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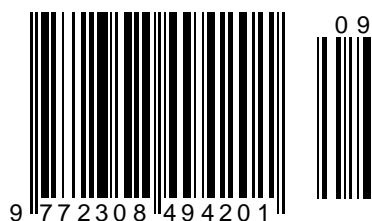
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POSSIBILITIES OF PREVENTIVE MEASURES AND CORRECTIVE MEASURES TO REDUCE PATHOLOGICAL FOOT ABNORMALITIES IN CHILDREN (MESSAGE 5)

Abstract: *in the article, the authors consider the need to restore production in the range of shoes for children, including orthopedic, whose feet have pathological abnormalities taking into account anthropometric features. The authors have developed recommendations for the orthopedist and manufacturers of orthopedic shoes on its correct selection, taking into account pathological abnormalities, to ensure that the child has a healthy foot, eliminating the formation of pathological abnormalities. At the same time, the authors substantiate their concern about the reduction of social protection of families in Russia, whose children have pathological abnormalities, to provide them with free service from an orthopedic doctor in regional centers with mandatory payment by social bodies of municipal, regional and Federal branches of government of the costs of manufacturing medical, preventive shoes and corrective products that create comfortable conditions for the child's foot.*

Key words: *footwear assortment, pathological deviations, anthropometry, demand, realization, competitiveness, demand, financial stability, plantography, rengenography, plaster casts, prosthetics, rehabilitation*
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Introduction

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The design of preventive footwear designed to prevent abnormalities of the foot, especially the static deformation. It is available on the pads for the mass manufacturing of shoes average (fourth -Six) completeness or blocks increased fullness. Preventive elements of the shoe are insoles polustelki, calculations of the longitudinal and transverse arches.

The design of orthopedic shoes tailored to the abnormalities of the foot, lower leg or thigh.

When orthopedic disorders complicated (it is primarily the degree of heavy dynamic deficiency diseases) special shoes assigned only after the maximum possible deformity correction by modern orthopedic surgery. In diseases with static lung failure and some forms of dynamic deficiency disorders - contrary to surgery is resorted to only in extreme cases where the conservative treatment in conjunction with an orthopedic shoe is inefficient.

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Orthopedic footwear serves the following purposes:

- Make sure the support, ie, facilitate walking and standing at more or less the defect stack if the deformation can not be removed surgically or if the patient refuses operation;

- corrected initial, unstable deformation of the stop;

- notify the progression or recurrence of deformation;

- to increase the area of support feet;
- compensate for the shortening of the limbs;
- to support the arch of the foot, to relieve painful areas;

- facilitate walking in orthopedic devices;
- mask cosmetic defect, and others.

Orthopedic footwear is made of all types and designs and may have low (0-29 mm) or medium (30-49 mm) heels.

Depending on the degree of severity of the strain of foot orthopedic shoes is divided into maloslozhnuyu and complex.

Maloslozhnaya orthopedic shoes designed for people with moderately pronounced deformation of the lower extremities. Shoes produced increased fullness (up to 13th) for a special orthopedic pads.

It is also possible serial production of such shoes. In this case, under the maloslozhnoy orthopedic shoes is to be understood such, the internal shape of which is standardized and designed to meet the anatomic changes of lower limb pathologies, for which it is designed. Thus individual approach to treatment is provided by varying the supplementary profile orthopedic insole, whose parameters are taken into account when designing the inner shoe shape. Thus, loose profiled orthopedic insole is not a separate supplementary device, and developed a special detail maloslozhnoy orthopedic shoes.

In most cases, orthopedic footwear maloslozhnaya appointed:

- in functional insufficiency (relatively rare);
- static deformations moderate;
- diseases on the background of functional impairment and static deformation;
- relative limb shortening up to 30 mm;
- hollow foot.

Construction maloslozhnoy orthopedic shoes, appointed in functional insufficiency stop distinguished by the presence of household:

- special parts (loose attachments);
- vnutriobuvnogo additional space for insertion of these devices.

Shoes can be made of all kinds, heel height - low or medium.

Sophisticated orthopedic footwear designed for individuals who have expressed strain and foot defects. It refers to a complex footwear, having at least two special parts or orthopedic Kosok to compensate for shortening of 30 mm or more. This shoe is

available both in standard blocks, and on plaster casts. Footwear includes special parts, correcting the position of the foot: rigid vamp, ankle boots, laying open vault, pronator, oblique or elongated heels, etc.

Complex orthopedic shoes can be divided into two major groups:

- corrective shoes, the purpose of which is more amenable to correction corrective deformations, such as paralytic clubfoot, etc .;

- footwear, the purpose of which is to compensate for various incurable deformations uncorrectable surgically, such as stumps foot, various shortening etc. Complicated orthopedic footwear characterized by the special design of the top and bottom. Its production is almost always done individually.

Main part

Children's orthopedic shoes - one of the tools of the conservative treatment of pathologies of the musculoskeletal system, which plays an important role in the child's recovery. The main task of the children's orthopedic shoes is to form the correct installation of the physiological and arches of the foot, disease prevention is not only the foot, but the entire musculoskeletal system.

However, these requirements are added also the aesthetic characteristics of the product. Appearance of the product, as well as functional movement correction, provide the desired medical effect.

One of the first characteristics of the surrounding world, which accept children - the color. Color - is the bright side of childhood. Kids love to color, react to it. Color contributes to their development and has a very strong impact on the child. Knowing its strengths and weaknesses, you can control the emotional state of the child and his mood.

Color impression that children get from the surrounding life must be organized, given to the system. This should be done in all areas of life.

Important for medicine is the fact that the foundations of the sensory perception of color laid down in the physiological nature of the person and are able to develop from childhood. According to modern psychological and pedagogical research, the child has a great potential in the field of color perception. Already in the early stages of development, the child needs a favorable visual impression and observations of objects.

In the analysis of preferences should be defined especially tsve- tovospriyatiya for children of different age groups.

In justifying his choice of color children do not rely on the subject of color associations, and are based on the impression produced on them one way or another color stimulus. Bright colors attract and delight them, look for the child to be color. Usually, experienced designers of children's shoes tend to use the three primary colors of the spectrum when

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choosing a design children's shoes. It's all shades of yellow, blue and red. Their children perceive better than others, especially paying attention to the shoes similar colors.

Red color for a child - a strong irritant. It usually causes children activity. If it is correct to use this, you can select the colors of children's shoes, depending on its intended use. Yellow is the color of harmony, it can cause a child feeling of joy, as well as encourage him to focus and obedience. Particularly beneficial effect on the yellow color of the excited, nervous and prone to tantrums child. Also, yellow stimulates the appetite (as a child or an adult). Pink - the color of the border. In a brilliant scheme is identical to the exciting red, and pale - read brain as blue. Green encourages interest in learning and knowledge of the world. Shades of green inspire courage child, form a self-confidence. Blue, light blue, purple - soothing colors, do any less active perception. They refer to the colors of introversion - impulses, facing inwards, focused on

the inner life closed. These colors can be used for hyperactive children, to counteract excessive stimulation.

Browns give stability and confidence, but we must be careful with them. It's more of an adult color. Emotional, and the moving child's mind brown can broadcast isolation and secrecy. Black, white, gray, color is also very adult. In child psychology, these colors are treated as extreme forms of neutral, often even as lack of color at all, and rarely cause any emotions, especially positive.

All these features of perception of color, and should be considered very selectively used in the manufacture of orthopedic shoes for children. Proper use of colors helps to improve psihoemotsonalogo condition of the child with disabilities. Color can be added decor. Examples shoe designs using applications are shown in Figure 1. It is possible to vary the color spectrum depending on the child's temperament and preferences.

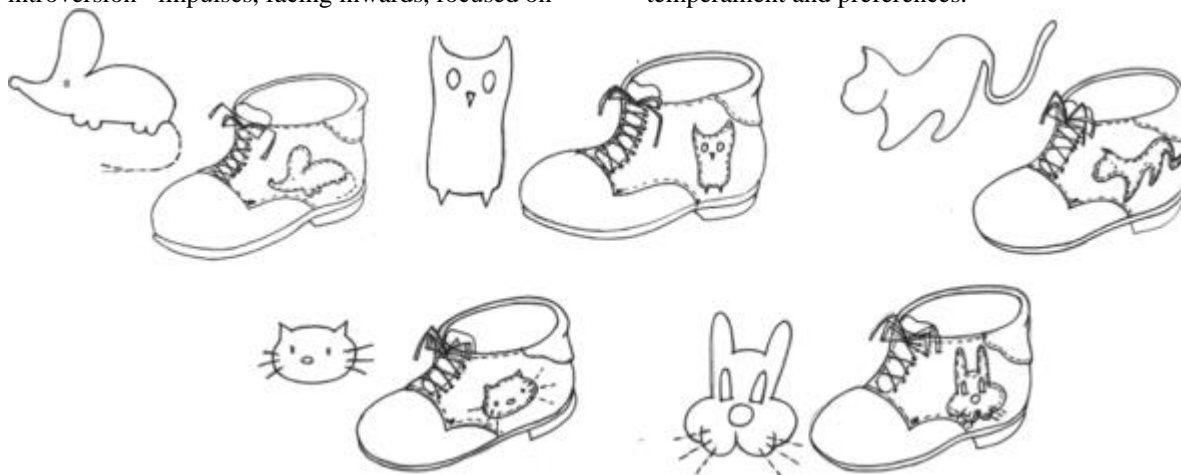


Fig. 1 Forms applications in children's shoes

For example, a "mouse" gray or white can be on any background - red, blue, green. The color of the soft edge can either repeat the background color, and have applications in tone depending on the desired effect. "Owlet" can be darker or lighter background tibia, or contrast. Applications "Kitten", "bunny" is better made of a material in a contrasting color, as children are very fond of these characters, and "Cat" will look spectacular from the material a little darker than the main. Decoration items shoe upper using such applications will allow the child to form positive emotions in the treatment, accelerate the process of adaptation of the small person in society.

Questions psychological assistance to children with cerebral palsy disease covered far enough. Practical application of various psycho-techniques aimed at patients, often used by psychologists and teachers without regard to forms of the disease, the level of development of intellectual processes and features of emotional and volitional. The lack of

clearly developed differentiated methods of psychological correction of children with cerebral palsy may have a negative impact on patient quality of mental development.

The problem of the development of children with cerebral palsy, devoted a considerable amount of work [126-133]. The process of perception and color reproduction children studied by many psychologists, art historians and educators. Special psychological studies of the development of sensory-perceptual and intellectual processes with cerebral palsy in the foreign and domestic literature presented is extremely insufficient. Several authors [134-136] linked disorders cognitive processes in cerebral palsy with impaired motor skills, underlining that breaches perception of objects, visual-spatial orientation with cerebral palsy due to motor failure. The mechanism of specific abnormalities in mental development is complex and determined by the time, and the degree of localization of brain lesions.

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Currently, the special psychology and correctional pedagogy, there are different classifications of disorders in development. The most common is the classification of BP Puzanov and VA Lapshina [137] (APPENDIX I), wherein the isolated group mentally retarded children and those with mental retardation separately from children with musculoskeletal disorders. But, in the framework of work on the creation of products with high rehabilitative effect, should be considered a violation of the musculoskeletal system in conjunction with mental retardation. Among the factors influencing the psychological development of children with cerebral palsy Disease allocated organic CNS and limited movement and self-self, which occurs due to a mismatch between the formation of a satisfactory overall level of abstract logical thinking and deficiency of spatial representations. Deviations of development can also be attributed to lack of practice, socio-cultural experience and an inability to communicate with others.

In all forms of cerebral palsy are taking place deep delay and disruption of the kinesthetic analyzer (tactile and muscle-joint senses). Children find it difficult to determine the position and direction of movement of the fingers without visual control. Gropping hand movements are often very weak, touch and recognition of objects on a touch difficult. Perceptual disorders in patients of children associated with the lack of kinesthetic, visual and auditory perception, as well as their joint activities. Because the perception of movement disorders also broken. Due to the difficulties of movement there are difficulties in the knowledge of the world. These children are vulnerable, impressionable, have emotional and behavioral and personality disorders. There is a strong attachment to parents or persons substituting them.

For the majority of children with cerebral palsy is characterized by mental retardation of the type of mental infantilism. At an early age, such children's activities are governed primarily an emotion of pleasure, self-centered, they are not able to work productively in a team, to relate their desires with those of others. At older ages, immaturity of the emotional and volitional can manifest itself in high suggestibility, inability to willpower over itself. This behavior is often accompanied by emotional instability, fatigue, motor disinhibition.

Thus, when considering the issues of psychological support for children with cerebral palsy to a large extent we have to pay attention to the quality of psychological diagnosis, considering the psychological support as a complex system of rehabilitation actions aimed at increasing social activity, the development of autonomy, strengthening the social position of the person, the development of intelligent processes.

Influence on mental state can be performed in various ways and methods. In the shoes of the most

significant influence is the color scheme of the product. Implementation of color solutions product associated with the analysis of the sequence of layers: color preferences and emotional impact of color. Color - qualitative subjective characteristic of electromagnetic radiation in the optical range, which is determined based on the physiological visual sensation arising and depends on a number of physiological and psychological factors. Human perception of color is determined by the individual, as well as the spectral composition, color and luminance contrast to the surrounding light sources and nonluminous objects. Thus, the color - it's a feeling that gets people in contact with him in the eyes of the light rays. The same light exposure can trigger different feelings in different people.

Studying the effect of color on the central nervous system involved many psychologists. Based on the recommendations of experts made painting walls, furniture, etc. in many institutions. According to psychologists [138, 139], color therapy is especially important for children with mental and physical development.

There are various diagnostic tests and for the study of color perception by preschool children, including "The study of color perception" Uruntaevoy GA, Afonkin YA.; "Survey Map of color children" Voylokovoy EF Andrukhovich YV, Kovalyova L.YU; "The color relations test" developed by M. Luscher [140-142].The studies found [143] that up to 2.5-3 years the child perceives only achromatic colors (black and white). From three to four it begins to perceive the color of the first chromatic axis - blue and yellow after four - recognizes the second chromatic color axis - red and green. Fully mastered all the colors of children to six years. It is noteworthy that the love of flowers, most children is replaced by exactly the chromatic circle. For thirty years the person usually does not define one of the colors as the preferred, and all the basic colors are perceived equally.

Selective chromotherapy - medical and pharmaceutical effects of monochromatic visible light. Visible light selectively affects subcortical nerve centers (midbrain, midbrain roof, rostral mounds). Visible light of different wavelengths can alter brain excitability, corrected the psycho-emotional state and improve the tone of the body.

During the absorption of the visible radiation in the skin is released heat which modifies spike activity thermo mechanosensitive leather fibers activates segmental reflector and local reactions microvasculature and enhances the metabolism of irradiated tissues.

Thus, when designing footwear to be considered, as will be perceived by a child of a given age and disease developed form design and, accordingly, it will affect his emotional state and psychophysiological development. In this case, shoes should promote the development of children's

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thinking, perception and harmony with the internal and the world around them. Thus, the development of the design of shoes for children with cerebral palsy disease must be considered not only a fashion trend, but also the nature of the disease, and mental state of the patient, controlling and regulating so emotional background rebenka. Razrabotka design of light industry products for patients with cerebral palsy disease should be carried out according with the temperament of children to compensate for the

deviation of a group of diseases. Following this, you can create a shoe that meets the visual component of therapeutic and prophylactic properties of the product. After studying the sources, dedicated to color and color therapy, we have compiled a table 1, which reflects the basic colors, their effects on the body and psyche of the child, as well as color to compensate for the negative effects of an overabundance of any color in the product.

Table 1 - Characteristics of the impact of color on the body and the psyche of the child

Color	medicinal properties		Excess	Compensation
	physical	psychological		
1	2	3	4	5
Red	It encourages all forms of energy. It helps to gather physical forces. Quickens the heartbeat. Stimulates brain activity. In brief exposure increases efficiency. improves appetite	It helps to concentrate, inspires confidence. May cause joy or aggression	causes stimulus-ness overexcited-set, fatigue, decreased attention	green
Yellow	It stimulates the brain, in the case of mental deficiency. It stimulates the mind to focus, harmony and obedience. improves appetite	uplifting, it gives confidence, energizes. Increases sociable-ness	It causes mental fatigue, headache	purple
Green	It promotes healing in medical institutions. It reduces pain. It calms the nervous system. Reduces irritability. It reduces high blood pressure, relieves migraines and neuralgia. Prolonged interaction causes a steady rise efficiency	soothing. It reduces stress. Encourages interest in the knowledge of the world and learning raises self-esteem and self-confidence. It gives courage, peaceful, meditative	causes boredom	red
Orange	It accelerates the heart rate. It improves appetite. In brief exposure increases efficiency	uplifting. It stimulates creative thinking. It creates a sense of well-being and fun, liberating feelings	It causes distraction	blue
Turquoise	stimulates the immune system, promotes relaxation of muscles	It strengthens the feeling of peace	It is stubborn and peremptory	pink

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Purple	improves physical abilities, it helps relieve headaches. A positive effect on the heart, blood vessels and lungs. Increases endurance. Reduces physical activity and performance.	Enhances intuition and empathy. It causes harmony and peace.	It causes a feeling of fear, oppression and anxiety.	yellow
Blue	lowers blood pressure, improves sleep, relieves joint pain. It is effective for neuralgic pains. It reduces appetite. Dramatically reduces the activity and emotional stress. It reduces the activity of life processes, normalizes breathing pulse	It helps in understanding new things. It induces a state of contemplation and meditation. Awakens the imagination.	dark blue cause depression, depression and self-doubt. Contributes to fatigue and depression	yellow
Pink	pale pink neutral. Bright pink is the excitement	It inspires confidence in stressful situations. promotes responsiveness	hot pink causes fatigue	turquoise
Blue	Relieves stress and headaches. Lowers blood pressure. Soothing. Slightly reduces the activity. Relaxes. It reduces the excitement and tension neutralizes	relieves anxiety, depression, feelings.	It evokes a feeling of alienation and cold	pink
Brown	It evokes a feeling of warmth	It evokes a feeling of stability and confidence		
Lime	cause dizziness, nausea	tones of the child and allows to reach new heights in creativity		

These colors like brown, black, white and all shades of gray are neutral for the children and in most cases do not cause any emotions and reactions.

