference elements have been juxtaposed in separate in accordance with the symmetry lines in order to identify the directions and legalities of modifying the dependent parameters based exclusively on the conformance indicator, starting from the practically equal value of parameters identifying the shape and the dimensions of the product central area.

In the result of juxtaposition it was determined that the front and back reference elements have substantial differences at the level of back width and face width, as well as in the degree of inclination of shoulder lines, depth of bust cut, as well as in the value of frontal and posterior equilibrium of constructions.

For a more detailed analysis the values of constructive parameters of obtained structures have been examined. In total 23 constructive parameters were considered. The obtained values have confirmed the differences identified by juxtaposition and enable us to affirm the following:

1) The width of back element first increases sharply by 0,7 cm and then at slower rates, showing a difference of only 0,2 cm.
2) The width of sleeve cut increases uniformly by 0,5 cm from one structure to another.
3) The width of product façade decreases at relatively uniform rates by 0,2 cm and 0,4 cm from one structure to another.
4) The width of bust line element differs substantially, denoting an increase by 2,0 cm and 0,3 cm for the structure elaborated for the maximum conformance group.
5) The parameters of neck cut do not differ substantially, the differences being of 0,1 cm, that being at the sensitivity limit.
6) The bust element has demonstrated an unexpected evolution, its depth has registered a decrease in the direction of structure for the bigger conformance group, having reached the „0" value here.
7) The shoulder line inclination on the back element reduces from 18 down to 15 and then down to 13 degrees.
8) The inclination angle of the anterior shoulder line is characterized by non-uniform variability.
9) The length of sleeve cut and sleeve head increases uniformly.
10) The sleeve width at the depth level increases uniformly by 0,4 and 0,5 cm.
11) The anterior-posterior equilibrium of the structure is characterized by a non-directional variability, first coming down from 0 to -1,3 cm, then increasing to 1,5 cm.

The results mentioned above allow us to formulate a series of recommendations for the optimization of construction of garments and to adapt their dimensions to the differences imposed by the conformance group parameters.

Hence, the most rational should be the models in which:

1) Elements providing for the adjustment of back width by at least 2 cm are provided;
2) Sleeves with a high degree of adjustment at the depth level are avoided;
3) The frontal element at the level of width measurement may be left unmodified;
4) At the bust line level one has to provide elements for the adjustment of its width by around 2 cm;
5) Given that the neck cut parameters do not vary substantially, the differences being of only 0,1 cm – at the sensitivity level, one may affirm that namely the lateral areas of the product need to be modified;
6) Reduction of the depth of bust element in the structures elaborated for the small school age group allows us to recommend the models in which the product shape in the pectoral area is made of free-shape elements;
7) The decreasing shoulder line inclination angle may be compensated by the models with volume fixation elements at the waist line or at the shoulder line;
8) The values with different significance of anterior-posterior balance attest the differences associated, most probably, with the body posture. Therefore, one shall opt for the solutions in which the superior support area provides the possibility to modify the parameters owing to the extensibility of used fabric or by the use of additions adequate for the trunk length.

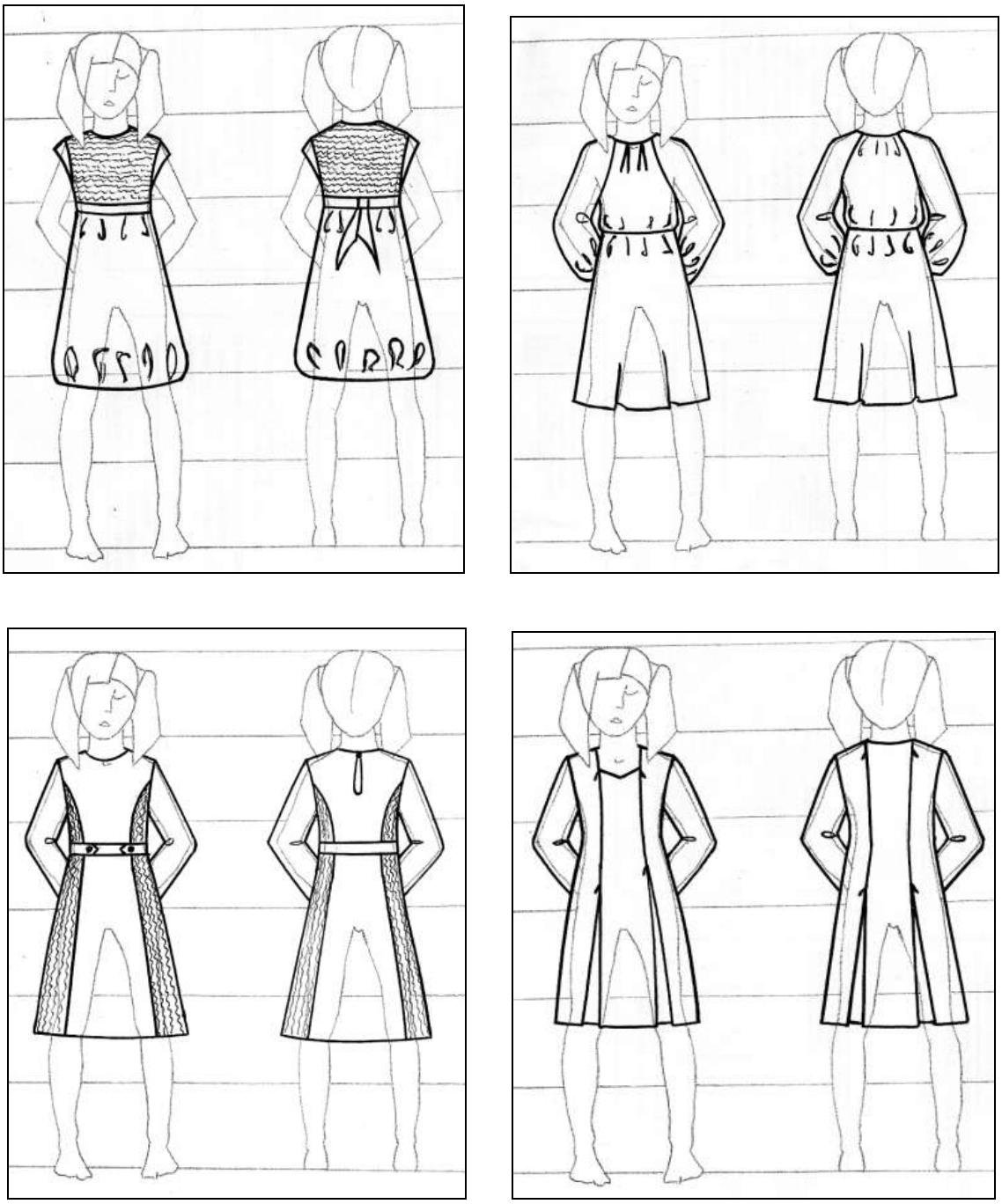

Figure 1: Series of new models of garments for girls

4 CONCLUSIONS

For the moment there are no anthropometric standards capable of establishing the values of dimensional characteristics for the bodies of children affected by metabolic syndrome.

The specialty literature offers information on the values of waist circumference that allow to determine the conformance group in the existing anthropometric standards.

The author has conducted a study of basic structures of dresses for girls aged 6,5...11,5 years elaborated for different conformance groups in order to determine the legalities of their modification.

The identified legalities of modification allow to design new models of garments with flexible structure assured by the use of materials with diverse extensibility characteristics, as well as by the use of transformable compositional-constructive elements.

The identified compositional-constructive solutions allow to elaborate products for serial production, highly suitable for the children affected by metabolic syndrome.

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