We conducted a study to identify the color preferences of children with cerebral palsy disease.

To do this, profiles have been developed, which questions:

- adequate to the age and degree of severity of the illness of the child;
- do not depend on the level of education of parents;
- short and clear, do not need additional explanations to children with speech impairment or developmental delay;
- It combines ease of use and informative.

For the experiment were chosen the colors red, orange, yellow, green, blue, indigo, violet, lime, turquoise, fuchsia and brown, like the color in the theory is not perceived by the children, but it is often

used in children's shoes; neutral colors: white, gray, black.

In such combinations as selected combinations of colors: RED-orange; red and yellow; red and green; red and blue; Red and blue; red and purple; orange, and yellow; orange and green; orange and blue, orange and blue; orange and purple, yellow and green, blue and yellow, yellow and blue, yellow and purple, green and blue, green, and blue, green, purple, blue and blue, blue and purple, blue and purple.

The important is to determine the color tone preference. The seven survey questions are 3 variants of color lightness.

The questionnaire had to specify the sex, age and shape of the child's illness.

Introductory text profiles contained description of the subject and its purpose. Form questionnaire is given in Appendix C. The study was conducted on color preferences Novosibirsk branch of the Federal State Unitary Enterprise "Moscow Orthopedic

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Enterprise" of the Ministry of Labor and Social Protection of the Russian Federation at the time of acceptance of an order for the manufacture of orthopedic shoes, as well as in Oyashinskoy orphanage for mentally retarded children; average boarding school № 152 (Novosibirsk); secondary schools "Perspective", dedicated to the training and education of children with disabilities. In addition, questionnaires were posted on the website [146]. Thus, in the experiment, the children took part, growing both in families and in boarding domah-

In determining the age group classification used AM Gazaliyev [101] in accordance with which the groups of: 4-7 years old, 8-14 years and 15-17 years.

To determine the population must take into account the psychological state of patients developing.

To identify the number of respondents with considerable delays of mental development, it is necessary to review the classification [42] (Annex A), in which data are available regarding the safety of intelligence in children with cerebral palsy. Thus for a study with a confidence level of 95% and 5% confidence interval required sample size for ages 4-7 years was 54 human 8-14 - 81 persons, aged 15-17 years - 55 people. For ease of processing the survey results were recorded in the form of service www.surveymonkey.com [146] which automatically performs data processing on the selected criteria.

The results of the study to detect monochrome color preferences - the first question of the questionnaire for children aged 4 to 7 years are represented as color preferences diagram (Figure 2).

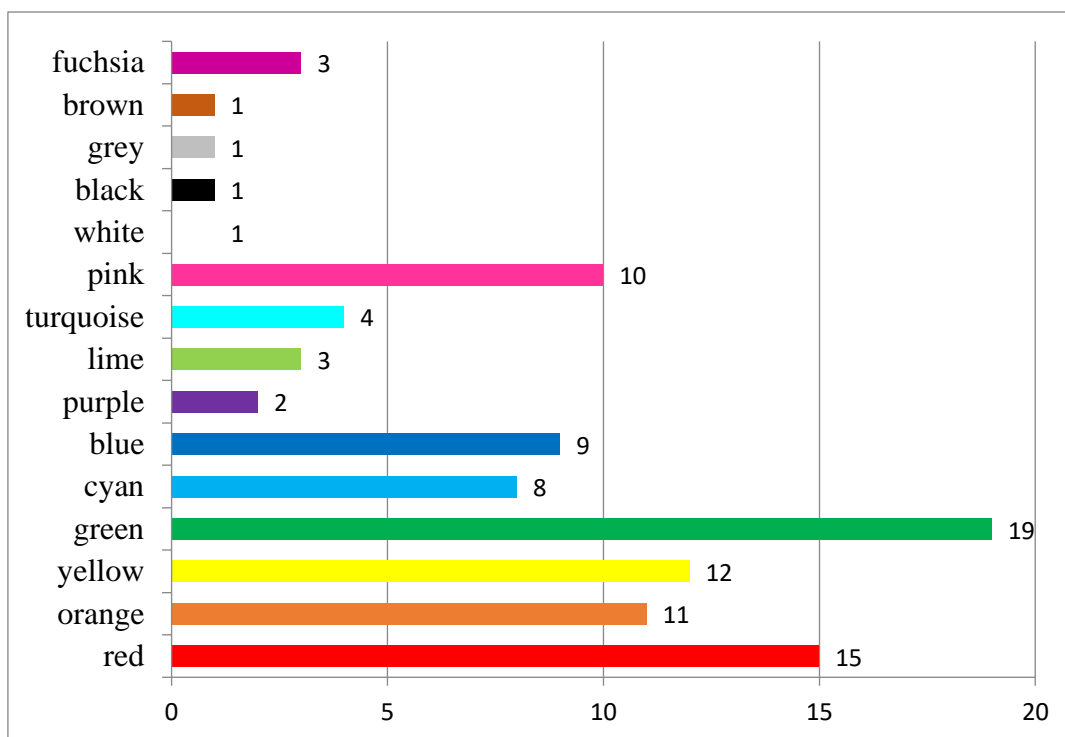


Fig. 2 - Distribution of color preferences of children aged 4 to 7 years

As can be seen from the chart, most of the children in that age group give preference to blue, blue, green, yellow, orange and red colors. Virtually chosen achromatic color, and brown, which as mentioned above is not perceived by the children and

gives them emotion. Popular pink and fuchsia, but it gave preference mostly girls, as can be seen from the diagram color preferences of children aged 4 to 7 years with regard to gender (see Figure 3).

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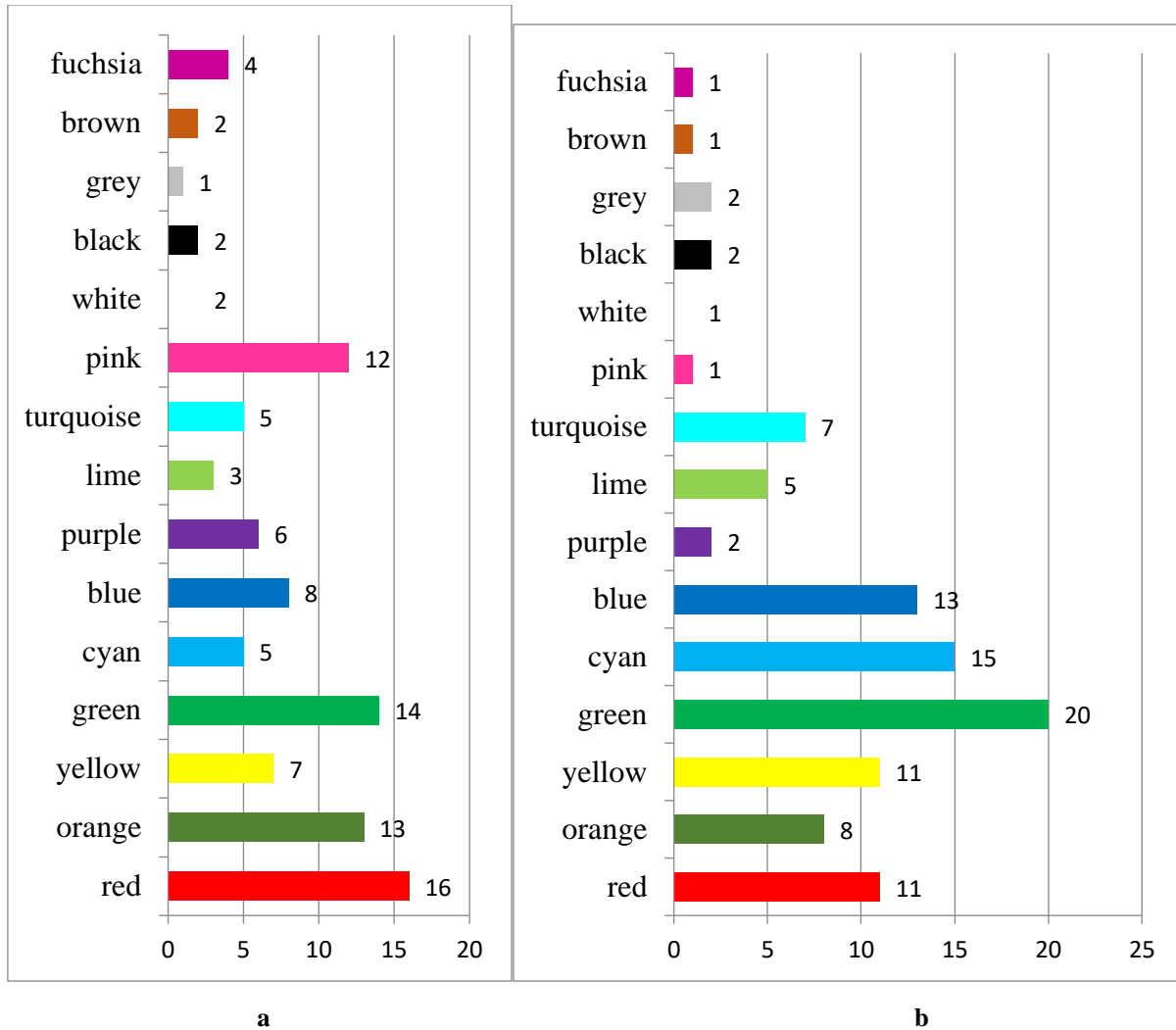


Fig. 3 - Distribution of color preferences of children aged 4 to 7 years with regard to sexual characteristics a) girls, b) boys

Analysis of color preference in the group of children aged 8-14 years (Fig. 4) shows that in a number of colors such as red, green and orange

downward trend in preferences. There is increasing interest in such colors as blue, white, gray.

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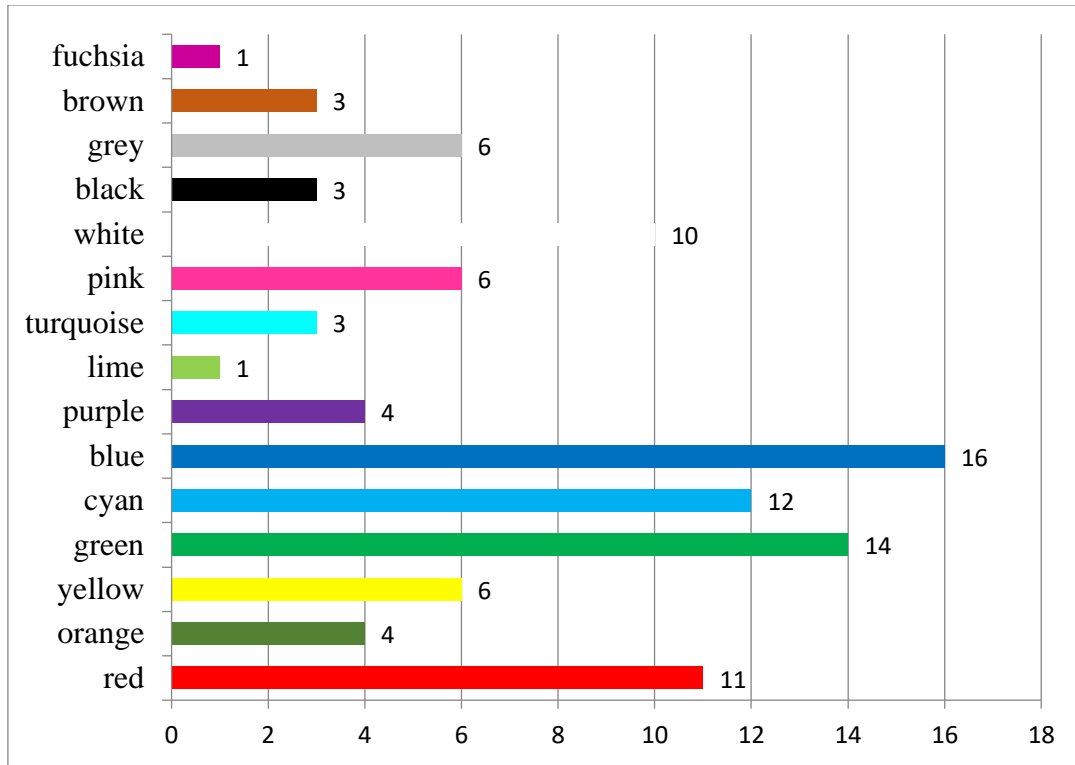


Fig. 4 Distribution of color preferences of children aged 8-14 years

The distribution of color preferences of children aged 15-17 years, presented in Figure 5, is very different from the previous ones.

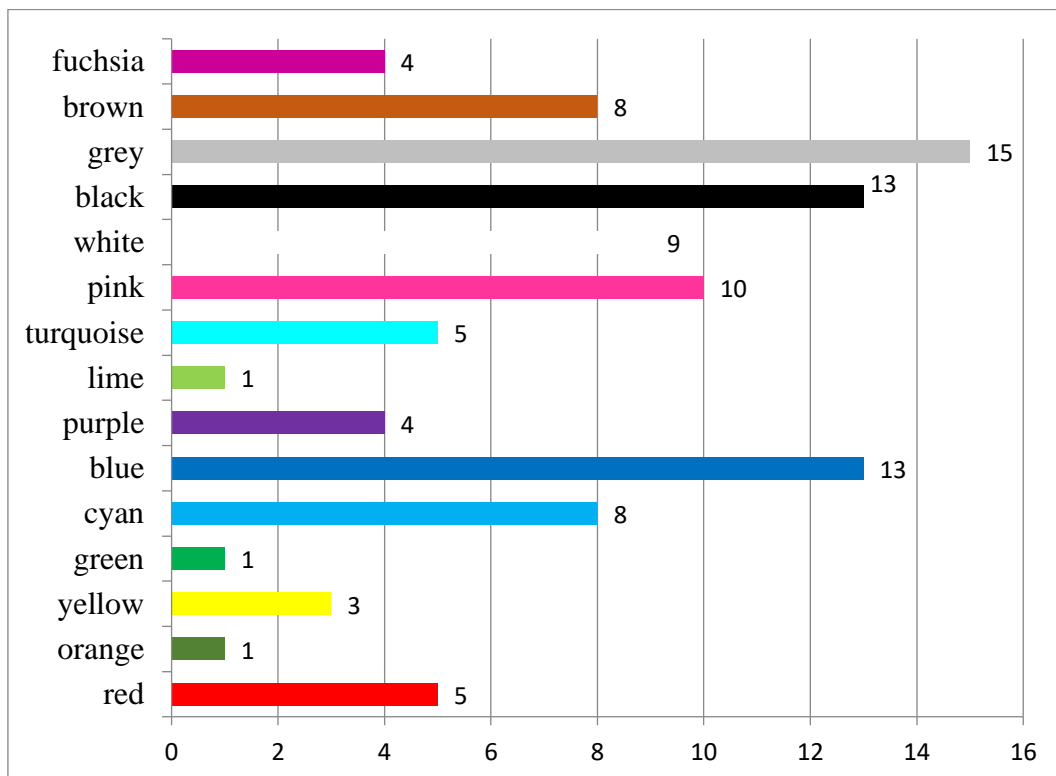


Fig. 5 - Distribution of color preference children 15-17 years

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Leading become achromatic color (white 9%, Black 13%, gray 15%), and 8% of the total number prefer brown. This may be due as a person growing up and adapting to the school dress code and general fashion trends.

A large percentage occupied by blue and pink color, but the distribution of the latter is clearly expressed by gender (9.75% girls, boys 0.25). The blue color is distributed at a ratio of 8% boys, 6% - girls.

Figure 6 shows the general diagram of monochromatic color change preferences by age groups.

From the chart it is clear that the most dramatic changes with age are subject to preferences such as the colors, green, red - to the downside; gray, white and black - in the direction of growth.

Thus there is a lack of interest (less than 8%) such as a lime color, purple, turquoise.

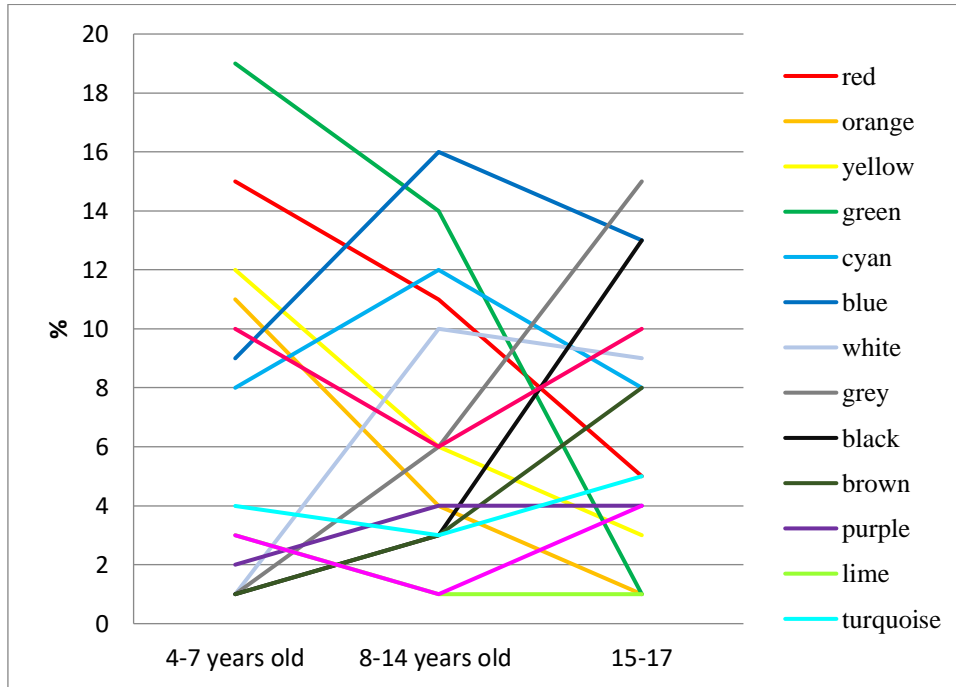


Fig. 6 - a diagram of the total monochromatic color preferences

Often shoe designs used a combination of different colors. A study to identify color combinations showed that children ages 4-7 and 15-17 do not allocate a specific combination of 2 colors. Diagrams distribution preferences color combinations shown in Figure 8 demonstrate that the percentage varies from 1 to 7. This proves unreasonableness isolation leading combination.

When analyzing the preferences of color combinations in children aged 8 to 14 years there is a tendency to the isolation of five color combinations, which accounted for 44% of the total (Figure 7).

The most popular color combinations for this age group are: blue with blue (11%) yellow blue (10%), red with green (10%), red purple (8%), and green and blue (7%).

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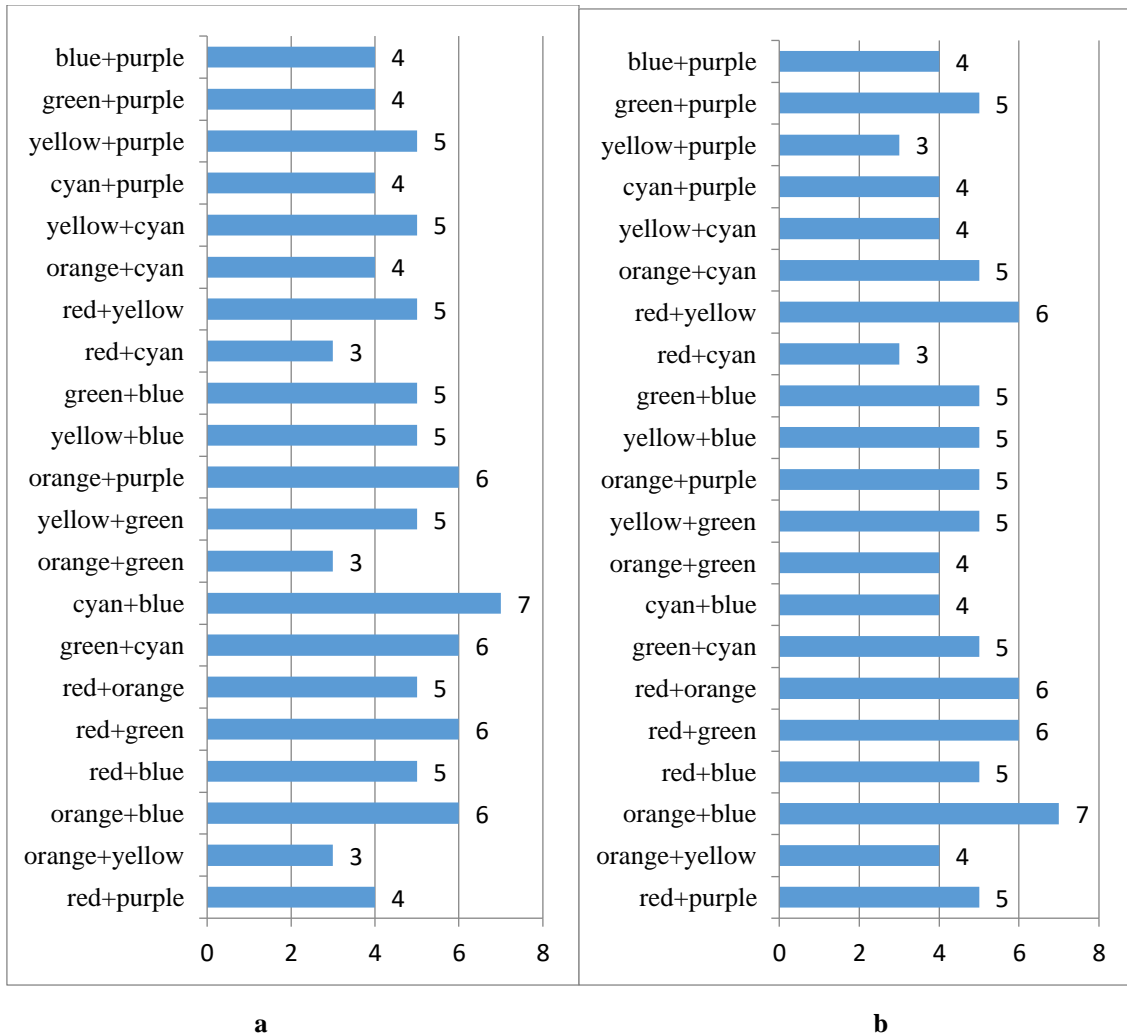


Figure 7 - Diagrams distribution preference of color combinations for children: a) 4-7 years b) 15-17 years

Another important indicator is the determination of the color tone preference. The questionnaire was given at 3-tone version of each of the primary colors. In the age group of 4-7 years (Figure 8) for all colors

darker tone it has the lowest percentage of preferences (from 4% to 11%). Light tone prevails on all colors except red (from 31% to 74%).

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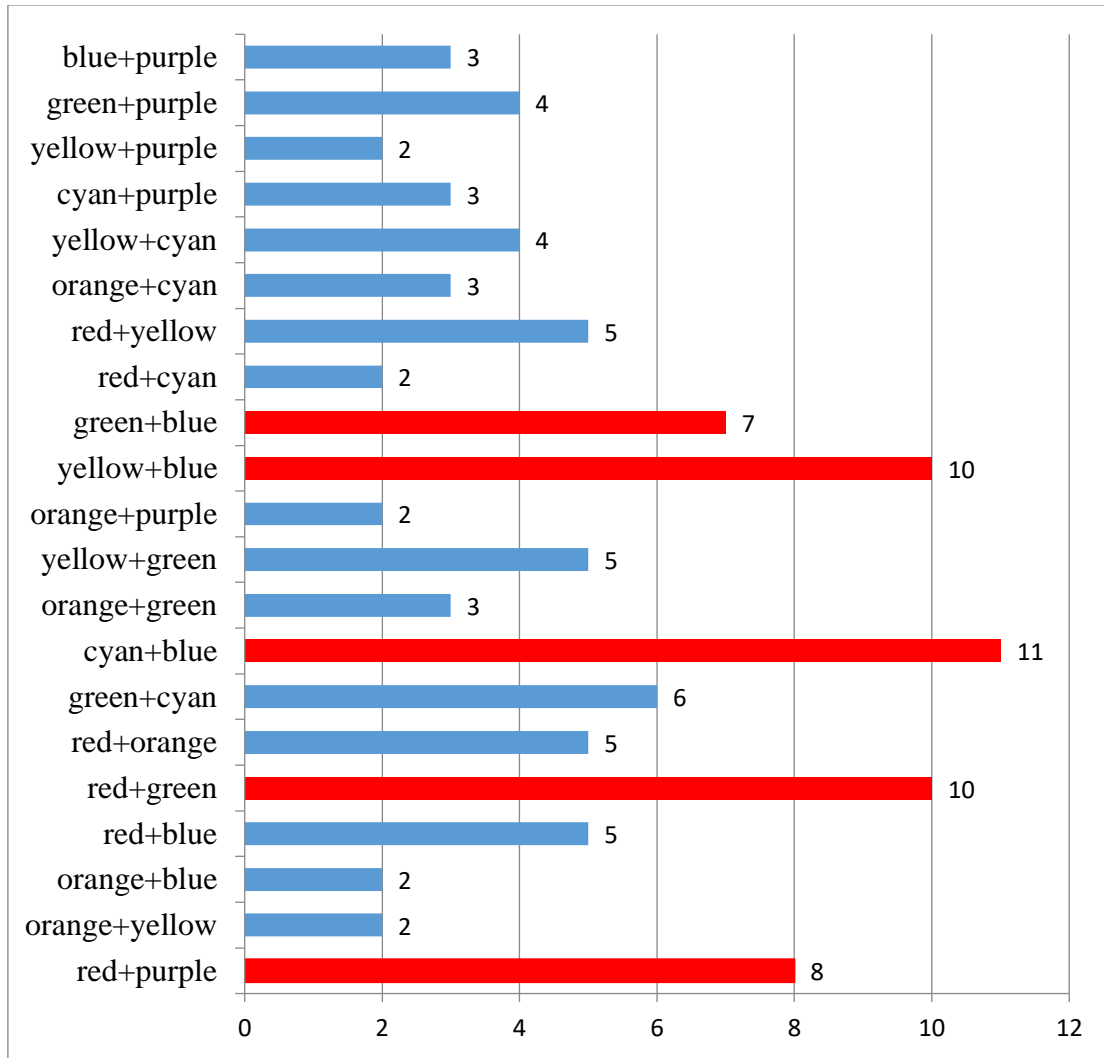


Fig. 8- preferences color combinations diagram for children 8-14 years

The distribution of color tones preferences for age 4-7 years is shown in Figure 9.

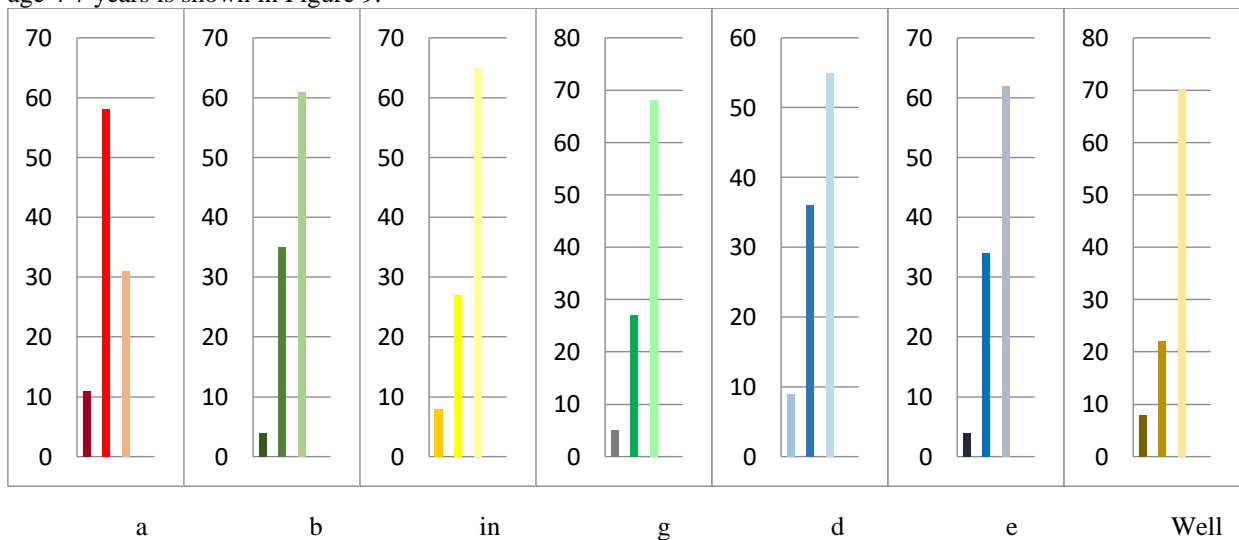


Figure 9 - Distribution hue preferences for children 4-7 years: and - red; b - orange; in - yellow; -Green g; d - blue; e-blue; Well - purple

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For the age group 8-14 years, the distribution of color preferences is shown in Figure 10.

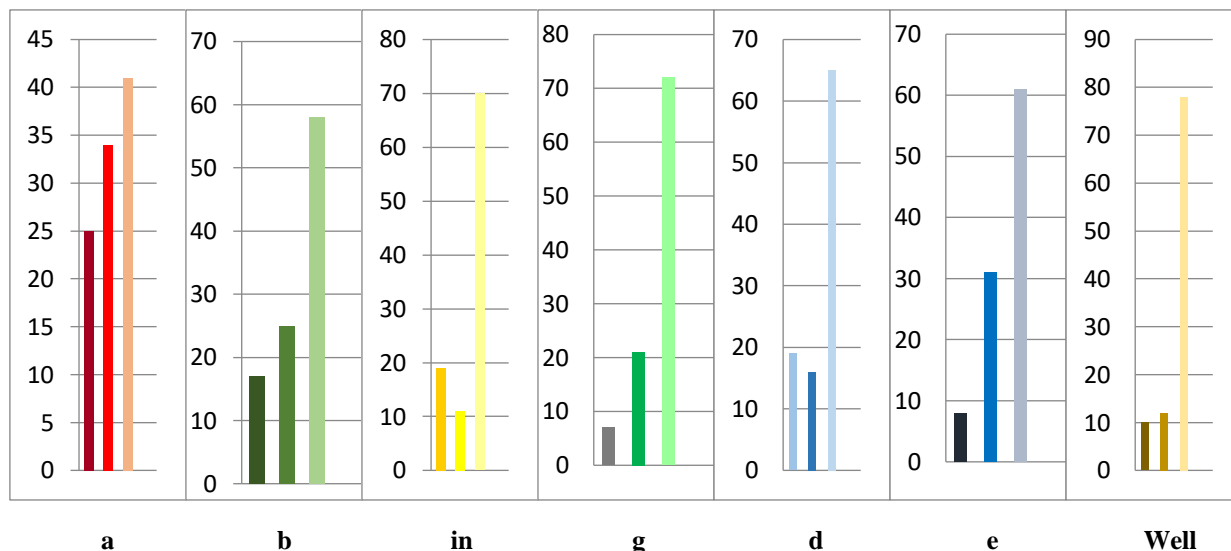


Fig. 10 - Distribution hue preferences for children 8-14 years: and red; b - orange; in-yellow; g-green; d-blue; e blue; Well-violet

Preference is given to children of light tones. Tendency to the predominance of dark tones preferences, primarily red and orange.

In the age group 15-17 years there is a tendency to abandon the original colors and the high prevalence of dark and light tones.

Distribution hue preferences for this group of children is shown in Figure 11.

The most significant predominance of dark colors seen in blue and red colors. The predominance of dark blue leads not only boys, but also to a large extent in girls. It has been a significant increase in the preferences of light-colored orange and yellow flowers. This fact may be related to the influence of the school dress code and social environment of the child.

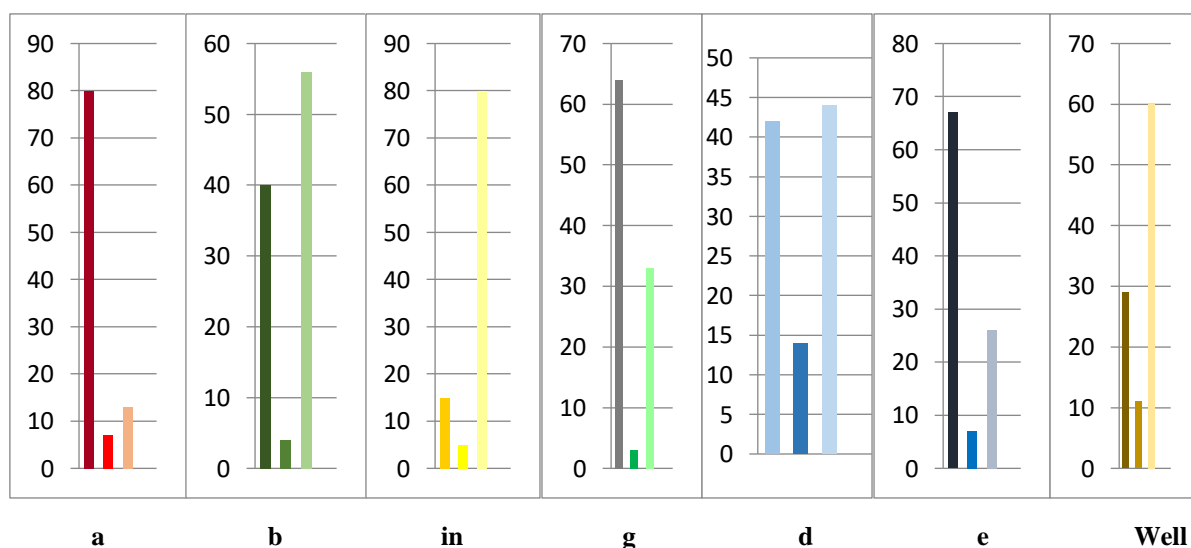


Figure 11 - Distribution of hue preferences for children 15-17 years old: and - red; b - orange; in - yellow; g - green; d - blue; e - blue; Well - purple

For all groups of children we have compiled a summary table 2 of preferences hue, where a light gray noted the predominance of light-colored, gray - the

original colors and black - dark. A few cells indicated two tones, is associated with a small difference (of up to 7%) in the results of studies on the element.

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Table 2 - Summary of the hue by preference

color \	red	Orange	yellow	green	blue	blue	purple
3-7 years	dark	light	light	light	light	light	light
7-13 years	dark	light	light	light	light	light	light
13-18 years	dark	light	light	dark	light	dark	light

Based on the results, we can conclude that in the preferences of children with cerebral palsy disease is dominated by bright shades of all colors. Interest in dark shades is shown only to 15 years.

The data obtained together with the color characteristics of psychoactive effects should be used in the preparation of color products making.

For small shoe production, it is often difficult to produce a customized model Mass shoes in different color combinations, so there is a need in the selection of a universal palette as by sex and age, and with respect to fashion trends, and rehabilitative effect.

In this study, for the first time developed a classification of footwear on the criterion of

'Rehabilitation color effect ', which is shown in Figure 12.

The proposed classification highlighted three areas of orthopedic footwear: the ultra-a customized, mass and a customized in the style of "unisex". In the shoes of the latter category of patients is necessary to abandon the flowers with a strong affiliation to any - or the floor, as well as flowers, causing a strong impact on the body and psyche of the child. In the design must take into account the range of the selected size range, and on this basis to determine the size of patches of color in the product.

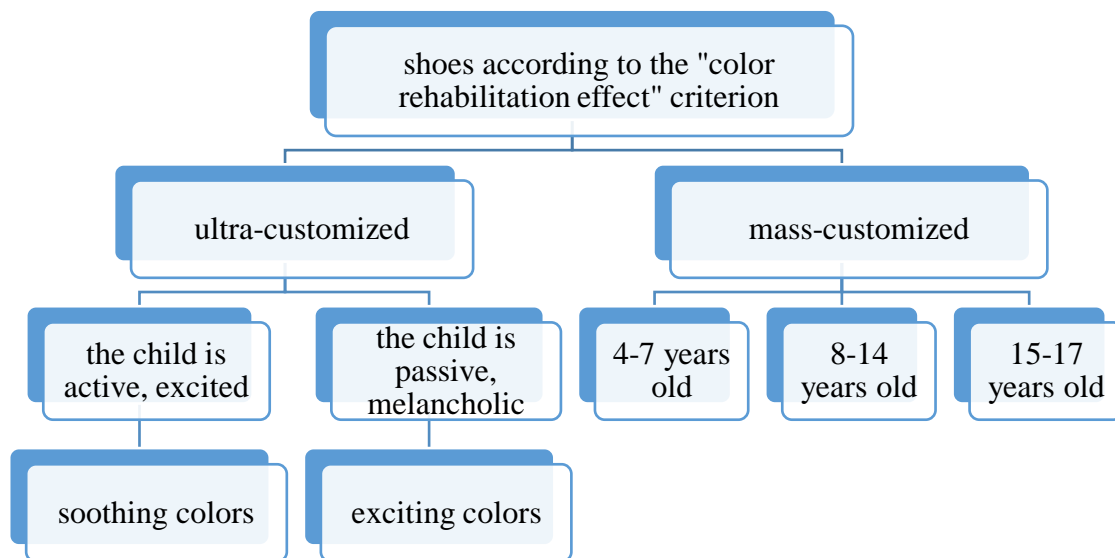


Figure 12 - Classification of footwear on the criterion of 'Rehabilitation color effect '

After studying and analyzing the impact of color on a child with cerebral palsy disease in combination with color preference, we have drawn up recommendations colors mass a customized shoes:

Age 4-7 years:

- red color;
- light shades of green;
- light shades of blue;

- light shades of blue;
- orange colors.

In this age group, it is recommended to use as starting combination with light colors and combination of colors of two initial colors which are in nyuansovom regard. Shades of red can be used with achromatic colors and light tones.

Age 8-14 years:

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- lighter shade of blue;
- lighter shade of blue;
- lighter shade of green;
- darker shade of red;
- darker shade of orange.

In this age group, it is recommended to use light shades of these colors, their combination with achromatic colors like light and dark tones. The decoration can use contrasting colors like dark and light tones.

Age 15-17 years:

- achromatic color;
- darker shade of blue;
- lighter shade of blue;
- Brown color;
- bright colors of orange, yellow, blue;
- dark shades of red, blue, purple.

In this age group it is recommended to use a combination of 2 light or 2 dark tones of different colors; combination of light and dark tones of the same color or achromatic colors.

Examples of models of footwear, made in different colors, shown in Figure 13

In the ultra-a customized footwear is recommended colors, neutralizing one or another mental disorder child. Conventionally rehabilitative effects can be divided into two groups: the color of soothing and stimulating colors. The classification scheme as presented in Figure 14.

In the manufacture of orthopedic shoes, most models undergo significant changes depending on the size, fullness, or the height of shoes. Proportionality parts of footwear in different sizes can be significantly different. As an example, Figure 17 is a drawing 3 sizes (19, 26 and 33) models summer shoes.



Fig. 13 - Examples of models colors mass a customized shoes for children 15-17 years old with the disease cerebral palsy

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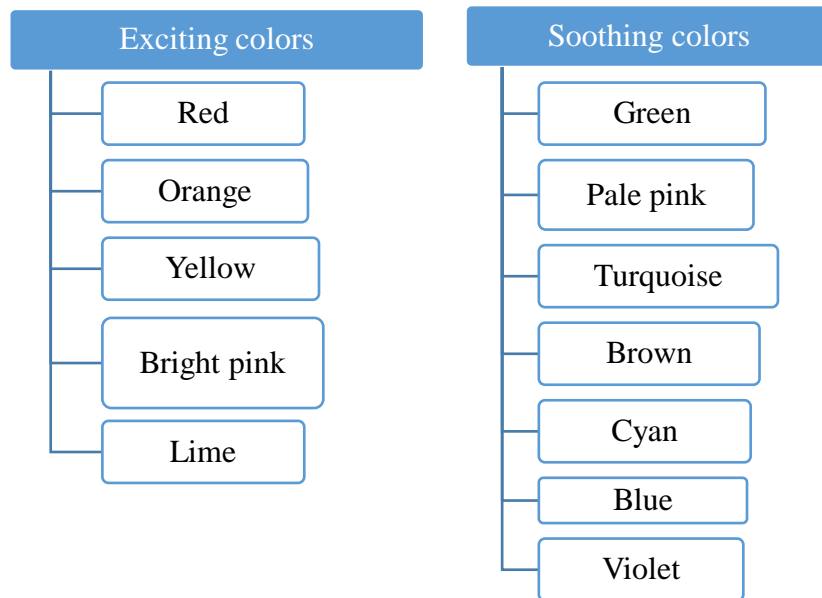


Fig. 14 color classification on the effects on the child's psyche

As seen in Figure 15 the design proportion in 3 different sizes. It should also influence the choice of colors and models of fittings. Therefore, the selection of color solutions need to focus both on the age of the

patient and on the size of the foot, given the combination of a color scheme with the specific design of orthopedic footwear.

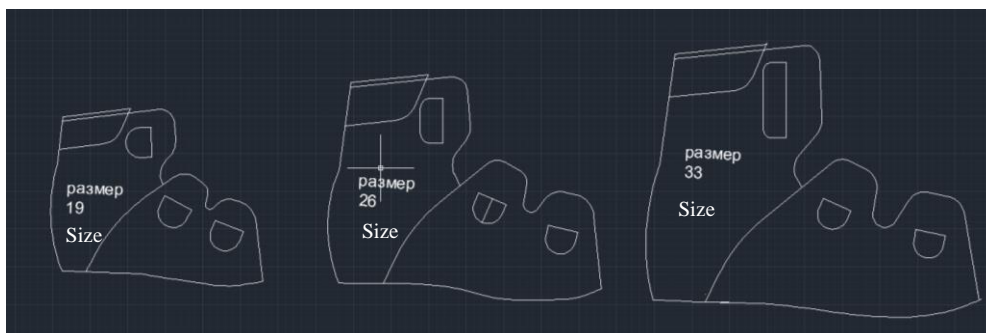


Figure 15 - The drawings of summer shoes three sizes

A combination of vibrant colors look better in the shoes of the track is not more than 165 mm in length. In the shoe with the greater length of the track recommended combination with achromatic, dark or light colors, or plain construction.

Technical Data Pediatric prophylactic shoes for flat-valgus deformity of the foot

Preventive shoes must pursue three main objectives:

- 1) to cause a targeted pressure on the bones of the foot, to determine its formation in the desired direction;
- 2) prevent progression of arch settling in the presence of the early ploskostpiya forms;

3) To enable the normal kinematics of the foot (Figure 16).

Marking a line in the form of color zones corresponding to the valid position of the boundary of the toes in the shoe allow you to monitor compliance with the size of the shoe size of the foot, which is especially important in the selection of shoes for young children who are not able to independently determine suits them this shoes or not, as well as periodically monitor compliance with the shoe size. Until a few years ago, orthopedic shoes prescribed by a doctor only in case of serious violations in the development of the foot in children and was little attractive in appearance - but now the situation is quite different. In the specialized salons and a beautiful range of quality orthopedic and prophylactic footwear

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is very diverse. Prophylactic anatomic models have longitudinal adjuster short, rigid heel and pyatochku, by which is achieved an even and correct load

distribution. The heel of the foot in anatomic shoe is fixed, and the child's leg is not "collapses".



Fig. 16 Preventive shoes for flat-valgus deformity of the foot

Due to distribute the load evenly across the foot of the child, children's preventive orthopedic footwear helps to properly form the leg of the child. Anatomical longitudinal arch support is suitable for all children, without exception, the size of the hard backdrop verified thoroughly, and can not prevent the further formation of the foot. Since the longitudinal arch of the foot in children is formed before the age of three, and the instep of shoes for children should not be too high-stop should form itself, naturally. Therefore, if there is no other special orthopedic indications - enough preventive orientation of shoes. For the proper formation of the foot to walk in such shoes needed as much as possible - not only outside but also at home. After three years of the child's foot is considered to be finally formed, and if there are no other, more serious problems, and violations can continue to wear prophylactic orthopedic shoes. Orthopedic corrective shoes. For valgus or varus deformity foot or flat foot must wear corrective orthopedic shoes. In the presence of the child diseases such as cerebral palsy and diabetes, medical orthopedic shoes should be worn necessarily. This is due to the general weakness and instability of joints with cerebral palsy and fragility of blood vessels in diabetes.

Orthopedic anatomical arch support. Shoes "Perseus" is made at special orthopedic pads anatomic profile which corresponds optimally shaped foot baby. This design allows pads to sew shoes with arch support insoles pledged, whose main task is the correct formation of the arch.

Tight fixation of the foot of the child and of sufficient height tibia in all models. When designing preventive orthopedic children's shoes a lot of attention is paid to every shoe firmly fixed stop child and held it in the correct position. Dense fixing foot achieved by high lacing or clasp "Velcro" with a large area.

Molded hard heel. The is made of thermoplastic material required density of children's shoes "Perseus" hard backdrop. Backdrop anatomically designed height and shape for each shoe size and has extended the inner wing. Paired with arch support heel provides the most effective support to the arch of the foot.

Roll soles. The sole is used in the production of children's shoes "Perseus," Hasroll in the forefoot with a certain angle that helps the child while walking properly set foot and did not stumble. Nosochno-beam portion of the shoe sole - flexible and rear - rigidly fixed gelenkom-instep made to the structure of shoes and disposed at a distance, calculated for each resolution. If the shoe sole bends in half, then these shoes can harm the child's foot, because Stop not anatomically designed for flexing between the beam and the heel (gelenochnoy parts).

Natural high-quality materials. In the production of footwear uses only natural high quality materials: leather and nubuck, allowing to carry out aeration of the foot. All materials and components are certified. The principle of action-2-sided hard Berecz fixes the ankle in a vertical position and holds the heel of the foot separated from valgus deviation due Kita tibia on the inside (Figure 17).

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Fig. 17 Standard design prophylactic shoes plane strephexopodia

- Individual display of the longitudinal arch on the instep of an elastic material, provides the necessary support to the arch without limiting spring foot function. The disadvantages of this design is the excessive stiffness in the ankle joint and feel uncomfortable with a child. Known removable insoles, which consists of soft elastic bottom layer, a flexible top layer, as well as of the studs, space fixed in the lower layer and on the surface of the insole groups at small distances from each other in the areas selected from the viewpoint reflex therapeutic massage, with this user various reflex zones of the foot sole are displayed on the surface of the insole marking lines. Removable insoles reflektorno- provides therapeutic foot massage.

The disadvantages of the prior art solutions are that removable insoles do not provide conditions for proper installation of the foot iprofilaktiki its static deformation makes it impossible to judge the size of the shoe according to the size of the foot. Removable insoles for children preventive footwear comprising an upper, intermediate and lower layers, the upper layer is made of leather, the intermediate layer of priformovyvayuschegosya in socks foamed thermoplastic material, and the lower frame layer of dense thermoplastic material, the intermediate layer is formed with a recess in the heel portion under the tubercle of the calcaneus sectional 0.18 D and computation with uniform internal and external arches in gelenochnoy portion with the highest point in calcaneocuboid ochleneniya sectional 0.36 D, and the top layer of the insole in the forefoot portion applied dimensional scale markings and a line color zones corresponding to the permissible boundaries position the toes in the shoe and allowing the process of fitting when installed on the foot taken out of the shoe insole judged gimp insole according to length and, accordingly, the length of the shoe size of the foot to the construction requirements Development of preventive shoes based on the basis of anthropometric and biomechanical studies.

When designing preventive elements of the shoe must be made taking into account the complex spatial form of the longitudinal arch of the foot and its sections. The complex shape of the arch is not taken into account before the design of supplementary devices, supports the arch. Meanwhile, only the maximum under the arch profile may provide the minimum partial pressure of the liner on the foot and painless wearing it. Existing liners, such as liner TSNIIP, which has a triangular shape, these requirements does not meet. Hence the problem in the design of removable insoles are reduced to create inserts with profiles typical for a specific age and gender group. Comparing the profile radiographs stop with their fingerprints and konturogrammami profile obtained on a special device, we found that the maximum height of the longitudinal arch on the inner edge corresponds to the middle of the navicular bone and is in section 0.40 of the foot length. The maximum height of the arch of the foot corresponds to the edge lateralnomu calcaneocuboid articulation. Thus, the highest part of the arch extends Shoparovskogo joint line. Normally, corrective insoles are mounted so that their maximum height corresponds to that level. However, it is necessary to shift the insole top few back to the cross section length of 0.38 foot. With this arrangement, the insole will be at its peak of a triangular space formed calcaneal-scapoid ligament, over which the head of the talus is located. It is on this site, not at the top of the arch. Rational shoes, ie corresponding anatomical and physiological characteristics of the foot, it ensures its normal operation, prevents deformation and diseases, the development of flatfoot, abrasions, calluses or the like Tight shoes as too loose, harmful, and may even be the cause of some diseases of feet. Short and narrow shoes restricts the movement of the joints, is almost completely eliminates the mobility of the fingers, leading to their curvature, ingrown nails, and also violates the sweat and blood circulation. Therefore feet in tight shoes quickly freeze and cold feet - a

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common cause of colds, inflammation of the kidneys and bladder. Too wide and free shoes leads to displacement of the foot during the motion, causing possible subluxation of the ankle, disturbed gait.

In order to pick up the shoes, you must correctly identify the size of the foot. It will be appreciated that the size of the foot under load is increased, both in length and in width. Flatfoot - the disease is extremely common, we can say social. To verify this, just to talk with relatives and friends: "every step" heard complaints of pain in the feet, the muscles of the lower leg in the knee, and even hip. The most common cause of pain - the flattening of the feet. A significant prevalence of foot deformities, flatfoot often static, reduces disabled people. Prevention and treatment of foot deformities associated with flat feet, are of great public value. To prevent the occurrence of foot deformities should wear shoes rational design, to comply with the labor regime, rational working and living conditions, to exercise and massage, use a corrective device. For flat feet, bending of the thumb, fingers hammertoes and other strains used corrective devices. Their purpose - to protect the feet and toes of the progression of deformities, relieve muscles and ligaments overload (by mechanical, passive support for the longitudinal and transverse arches) go to protect the painful areas stop when deformed fingers, calluses, corns, constant abrasions. Correction appliances are simple, can easily be produced in large quantities and individually. They are in addition to normal shoes. One type of corrective devices for flat feet are insoles.

Their task - to bring the heel of the position of pronation and support the arches of the foot during muscle fatigue. Given that muscle failure occurs only when the muscles are tired transferred, arch supports should be located below the highest point of the arch, so that only the period of fatigue vaults rested on him. Arch support can relieve pain and prevent the development of deformation. By appointment insoles divided into insoles for maintaining the longitudinal arch, maintaining the longitudinal and transverse arches, maintaining the transverse arch. Depending on the materials used insoles can be divided into hard - leather with a metal plate, elastic - leather insole and

various calculations in podsvodovoy portion (leather and cork) of plastic or rubber. If gelenochnoy of the shoes can not withstand the load of the foot and flex, rigid insoles are used - a metal plate is not deformed and firmly holds the arches of the foot. However, use of these arch supports leads to restriction of the function of the foot muscles, appearance Stiff gait. Central Institute of Traumatology and Orthopedics named Priorov designed elastic insoles of plastic. They can not bind the skin, as they do not cause sweating. Arch supports in the form of small preventive liners are used for the maintenance of the longitudinal arch. Inserts are inserted into the insole pocket. Arch supports for the longitudinal and transverse arches, in addition to lifting the longitudinal arch support transversal arch. When transverse flat leather insoles can be used with the bulge of soft cellular plastic to maintain the transverse arch. When transverse flat and considerable spreading feet sometimes it is necessary not only to support a cross vault, but also to pull the stack in the middle. In such cases it is recommended to use a cuff of the binding rubber or rubber tape with stitched to maintain the transverse arch gaskets.

In the event of the thumb between it and the second finger is inserted into the coil-shaped gasket, which deflects the thumb inside. To increase the deflection of the thumb into the opening gasket lay sponge rubber, porous plastics, wool. A feature of the base module orthopedic insole disclosed in providing a positive effect of its use is the ability to stack priformovyvaniya topography due to the presence of elastic prostilki 2-4 mm thick. prostilki material - foam, the apparent density of which is related to the thickness and inversely proportional selected from the range 90 - 45 kg / m³. Prostilka located under the skin of the backing coating. Under the influence of pressure accented corns bone protrusions or recesses formed in prostilke, increasing the contact area and the insole plantar surface of the foot. This reduces the pressure on the brake painful areas.

Range characteristic of winter, autumn, spring and summer of orthopedic shoes for girls and boys are presented in Figures 18 - 26.

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Fig. EXAMPLE 18 correct children's shoes



Fig. 19 Orthopedic summer footwear for children (sandals for girls)



Fig. 20 Features orthopedic shoes for children

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Fig. 21 Orthopedic summer footwear for children (for boys sandals)

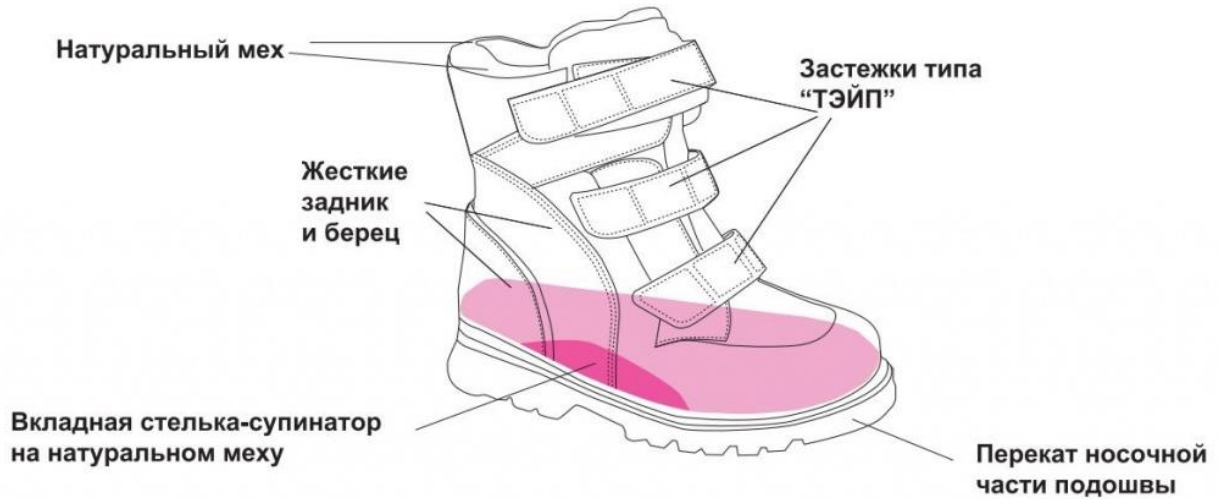


Fig. 22 Orthopedic winter boots for children (boys and girls)



Figure 23 The range of orthopedic shoes for children

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Fig. 24 year old range of orthopedic shoes for children



Fig. 25 year old range of orthopedic shoes for children

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Fig. 26 The range of orthopedic shoes for girls and boys

range analysis orthopedic shoe for patients with cerebral palsy

Range of children's orthopedic footwear is wide, requiring its classification and identification of the basic models. To solve this problem we analyze the designs of shoes manufactured by enterprises of Russia specializing in the manufacture of orthopedic shoes. Thus, the construction of the "envelope" is made orthopedic enterprise Barnaul, Tomsk, Novokuznetsk, Ulan-Ude, Chita, Kirov and Lipetsk, Kaliningrad, Rostov, Syktyvkar. Table 3 shows the

photographs of models with insulated footwear, made from industrial business directory. For clarity, the structure transformed into a technical drawing in the description of their structural elements. Table 3 - Constructions shoes with their configuration bertsami illustration products Technical drawing Structurally decorative elements 1 2 3 laced boots with soft edges. As a decorative use decorative stitches

Table 3 - Constructions shoes with their configuration bertsami

illustration products	technical drawing	Structural and decorative elements
1 	2 	3 Lace boots with soft edging. As a decorative use decorative stitches
		Shoes with laces. As used their configuration decor decorative elements contrasting color

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		Lace boots with soft edging. In used as a decoration: the division of parts, parts contrasting in color saturation
		Lace boots with soft edging. In used as a decoration: the combination of colors, stitching in a contrasting color
		Lace boots with soft edging. As used decor division parts, parts of neutral colors
		Boots on the tapes "Velcro" with soft edging. As decor used: partitioning parts, parts related colors.

The most popular design is the type of "envelope" with bertsami boots, ankle closing for frame details. Illustrations articles, technical design drawing and description are given in Table 4.

Various modifications to these models can be obtained by partitioning parts, their configuration using decorative items, decorative items and accessories.

Table 4- designs of summer shoes with open toe part

illustration products	technical drawing	Structural and decorative elements
1	2	3
		Shoes with soft edging tape fasteners. In used as decoration parts division, a combination of flowers, applique

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		<p>Shoes with Velcro tape. In used as decoration parts division, a combination of flowers, applique</p>
		<p>Shoes with soft edging tape "Velcro" and buckles. In used as decoration parts division, a combination of flowers, applique</p>
		<p>Shoes with soft edging tape "Velcro." In used as decoration parts division and combination of colors</p>
		<p>Shoes with soft edging tape "Velcro." As used decor articulation parts</p>
		<p>Shoes with soft edging tape "Velcro" and buckles. As a decorative use: the division of parts and combination of colors.</p>

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Table 5 Construction of summer shoes with high bertsami and vamp with an elongated tongue

Illustration products	technical drawing	Structural and decorative elements
1	2	3
		Summer shoes with a closed nose and the vamp-tongue. fixing method on the foot - tape "Velcro." In used as decoration parts division and combination of colors
		Summer shoes with a closed nose and the vamp-tongue. fixing method on the foot - tape "Velcro." In used as decoration parts division, a combination of flowers, applique
		Summer shoes with a closed nose and the vamp-tongue. fixing method on the foot - tape "Velcro." In used as decoration parts division, a combination of flowers, applique
		Summer shoes with a closed nose and the vamp-tongue. fixing method on the foot - belt buckles. As a decorative use unusually shaped buckle and preformation on uppers
		Summer shoes with a closed nose and the vamp-tongue. fixing method on the foot - belt buckles. As a decoration used: stitching in a contrasting color and perforations on the vamp.

The closed part of the shoe beam creates difficulty dressing shoes for patients with severe contractures of the ankle and foot paresis. There are 2-clamp technique, the shoe on the foot: Velcro tape and buckles, as well as in the previous model can be a combination thereof.

The third model - summer shoes oversized bertsami and closed toe portion (Figure 27). The model has a number of limitations: absolutely not suitable for patients with severe contractures of the ankle joint, paresis feet, deformities of fingers, etc.

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Fig. 27 - Models of the shoe summer oversized bertsemi and closed toe part

For the purpose of this design for patients with paresis of the foot or slight contractions necessary soyuzochnoy shortening of the shoe to the foot uncomplicated input in vnutriobuvnoe space. For

constructive vamp length standards used Velcro tape width of 2.5 cm and more which extend soyuzochnuyu of the shoe (Fig. 28).



Fig. 28-year old model shoe with increased due to belt vamp

Thus, allocated four basic constructions of shoes for patients with cerebral palsy disease. We take them as a base. Examples of designs are shown in Figure 29, and description thereof - in Table 6.

Table 6 - Description of basic models of orthopedic footwear for patients with cerebral palsy disease.

boots	Footwear summer with high tibia part		
their configuration ankle boots	open toe part	closed toe portion (vamp with an elongated tongue)	closed toe portion (vamp without tongue)

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Fig. 29 - Models orthopedic shoe for patients with cerebral palsy disease.

Various modifications to these models can be obtained by partitioning parts, their configuration using decorative items, decorative items and accessories.

To ensure the necessary degree of locking shoe on the foot ribbons "Velcro" bertsami design proposed in the recess in the crook of the ankle joint, thus changing the distribution of resistance forces. An example of the proposed design solution is shown in Figure 30.

3.3. Classification of shoes for people with cerebral palsy in the degree of rehabilitation effect

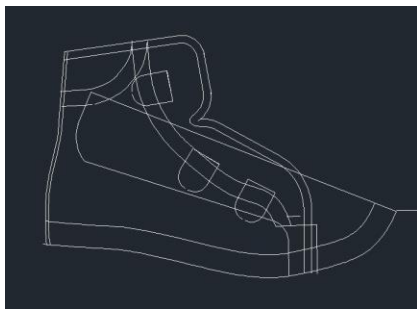


Fig. 30 - Options for changing the shape of tibia orthopedic shoes

Figure 31 is a drawing showing the structure of shoes with high rigid backdrop (shaded) with a weak degree of fixation. shoe design is indicated for minor

deviations in the lower extremities. Rigidity backs provided using polymer materials, or skins increased thickness.

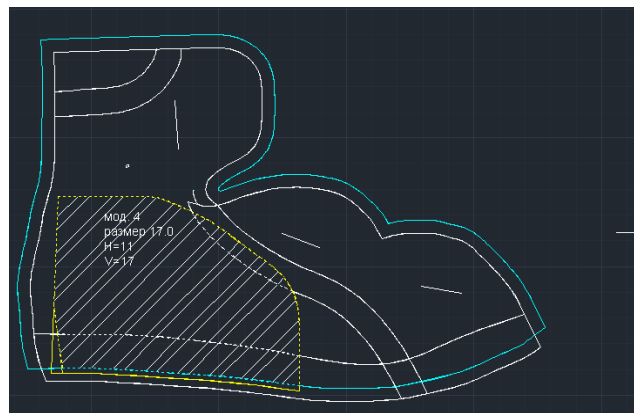


Fig. 31 - Construction of shoes with high backdrop rigid (with a weak degree of fixation of the foot in space vnutriobuvnom)

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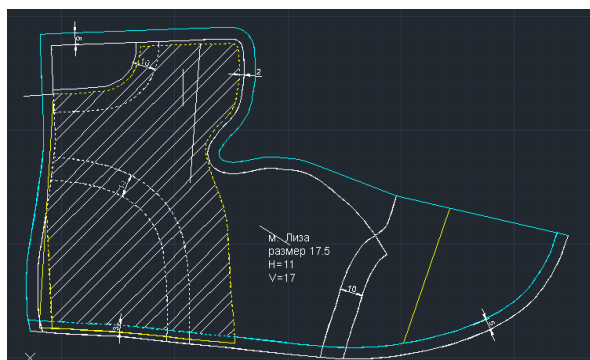


Fig. 32 - Design shoes with hard tibia (with a higher degree of fixation of the foot in space vnutriobuvnom)

In this model, high hard Berecz (shaded) is used with a higher degree of fixation of the foot (Fig. 32) as the frame parts. Recommended method of fixing the shoe on the foot are the buckles and laces.

In the model shown in Figure 33, the frame parts are high rigid ankle boots in combination with rigid barrels, which ensures a significant degree of fixation. This design of shoes is designed for children with significant deformities of the lower extremities.

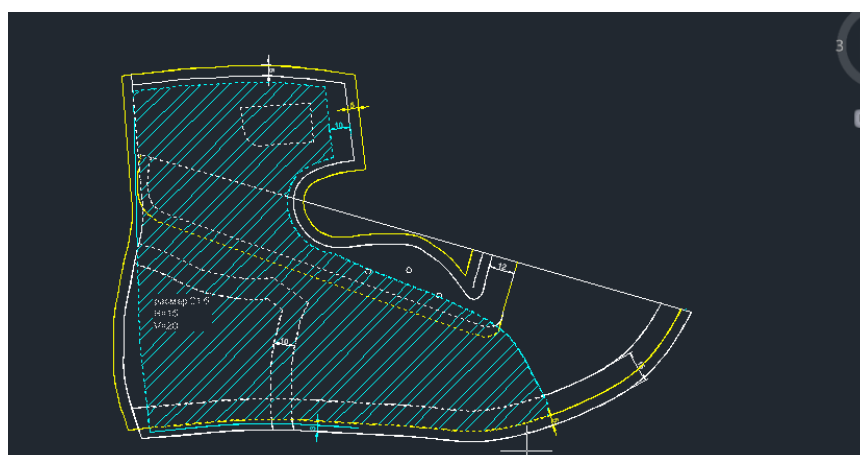


Figure 33 - Construction bertsami shoes with hard and rigid barrels (with considerable degree of fixation of the foot in space vnutriobuvnom)

Continued - Part 2

introduction

The design of preventive footwear designed to prevent abnormalities of the foot, especially the static deformation. It is available on the pads for the mass manufacturing of shoes average (fourth -Six) completeness or blocks increased fullness. Preventive elements of the shoe are insoles polustelki, calculations of the longitudinal and transverse arches.

The design of orthopedic shoes tailored to the abnormalities of the foot, lower leg or thigh.

When orthopedic disorders complicated (it is primarily the degree of heavy dynamic deficiency diseases) special shoes assigned only after the maximum possible deformity correction by modern

orthopedic surgery. In diseases with static lung failure and some forms of dynamic deficiency disorders - contrary to surgery is resorted to only in extreme cases where the conservative treatment in conjunction with an orthopedic shoe is inefficient.

Orthopedic footwear serves the following purposes:

- Make sure the support, ie, facilitate walking and standing at more or less the defect stack if the deformation can not be removed surgically or if the patient refuses operation;
- corrected initial, unstable deformation of the stop;

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• notify the progression or recurrence of deformation;

- to increase the area of support feet;
- compensate for the shortening of the limbs;
- to support the arch of the foot, to relieve painful areas;

- facilitate walking in orthopedic devices;
- mask cosmetic defect, and others.

Orthopedic footwear is made of all types and designs

and may have low (0-29 mm) or medium (30-49 mm) heels.

Depending on the degree of severity of the strain of foot orthopedic shoes is divided into maloslozhnyu and complex.

Maloslozhnaya orthopedic shoes designed for people with moderately pronounced deformation of the lower extremities. Shoes produced increased fullness (up to 13th) for a special orthopedic pads.

It is also possible serial production of such shoes. In this case, under the maloslozhnoy orthopedic shoes is to be understood such, the internal shape of which is standardized and designed to meet the anatomic changes of lower limb pathologies, for which it is designed. Thus individual approach to treatment is provided by varying the supplementary profile orthopedic insole, whose parameters are taken into account when designing the inner shoe shape. Thus, loose profiled orthopedic insole is not a separate supplementary device, and developed a special detail maloslozhnoy orthopedic shoes.

In most cases, orthopedic footwear maloslozhnaya appointed:

- in functional insufficiency (relatively rare);
- static deformations moderate;
- diseases on the background of functional impairment and static deformation;
- relative limb shortening up to 30 mm;
- hollow foot.

Construction maloslozhnoy orthopedic shoes, appointed in functional insufficiency stop distinguished by the presence of household:

- special parts (loose attachments);
- vnutriobuvnogo additional space for insertion of these devices.

Shoes can be made of all kinds, heel height - low or medium.

Sophisticated orthopedic footwear designed for individuals who have expressed strain and foot defects. It refers to a complex footwear, having at least two special parts or orthopedic Kosok to compensate

for shortening of 30 mm or more. This shoe is available both in standard blocks, and on plaster casts. Footwear includes special parts, correcting the position of the foot: rigid vamp, ankle boots, laying open vault, pronator, oblique or elongated heels, etc.

Complex orthopedic shoes can be divided into two major groups:

- corrective shoes, the purpose of which is more amenable to correction corrective deformations, such as paralytic clubfoot, etc .;

- footwear, the purpose of which is to compensate for various incurable deformations uncorrectable surgically, such as stumps foot, various shortening etc. Complicated orthopedic footwear characterized by the special design of the top and bottom. Its production is almost always done individually.

Main part

Orthopedic orthoses (Correction products)- a external device curative and preventive effect which is intended to modify the functional and structural indicators and skeletal neuromuscular system (Figure 18 - 23). This definition, which offers Wikipedia. So, what is this brace? Simply put, this medical product necessary for unloading and support of patients, injured, operated joints or limbs.

The term refers to several types of orthosis devices:

- corsets;
- Washer;
- bandages;
- Special shoes and night splints at heel spur;
- Orthopedic insoles.

They are worn with unstable ligaments, after injuries and operations during active exercise, in diseases of the musculoskeletal system. The need for fixation and unloading of the joints (ligaments) can occur in the following cases:

- Paresis or paralysis (including post stroke state);
- Predisposition to the appearance or presence of contractures (including cases of CP);
- Congenital diseases of the musculoskeletal system.

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Figure 18 - Basic functions orthopedic ortreza

Functional products depends on its purpose. The main tasks that perform different types of orthoses. It should be borne in mind that one bandage or corset may have just two or three functions:

- fixing a certain area in the right position, its stabilization and unloading;
- recovery of locomotor function after limb and tissue damage (expansion, fractures, contusions, sprains and subluxation) or of surgical interventions;

- correcting defects caused by congenital or acquired deformities of the musculoskeletal system (a kyphosis, scoliosis);
- prevention of spinal injuries and joints during intense exercise (sports strength training, active work of his hands, long driving);
- pain syndrome, which causes chronic diseases (arthrosis, arthritis, osteochondrosis, spondylosis and many others).

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Figure 19 - Classification of modern orthoses

All modern orthoses can be divided into three groups in terms of their purpose:

- dorsal (cervical collars, thoracic and lumbosacral braces, recliners, prenatal and postnatal female bandages and the like);
- orthoses upper limb (arm locks, wrist supports, elbow pads, orthopedic napalniki etc.);
- products for lower extremities (hip and ankle supports, knee pads, orthopedic insoles, shoe clips).

Medical devices of this type are prepared and the individual:

- ready and braces are made in factories in a wide dimensional range;

- customized orthoses produced according to the order in orthopedic casts workshop with the damaged portion.

According to the fixing level (degree of hardness) the following types of products:

- hard - immobilizers. A distinctive feature of this category - plate and metal ribs. They restrict movement and fix the joint in the correct position. As part of the technical equipment of the presence of metal and plastic fasteners, straps and fasteners, hinges, magnets, removable pelota. The purpose of wearing - the protection of the weak, the sick limbs from damage and subsequent deformations. Such products are used and during the postoperative recovery to normal accretion of bones;

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Figure 20 - Semi-rigid brace

- semi - the most popular and extensive group of orthoses in which there are many subtypes. They vary in shape and design details. Almost all are equipped with plastic or metal stiffeners. Products may have straps, buckles, Velcro fasteners and other

options for the establishment of the necessary tension level. Possible functions: elimination of pain syndromes, unloading joints, injury prevention, treatment of diseases of the musculoskeletal system



Figure 21 - Soft brace

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- soft orthoses - is bandages of stretch fabrics or wool, designed to relieve pain, reduce inflammation. Some models operate

- massage or warming function, accelerating recovery and kupiruya pain syndrome. They are useful for the prevention and the treatment of minor injuries.



Figure 22 - Soft brace of wool or elastic fabrics

Criteria for selecting the device-orthosis

If you are at the initial stage of the selection brace, do not rush. There are lots of criteria to help you find the best option.

Recommendations doctor - orthopedist

Modern orthosis for the back, knee, elbow or any other joint can perform a variety of functions. Its capabilities are directly dependent on the shape and structure, so these parameters should be determined by the expert.

Sign up for a consultation with an orthopedic traumatologist or (depending on the nature disease). Tell the doctor that you want to wear a brace. Clearly describe its purpose.

- If you need to stop pain syndromes, maybe you fit elastic belts. The absence of stiffeners gives more freedom and ease. This is perfect for everyday wear.

- If necessary, support the joints and soft tissues in the right position you will register more rigid model. The degree of fixation depends on the specific requirements. The doctor will determine how many plates and stiffeners required.

- If you have problems with the skin, this item should also be discussed with a specialist. It is advisable to consult a dermatologist. After inspecting it determines whether it is possible to wear a brace in your case.

Record all of the recommendations of doctors, not to forget the important parameters of a suitable model. This information will come in handy when shopping.

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Figure 23 - corrective products for the correction of scoliosis

The size of the orthosis

To the medical device properly fulfill its function, it must sit on the figure. To achieve this, heeding some yardsticks, using soft tailor centimeter. measuring point depends on the type of orthosis:

- dorsal (different parts of the spine) - chest circumference, waist and lower back;
- neck - circumference of the neck;

- knee - foot circumference at two levels: 15 cm above and below the center of the patella;
- shoulder - chest girth under the armpits, arm circumference of the shoulder;
- elbow - arm circumference in the elbow joint.



Recliner - the simplest design for the thoracic, which is prescribed for severe stoop, weakness of the muscles of the shoulder girdle, scoliosis. Shape of the product in the expanded form is similar to the sign of infinity. Such braces support the upper back, shoulders and the clavicle in the correct position.

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	<p>Thoracic spinal orthopedic corset - a more complex structure, which is the skeleton of a wide longitudinal strip on the back. From it are two straps passing under the armpits and collarbone breeders in hand. Products of this type are provided with stiffening ribs for a stronger fixation. They are at serious pathologies of the cervical and thoracic part of the back, as well as radicular syndrome.</p>
	<p>Lumbosacral belt, intended for the correction, the treatment and prevention of problems in the lower back.</p>
	<p>Thoracic lumbosacral corset that covers the entire back - this is a complex medical design and fixing the corrective nature. Wearing of the products shown in scoliosis first or second degree, kyphosis, osteoporosis and lumbar lordosis. To brace securely in the back, it has reinforcing ribs and plates sewn into a solid fabric.</p>

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	<p>Corsets for pregnant women - a separate group of products designed just for women to bear a child. They are the second and third trimester, when the size of the stomach increases significantly. Products in this category allows you to distribute the increased load on the spine, avoid skin stretch marks and ptosis of the internal organs. Sales have options as elastic Velcro and reinforced model with ribs for patients with spinal problems.</p>
---	---

Division units respectively function. Devices fall into Correcting (repositioned in a), the retaining, guiding, forming, replacement and combined.

	<p>Regulating (repositioned in a) are called the apparatus, contributing to reposition bone fragments: tightening or stretching them before installation in the correct position. These include aluminum wire bus with elastic rod, wire elastic braces, extraoral devices with the control lever apparatus for breeding jaw contractures and others.</p>
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	<p>By guiding devices advantageously includes a ramp, sliding joint which permits the jaw bone fragments specific direction.</p>
	<p>Apparatus (tires) holding the body parts (e.g., jaws) in a particular position, called the locking. These include smooth wire bracket extraoral apparatus for fixation of bone fragments maxillary intraoral and extraoral apparatus for fixation of bone fragments at lower jaw bone grafting et al.</p>
	<p>Called forming apparatus, the support being a plastic material (skin, mucous membrane) or creating a bed for the prosthesis in the postoperative period.</p>

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By substituting devices include replacing defective dentition, formed after tooth extraction, filling defects in the jaw, face parts, arose after the trauma operations. They are also called prostheses.



By combined include apparatuses having several purposes, such as fixation of bone fragments jaw and forming prosthetic bed or substitution jaw bone defect and simultaneously forming a skin graft.



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bandages

	<p>Bandage hernia. Used to prevent disease progression. Strapping allows hernia infringe. Constant use of this bandage will help avoid surgery.</p>
	<p>Of knee brace. It applied prophylactically trauma knee or joint instability, as well as damage and muscle tension.</p>
	<p>Ankle. It has a protective function. Protects joints when running or playing sports, as well as muscle injuries and other diseases.</p>

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	<p>Nalokotnye. Necessary to restore ligament sprains and contusions of the elbow.</p>
	<p>Wrist. Necessary to restore ligament sprains.</p>
	<p>Shoulder. Apply when suffered a dislocated shoulder, osteoarthritis, osteoarthritis, and other similar problems.</p>

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Neck. Use if I have a subluxation of neck injury, concussion.



These shoes must meet the following requirements:

- manufactured from high-quality natural materials;
- have a stable heel of 3-4 cm for female models and 1-1.5 cm - for men;
- High availability is required dense, but not traumatic backdrop with a vertical axis;
- the sole should be of medium hardness, light, non-slip;
- Shoes should fit perfectly on the fullness and size.

Special requirements for insoles in orthopedic footwear. They should have a thickened area podpyatochnuyu not wrinkle, absorb moisture, absorb the foot when walking. In the absence of orthopedic shoes, arch support can be set separately.

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	<p>Unloading. Advantages: soft support transverse and longitudinal arches of the foot, the load is reduced, eliminate pain, fatigue, swelling. Cons: Do not have a therapeutic effect.</p>
	<p>Prevention. The good news is that they are used to combat the signs of the cross and longitudinal flat 1, 2 degrees. Special shape, bends repeat exactly the anatomy of the foot. The bad news is that not help at an advanced stage of the disease.</p>
	<p>Diabetic. Advantages: different semi-hard or a soft base with grooves that reduce the burden on the foot. Products do not have a rigid elements, so do not injure the feet are recommended for diabetics and people with rheumatoid arthritis. Disadvantages: not to risk their own health, it is necessary to do custom insoles.</p>

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	<p>Massage. Pros: Focuses on pressure points during a walk. This removes puffiness and fatigue. Insoles relax muscles, restore the circulation. Cons: have no therapeutic properties.</p>
	<p>With arch support. These devices have an anatomical shape for a full arch support. The good news is that they are used to fight flat-footed, and other diseases. The bad news is that it is not too easy to use.</p>

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Baby. They are made of soft and hard materials feet enough support. Advantages: well-chosen model is not felt, does not cause discomfort, walk with them the child is much easier and more convenient. Recommended for kids with clubfoot, flatfoot, congenital foot defects. Disadvantages: there is a risk of buying substandard products.

Plants

proven manufacturers

The abundance of brands that produce medical orthoses, able to stall. In order not to be disappointed in buying, give preference to well-known companies. Their products are in great demand in Russia and abroad, and the new development receive only positive feedback.

- Orlett - German brand founded by Rehard Technologies GmbH. This is a world market leader in orthopedic products, because the range is really amazing. The manufacturer offers all possible types of orthoses, with several options for each joint and limb. Modern high-tech equipment, innovative research and development and use of quality materials to deliver the highest quality finished products.

- BAUERFEIND produces not only medical bandages and splints, but also compression stockings. Products of this German brand are very popular in Russia thanks to affordable prices and excellent design. Moreover, the company has repeatedly advocated a sponsor of the Olympics, providing its own products for athletes.

- REHBAND - a Swedish brand, part of the list of the world's leading ortho-market. This company

specializes in sports bandages and corsets. Most models are made of high-elastic materials that enhance comfort when worn.

- DonJoy - American orthoses premium. They have won worldwide popularity because of the unique development, allowing to solve highly specialized tasks. The product line contains not only soft and semi-rigid orthoses, but postoperative splints, corrective products and fasteners.

- Ortex - fairly low cost orthopedic products from Slovakia with excellent functionality. The lion's share of the assortment is adjustable hinges with orthoses.

- OPPO - another American brand, offering a large selection of corrective, preventive fixation and orthoses. Products of this brand are different in that their composition has a lot of different materials, which increases the possibility of individual selection.

- Otto Bock - the famous German manufacturer of orthopedic products of various kinds. In its portfolio are sure to find a model perfectly fits your needs. The fact that the company pays great attention to detail, creating a multifaceted orthoses designs.

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service regulations

To the effect of wearing it was positive, it is necessary to strictly adhere to the doctor's recommendations - orthopedics and producer. How to wear a medical orthosis correctly? Pay attention to the following points:

- **Duration of wearing.** This parameter is able to identify only a trained technician. The basis of the diagnosis and take the degree of development of the disease. Any initiative in this regard may lead to negative health effects.
- **Proper donning.** Fixing the desired degree of rigidity - the key to the effectiveness of wearing a corset or brace. To feel the correct tension, the first time put on the orthosis under the guidance of a specialist. The doctor will show how and in what order to fasten the straps and clips. Advise on the degree of fixation, with the correct settings. In the future, these instructions will be useful to you for the independent operation of the product.

- **Regular maintenance by the rules.** Since the brace is made of textile, over time it gets dirty. Usually flexible model can be run in the washing machine, and the other orthoses with reinforcing ribs and plates have to be washed by hand. The water should be cool, not hot 40 degrees. Use aggressive powders and other cleaning chemicals can not. You can use a mild soap. Dry the product in the straightened form, placing them on a horizontal surface. Make sure that was not there heating or radiators. The fact that the plastic parts can be deformed by heat.

Bracing

Bracing - this strap-lock for removing the foot from the shoe, special shoes with clubfoot. And it can be used only after the clubfoot has fully corrected manipulations and plaster bandages (Figure 12 - 17).

Clubfoot relapse up to 4 years of age against the backdrop of rapid growth is possible even after

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successful correction. To date, the brace - the most simple and reliable method of preventing relapse. Consistently observing usage patterns brace can prevent relapse in 90% of children. Wearing a brace, as a rule, does not prevent the development of the child. This convinced the parents, when a child learns to crawl and even stand up (depending on age). The task of parents - the right to wear the brace.

Bracing for clumsy: features of wearing and caring

Please note that the shoes with such a device - this is no ordinary walking shoes. Rigid and fixed base brace designed for therapeutic use. It does not allow the foot to move the usual way from heel to toe. sole materials are such that on some surfaces lead to slip boots. Therefore, wearing only shoes without the strap

will not provide a therapeutic effect. A child should always wear shoes with metal lath.

Fixators combined with the majority of car seats and strollers. Choosing a highchair, correlate its width to the width of locks, it was not necessary every time take smb. Shoes off before boarding a child in it.

Screws that shoes are attached to a metal bar, you need to check 2 times a month - sometimes it is necessary to tighten them. Remember! Small items of orthopedic shoes separate from the metal strap clamps are dangerous for the baby!

Clamps are made by different manufacturers. Are proven brace "Bear" ("Bear" also offers [orthopedic shoes](#)). Clips can also be manufactured according to individual orders (Figure).



Figure 12 - Bracing for deformity correction stop ditey after adjusting them to conduct surgery in a clinic M. Vavilov operation

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Figure 13 - a fragment Brace



Figure 14 - Correct use of the brace scheme

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Figure 15 - Features of use of the brace to correct various cases of clubfoot stop children



Figure 16 - Arrangement of clamps stop children in the brace

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Figure 17 - Detail of fixing the corrective product on the brace

What is intoing?

Intoing (from the English «in» - Inwardly, «toe» - toe) - is an English term, not having so short as analog in Russian language. In domestic medicine this phenomenon is often called the reduced forefoot (CSPs), in the people - "Clumsy" (not to be confused with the clubfoot).

If in a standing position to look at your feet from top to bottom, then most people will see that they are directed either straight ahead or slightly curved outwards. However, in some cases, the arch of the foot inward toward each other, and this phenomenon is called "intoing". This violation is very common among young children, and in most cases it is itself corrected on its own over time. Only a small percentage of children remains a problem and requires treatment.

What causes intoinga?

There are three main reasons intoinga in healthy children: given stop, the inner torsion tibia and femur excessive eversion.

What is a given stop?

stop Present - this curvature, which is best seen when viewed from the child's feet. This violation is noticeable even in infants, and it occurs in the womb because of the pressure on the foot of the fetus. At the same time, in 9 out of 10 children born to a given foot, as they grow older the problem solved itself.

What is the inner torsion shin?

Internal torso twisting tibia called the tibia, linking the knee and ankle. As a rule, parents are discovering the violation, when the child begins to walk. It is understood that a small torsion in infants is the norm, and in the first year of life it is usually equalized. However, in some cases, this alignment is not sufficient to ensure that the foot when walking facing forward or slightly outward. These children intoing persists up to 6-8 years, because it is before the age of the bones of the legs continue to be straightened.

What is excessive eversion of the femur?

Excessive inversion - is the internal femoral torsion. It is worth noting that all children are born with a mild form of the disorder, but it usually occurs between the ages of 2-4 years after the child begins to walk confidently. During early childhood, the violation may be exacerbated.

How is intoing?

intoinga Treatment depends on the cause of its occurrence.

The above stop

A doctor can teach you special massage to stretch the child's foot and its gradual straightening. If the bend is too strong or if the massage does not work, assigned superimposition on the foot brackets or bus.

Doctors are still arguing about the optimal age for laying orthopedic appliances, but still most of them converge in the opinion that the presence of uncorrected curvature of 4-6 months to start treatment

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should be at this age, and it must end even before as the child begins to walk confidently. If even after correcting the child's feet are slightly crooked, it will not prevent him to run and play, and in general this condition is not accompanied by painful sensations. Only a strong curvature can create problems with the selection of shoes, which is the main reason for the use of tires and staples.

In this case, the bracket and corrective shoes alone are ineffective. But there is a treatment option that combines the orthopedic rod with shoes, which together are putting pressure on the foot, causing it to straighten. The disadvantages of this method are the relatively high cost and the reluctance of children to wear pretty uncomfortable and bulky structure. That is why many doctors do not recommend to treat the inner torso tibia in young children. Firstly, most people eventually she corrected on its own. Second, even if this does not happen, the doctors and scientists still have not established any connection untreated torsion shin with the development of arthritis or the inability to run and jump.

In rare cases, the main problem is the appearance of the curvature. In this case, the solution is surgery in which the bones are cut and turned inside out, and the foot is straight. However, in practice such an operation was made only a very small number of people, and the possibility of its implementation should be very carefully and discussed in detail with your doctor.

Excessive eversion of the femur

As a rule, excessive eversion femur runs itself. Most children stop rectified by the time they reach 6-8 years of age. staples or orthopedic footwear is usually ineffective in fighting this cause intoinga, and only in very rare cases with very pronounced curvature child needs surgery. However, again, the surgery method is considered only in the most severe cases.

Conclusion.

It is shown that anthropometric study and stop the development of science-based requirements for the design of footwear for children and teenagers is a topical issue for the footwear industry. It was determined that the main factor in the formation of the requirements for shoes for children's shoes should be the preservation of health, as this age is vulnerable to environmental action. The place of the shoe in combination of health factors. It was found that the shoe has an impact on all categories of health: somatic, personal and social. Thus, the use of standard mass production of shoe orthopedic technology means in the form of supplementary insoles and other supplementary devices can serve as an effective means to improve its preventive properties including for valgus plane of the foot. To do this, specialists in the design and manufacture of footwear of mass production should timely receive current information about the new designs of these orthopedic appliances, as well as the indications for their use.

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HOW TO ENSURE SUSTAINABLE DEMAND FOR THE PRODUCTS OF THE FASHION INDUSTRY CONSUMERS IN THE REGIONS OF SFD AND NCFD

Abstract: In the article, the authors suggest ways to solve the problems of reviving the domestic light industry and creating conditions in the regions of the country to improve both the economic and social situation. This is especially justified for the districts of the southern Federal district and the Northern Federal district. The authors' article is also interesting what is written on the basis of deep analysis of the real situation in the SFD and NCFD, where today a particularly high percentage of unemployment among women, which requires the creation of new jobs, to reduce social tensions in these regions. This is possible if we establish the production of shoes and other fashion products taking into account national and climatic characteristics in these regions, that is, the authors emphasize the need to look for a niche where import-substituting products will always have a steady demand, and enterprises will ensure that they receive stable TEP from their activities. The authors' article is of scientific and practical interest for teachers, employees and students of universities and colleges, as well as for a wide range of readers and practitioners engaged in the production of fashion industry products.

Key words: import substitution, competitiveness, demand, fashion industry, innovation, regional, municipal, Federal, branches of government, product range, demand, market, profit, discounts, returns, profitability, technical and economic indicators (TEP), financial condition.

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Introduction

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The life cycle of any product (including a pair of shoes) is a concept that describes the sales of

products, profits, consumers, competitors, and marketing strategy from the moment the product enters the market until it is removed from the market.

At present, companies operating in a competitive environment with changing external

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influences, increasingly attach importance to conducting marketing research of their products. It is also important that the information acquired in the process of such research is used in the multivariate analysis and justification of management decisions on the range of products, their quantity, prices, consumer properties, etc. When the value of performance is underestimated the marketing system at the enterprise becomes unclaimed its production capacity, intellectual and human potential. The dynamics of the impact of market demand on manufactured goods should be monitored by the marketing service at all stages of their life cycle and taken into account in systems responsible for the quality and quantity of products produced, their price, innovation, and development of new types of products. Thus, all types of products, technologies and services have a certain life cycle. The success of

an enterprise depends on the degree of consistency of various stages of the main life processes.

The market situation changes at every stage of the life cycle and requires a corresponding change in the strategy and tactics of the company's behavior in the market, which is of particular importance.

The main types of products go through 4-5 stages before disappearing from the market:

- presentation (introduction to the market);
- growth (development); maturity (stabilization);
- decline (the decline and renewal of products);
- dying (dying and beginning of the product update cycle).

Figure 1 shows a graphic illustration of the product's life cycle on the market.

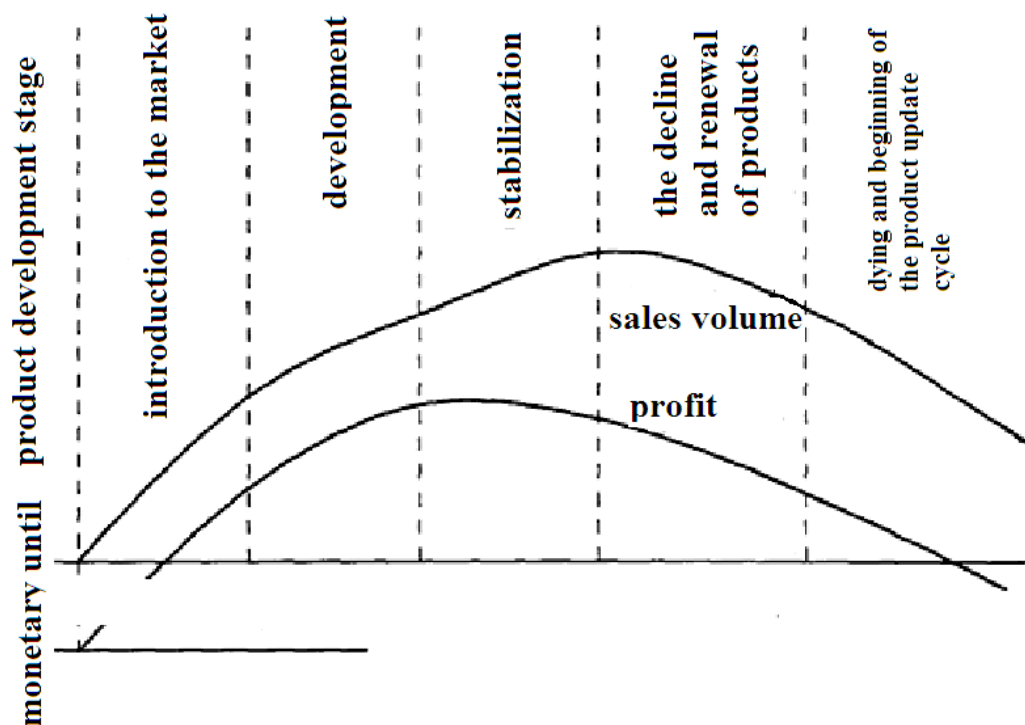


Fig. 1. Life-cycle product on the market

The above graphic illustration is conditional. Each product has its own life cycle characteristics.

So, we can distinguish the following stages of the product lifecycle.

The first stage is the presentation stage (the period when the product is introduced to the market). At this stage, the demand for the product increases slowly. This is due to the fact that the period when a new type of product is introduced to the market is not yet known to most prospective buyers.

At this stage, the company makes a small profit. Often, the entrepreneur calculates losses, sometimes

even very large. Sellers are usually very careful in adding to their assortment of products that are at the presentation stage. They are aware that most regular customers are not familiar with this type of product, so it is always difficult to sell these products. As a result, sellers can claim various privileges for themselves, which include: free delivery of billboards and other materials, joint advertising expenses, and so on. D. a Powerful firm for the retail sale of goods may even require exclusive rights of distribution of products in your shopping region. At

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this stage, prices are set to the minimum, the company has little or no profit.

The second stage is the growth stage. If the product survives at the first stage, it continues to develop. At this stage, sales increase rapidly. Modified versions of the basic model must be offered to meet the growing market. Relative profits are high.

The third stage is the stage of maturity. At this stage, the product has its own market and is in demand. At the stage of maturity, competition increases and reaches its maximum, as many firms enter the market. As a result, profits in General and per unit of product are reduced, since discounts are widely used.

The fourth stage is the decline stage. At this stage, the product that does not undergo any changes becomes boring to consumers, or the need that it was intended to satisfy disappears. An unpredictable reason for declining sales during a downturn may be technical obsolescence of the product. During the downturn, sales across the industry are declining and many firms are leaving the market as the number of consumers decreases and the product range focuses on the best-selling models.

The fifth stage – the stages of decline and death, i.e., the decline and renewal of the product, as well as the death and beginning of the product renewal cycle, are characterized by a slow, and then a sharp drop in demand. In the face of declining sales and profits, manufacturers sometimes struggle to restore demand for a particular product. These include the following steps:

- new type of packaging;
- special advertising;
- changed price.

Although it is quite difficult to give up products, sooner or later, as sales continue to decline, entrepreneurs are forced to make this decision. At this stage, the following measures are being taken:

- decommissioning of this type of product;
- the gradual narrowing of the investment;
- development of private organizational changes in relations with the

intermediaries, so that they do not suffer losses along the way, and inventory of surpluses.

In relation to products that are clearly in decline, sales representatives begin to reduce the number of deliveries, strive to minimize repeat orders, and then gradually refuse to deliver the product. They can even reduce the price of the remaining items in order to completely reject the product.

Thus, each stage of the product lifecycle is a variable that determines marketing actions in the target market.

The product life cycle depends on the number of substitute products, their competitiveness, as well as on correct management decisions aimed at developing support measures to optimize the structure of the product life cycle. The main measures to optimize the product lifecycle structure include:

Proper use of various marketing elements at different stages of the product lifecycle;

The company's production strategy.

Table 1 shows the main elements of marketing at different stages of the life cycle.

It is very important to maintain the optimal life cycle, to determine the initial price for the product produced and the maximum possible amount of price reduction, provided that the production break-even is maintained. To optimize this factor, the company should work out discount systems that allow attracting various consumer segments to purchase the company's products and thereby reduce the inventory of manufactured but not yet sold products at the moment when it becomes clear that this product is losing its previously occupied market niche.

In the practice of pricing, a large number of discounts are known, which are used at various levels: enterprises, sales organizations and trade. The following types of discounts are most common for companies in the footwear industry:

Table 1. The basic components of marketing at different stages product life cycle

Elements of marketing	Stage of the product life cycle				
	performance	height	maturity	Decline	dying
Goals	Bring the product to market	Gain a strong position	Hold positions in the market	Bring all your inventory into circulation	Go to a new lifecycle without loss
Price	High	High, then slowly begins to decline	Stabilizes, then decreases	Continues to fall	Minimal (up to minuscule)
Distribution channel	Agents who supply the trial	Channels are used to increase sales, and	All possible channels are involved	The number of sales channels is decreasing	Only channels that provide the minimum

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	batch of the product	wholesalers are included			supply are available
Advertising	About the consumer properties of the new product, its advantages, its prestige is emphasized	Advertising is enhanced and focuses on a variety of shopping motives	Supportive, persuasive	Supportive, reminding	Reminiscent

□ bonus-a price discount of up to 10%, which is provided to a large wholesale buyer for a specified volume of turnover during a certain period;

□ seasonal-provided to the consumer when the shoes are sold

□ outside of the main sales season, the purpose of introducing discounts of this type is to maintain a constant level of sales throughout the year, in addition, this discount saves the manufacturer from part of the warehouse costs and reduces the risk of non-liquidity;

□ dealership-available to wholesale and retail merchants, agents and intermediaries to cover their expenses;

□ special-provided to regular customers;

□ sales promotion discount-a measure to reduce the sales price shoes that are guaranteed to Resellers if they take for sale new types of shoes or Vice versa types of shoes that are at the stage of decline in the life cycle;

□ discount on trial batches and product orders-setmanu facturer in order to interest the buyer in new models of shoes;discount for speeding up payment-a measure of reducing the price for each

□ the " saved " week against the agreed period in the contract;

□ a discount for paying real money – the consumer, those who pay for deliveries on time with real money, and not their substitutes, can get a discount from the base price, since the last price is usually set by the company for possible losses from non-payments;

□ discount for regular orders.by the manufacturer in order to retain a regular customer;

□ advertising-discount from the price of shoes provided by the company to a retailer so that the latter can organize local advertising of shoes;

□ sales – discount from the wholesale price provided by a supply and sales organization that performs the functions of selling shoes in transit with participation in calculations;

□ trade-part of the retail price of shoes remaining in the

□ disposal of trade organizations and enterprises to cover the costs of circulation and profit generation;

□ discount from the price-applies if you buy shoesreduced quality.

In addition, the company can take the initiative to reduce the price when underloading production capacity, reducing the market share under the onslaught of an aggressive competitive environment, etc.

If an enterprise uses proactive periodic price reduction as a tool to influence consumers, taking care of their costs, developing measures to reduce them by improving equipment and technology, introducing new types of materials into production, constantly improving the quality of shoes, then you should be afraid of a premature or sharp decrease in the price of products. And as a result, the company will not receive an increase in profit due to an increase in sales due to a decrease in price, but a sharp drop in demand for this type of footwear and as a result, a reduction in sales and a negative financial result for this type of product.Such phenomena of time as: style, fashion, and fetish significantly affect the Shoe shopping center.Style is the main peculiar form of expression that occurs in a particular sphere of human activity. Once created, a style can exist for many generations, sometimes gaining wide popularity, then losing it. Figure 2 shows the standard curve for the effect of a product's style on its lifecycle.

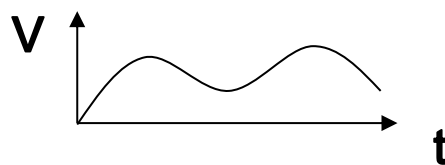


Fig. 2. Influence of style on the product lifecycle

Fashion is the most popular or widespread style in a given period of time in a given field of activity.

Figure 3 shows the impact of fashion on the product lifecycle.

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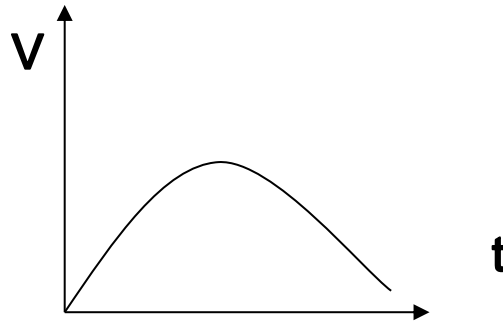


Fig. 3. Influence of fashion on the product lifecycle

Fetishes are particular manifestations of fashion that win everyone's attention, are perceived with great enthusiasm, quickly reach the peak of popularity and very quickly pass to the stage of decline. The cycle of their recognition is short and, as a rule, the number of their adherents is limited. Figure 4 shows the effect of the fetish factor on changes in the product lifecycle.

Thus, the Shoe manufacturer should plan its production strategy based on the possibility of using

marketing elements to optimize the structure of the product lifecycle.

Different companies have different approaches to determining the strategy for the production of goods and services, depending on the needs of customers, available resources, market conditions, and so on. Moreover, the same company may use different strategies for different products. The choice of strategy is usually based on the product's competitiveness.

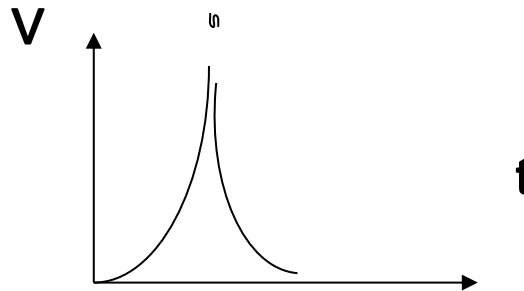


Fig. 4. Influence of a fetish on product lifecycle changes

Various approaches or methods of analyzing the order portfolio have also been developed that allow evaluating the range of production assortment in terms of profitability of its individual elements.

One such approach, by which the sales and marketing Manager can make decisions about the firm's strategy when selling certain products or

services, was proposed by the Boston group. This method allows you to classify various combinations of goods and services of a firm with a differentiated production program based on the so-called growth matrix, or "portfolio of business development directions" (Fig. 5).

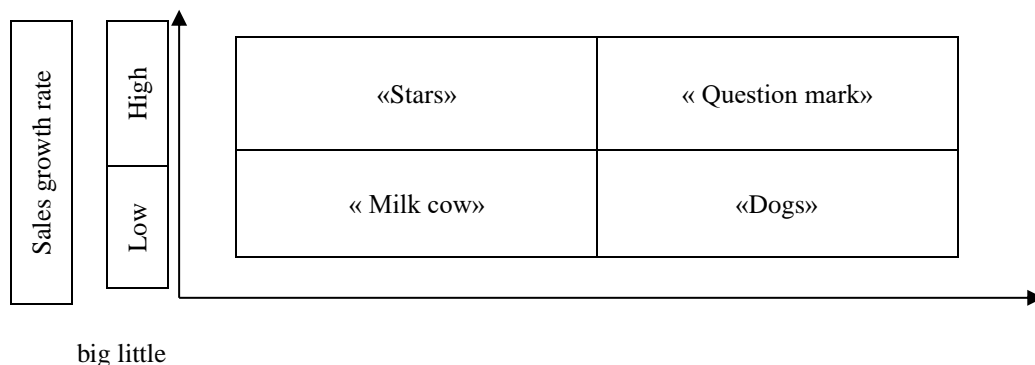


Figure 5. Boston consulting group Matrix

Applying this classification requires taking into account current and potential market segmentation,

various temporary aspects of profitability of a particular combination of goods and services, as well

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as the impact of competition. For example, a company may be the largest in its industry, but it does not take a leading position in one of the market segments.

In figure 5, the combinations of products and services that belong to the category of "stars" are located in the upper-left quadrant. These products are characterized by rapid sales growth, which requires large amounts of working capital, but cash flow is also high, since these combinations of goods and services are leading in their market segments. Usually in this case, there is a balance of money turnover within the company. Sales agents are willing to sell such combinations of goods and services: their production volumes are large, they are leading the market and are in high demand, but, as a rule, do not bring profit to the manufacturer. Over time, but as their life cycle progresses, sales dynamics slow down, and they turn either into "cash cows" or, if their market share declines and they lose their competitiveness, into "dogs", i.e., unviable combinations of goods.

Combinations of goods and services that belong to the category of "cash cows" are characterized by low dynamics of sales growth. However, their market share is usually high and they can be "milked" because they can generate more revenue than is required to invest in production. These product combinations are particularly popular with sales agents because of the high demand for

them and are attractive to the sales and marketing Manager, as they are able to generate the real money needed to develop and support the sale of new or upgraded products and services.

The really difficult problems are posed to the company's management, marketing and sales managers by products that belong to the "question mark" category ("difficult children"), which are located in the upper right quadrant of the matrix. They tend to have a small market share, often need support, and are far behind the leading products in terms of market positions and customer confidence. Those who deal with them inevitably have the following questions: will they become "stars" or "cash cows"; how much time and money will it take for them to "get back on their feet"; what are their prospects in the market? Such combinations of goods and services are usually not favored by sales agents. A small market share and weak demand, often a low degree of trust and ignorance of customers, and weak advantages over competing products make it difficult to sell them. However, if they turn into "stars" or "cash cows", sales agents should devote maximum effort to organizing their sales. However, the sales and marketing Manager may need to introduce a special incentive Commission rate and provide personal guidance to support sales agents' efforts to market these combinations of products and services.

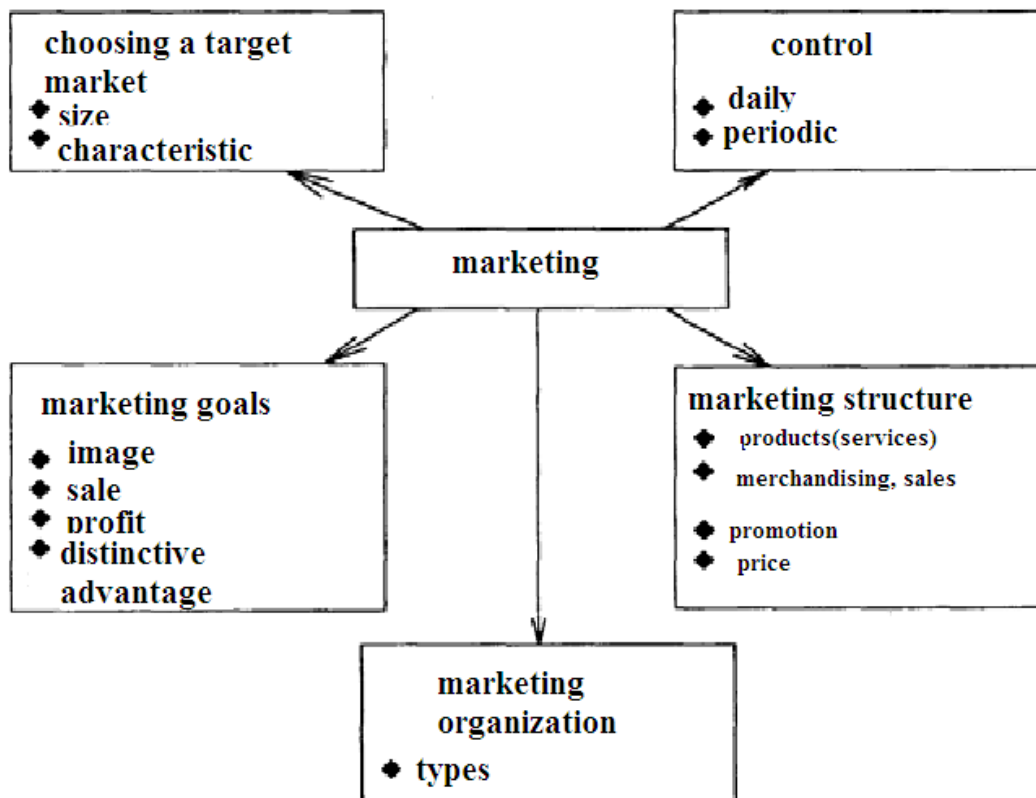


Figure 6. Factors controlled by marketing

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The development of new combinations of goods and services is carried out taking into account the goals and strategies of enterprises and is accompanied by an analysis of the company's position, which results in a decision on possible diversification of activities. When developing a strategy, it is mandatory to take into account factors that are controlled by marketing (Fig. 6). As well as factors that are not controlled by marketing (Fig. 7).

Marketing research and the study of the profitability of new product concepts are conducted separately from the assessment of technological capabilities, since it may be appropriate to transfer production partially or completely to the contractor. After evaluating the results of production, a decision can be made to resume it.

So, product lifecycle management is the process of managing a product from concept development to disposal. When this process works effectively, the company is able to manage profitable innovations — accelerate the development of new products, quickly bring them to market and constantly improve quality, while reducing costs.

At the same time, in order to stay competitive, Shoe companies are forced to constantly improve the consumer properties of their products and expand the range of terms of supply and services, although all this is more or less taken into account in the price and ultimately paid by the consumer. When setting the price of a product, the company must also take into account the level of already established prices for other products that are similar in purpose and quality on the market.

The presence of stages in the life cycle of shoes requires constant changes in the pricing strategy. The product life cycle is characterized by fluctuations in sales volume and profit from its sale. Accordingly, the price will change depending on the stage of the product's life cycle. Therefore, it can be concluded that the price set by an enterprise for a product depends on production costs, supply and demand, as well as on the solvency of the population, the price policy and market strategy of the firm, the quality of the product, additional services and services, interchangeability of goods and their life cycle.

Main part

The development of a market economy sets the task of developing new approaches to managing microeconomic systems. Usually, the functioning of any enterprise in a market economy is aimed at obtaining maximum profit, the amount of which is significantly influenced by the rationality of decisions made by the company's management based on external and internal factors, as well as the analysis of the economic situation in the market. Recently, the direction related to maintaining profits at a certain level that satisfies the company's management has become relevant.

At present, many phenomena of the real economic situation can be explained using economic and mathematical models. Therefore, to make an adequate decision based on forecasting the company's profit, it is necessary to develop an economic and mathematical model of the process of its change, which takes into account both external and internal factors. In addition, in a changing economic situation, it is useful to apply dynamic models that reflect the process of production, storage and sale of products over time. The constructed models of such processes are more complex due to the need to take into account many local factors. However, the potential use of these models is much broader. For example, the construction of an economic and mathematical model of the process of changing the company's profit is primarily necessary for management to make informed management decisions on regulating the levels of manufactured and sold products. The model will allow you to reflect not only the periods of time for increasing the volume of output and getting more profit, but also the periods associated with its reduction and the sale of only products stored in the warehouse. In addition, the company's management will be able to make correct economic decisions based on the economic and mathematical model of the profit change process in cases when the forecast value of the company's profit is very small or not at all.

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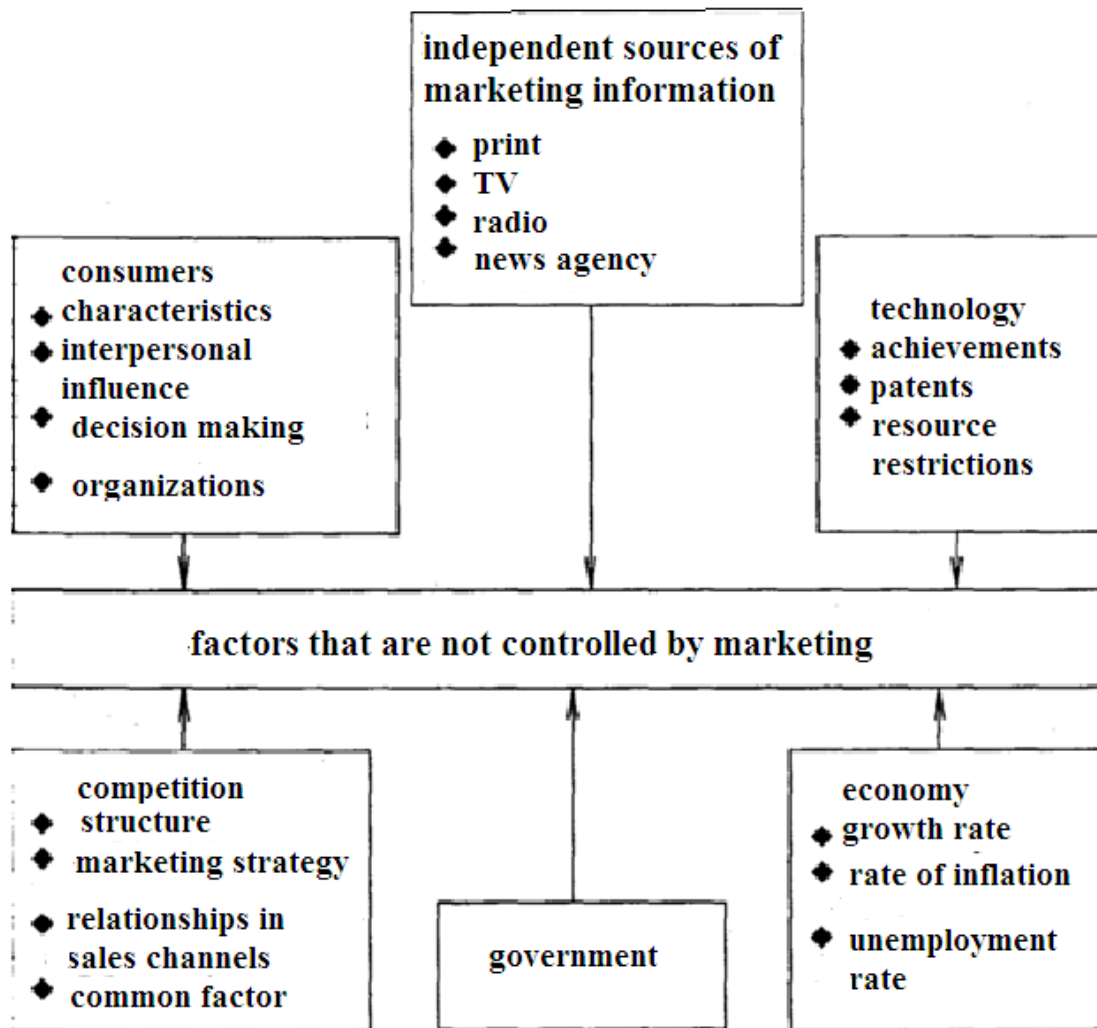


Fig. 7. Factors that are not Controlled by marketing

The developed dynamic model allows you to determine the profit from the sold product, taking into account the seasonality of demand, the current price of the product, the cost price, and to regulate based on data on the number of goods produced and sold on the market. The built model takes into account the processes that occur in the production, sale and storage of finished products, as well as in the field of its repair. In addition, the model can form the basis of expert decision-making systems for

calculations related to determining the company's profit, which will help to remove uncertainty in the process of establishing the company's profit when seasonal fluctuations in demand for products in a market economy.

Let's proceed to the consideration of the economic and mathematical model of the process of changing the company's profit, presented in the form of the following differential equation (1):

$$\frac{dW(t)}{dt} = p_1 \frac{dN_{np}(t)}{dt} - c \frac{dN(t)}{dt} - k_2 * N_p(t) * p_1 \tag{1}$$

The resulting equation is formed on the basis of the developed models for the number of goods sold TPR, the total number of goods Tr. The equation includes parameters such as cost-C, current product

price P1, current time t, and the fee for storing units of goods per unit of time k2.

Integrating equation (1), we have(2):

$$W(t) = \int p_1 dN_{np}(t) - \int cdN(t) - \int k_2 N_p(t) p_1 dt \tag{2}$$

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The resulting expression is represented in the following form (3):

$$W(t) = I_1(t) - I_2(t) - I_3(t) + C \quad (3)$$

where C is the integration constant.

First, consider the integral I1 (t) included in the expression (4):

$$I_1(t) = \int p_1 dN_{np}(t) = \int p_1 \left(n_0 + \Delta p_1 \cos\left(\frac{m\pi t}{\tau} - \varphi_2\right) \right) \left[I_{3'}(t) + I_{4'}(t) \right] dt \quad (4)$$

Let's represent the integral in the following form (5):

$$I_1(t) = I_{14}(t) + I_{24}(t) + I_{34}(t) + I_{44}(t) + I_{54}(t) + I_{64}(t), \quad (5)$$

where

$$I_{14}(t) = \int p_1 n_0 I_3(t) dt$$

$$I_{24}(t) = \int p_1 \Delta p \cos\left(\frac{m\pi t}{\tau}\right) \cos(\varphi_2) I_{3'}(t) dt$$

$$I_{34}(t) = \int p_1 \Delta p \sin\left(\frac{m\pi t}{\tau}\right) \sin(\varphi_2) I_{3'}(t) dt$$

$$I_{44}(t) = \int p_1 n_0 I_{4'}(t) dt$$

$$I_{54}(t) = \int p_1 \Delta p \cos\left(\frac{m\pi t}{\tau}\right) \cos(\varphi_2) I_{4'}(t) dt$$

$$I_{64}(t) = \int p_1 \Delta p \sin\left(\frac{m\pi t}{\tau}\right) \sin(\varphi_2) I_{4'}(t) dt$$

$$I_{3'}(t) = -\frac{m\pi Na}{\tau} \left[\frac{(1-k)(n_0 + \Delta p \cos(\varphi_2))}{[(1-k)(n_0 + \Delta p \cos(\varphi_2))]^2 + \left(\frac{m\pi}{\tau}\right)^2} \times \cos\left(\frac{m\pi}{\tau}\right) \sin\left(\frac{m\pi}{\tau}\right) - \frac{\frac{m\pi}{\tau}}{[(1-k)(n_0 + \Delta p \cos(\varphi_2))]^2 + \left(\frac{m\pi}{\tau}\right)^2} \cos\left(\frac{m\pi}{\tau}\right) \cos\left(\frac{m\pi}{\tau}\right) \right]$$

$$I_{4'}(t) = \frac{m\pi Na}{\tau} \sin(\varphi_1) \times \left[\frac{\frac{m\pi}{\tau}}{[(1-k)(n_0 + \Delta p \cos(\varphi_2))]^2 + \left(\frac{m\pi}{\tau}\right)^2} \times \sin\left(\frac{m\pi}{\tau}\right) - \frac{(1-k)(n_0 + \Delta p \cos(\varphi_2))}{[(1-k)(n_0 + \Delta p \cos(\varphi_2))]^2 + \left(\frac{m\pi}{\tau}\right)^2} \times \cos\left(\frac{m\pi}{\tau}\right) \right]$$

Then we calculate the integrals (4) sequentially.

Let's start with the integral I 14 (t). As a result, we have:

$$I_{14}(t) = p_1 n_0 \left[\frac{m\pi Na}{\tau} \cos(\varphi_1) * \left[\frac{(1-k)(n_0 + \Delta p \cos(\varphi_2))}{[(1-k)(n_0 + \Delta p \cos(\varphi_2))]^2 + \left(\frac{m\pi}{\tau}\right)^2} \left(-\frac{\tau}{m\pi}\right) * \cos\left(\frac{m\pi}{\tau}\right) - \frac{\frac{m\pi}{\tau}}{[(1-k)(n_0 + \Delta p \cos(\varphi_2))]^2 + \left(\frac{m\pi}{\tau}\right)^2} * \frac{\tau}{m\pi} * \sin\left(\frac{m\pi}{\tau}\right) \right] \right]$$

Let's proceed to calculating the integral I 24(t). As a result, we get:

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$$I_{24}(t) = p_1 \Delta p \cos(\varphi_2) \left[-\frac{m\pi Na}{\tau} \cos(\varphi_1) * \frac{(1-k)(n_0 + \Delta p \cos(\varphi_2))}{[(1-k)(n_0 + \Delta p \cos(\varphi_2))]^2 + \left(\frac{m\pi}{\tau}\right)^2} * \left[-\frac{1 \cos\left(\frac{m\pi}{\tau}\right)^2}{2m\pi} \tau \right] - \frac{\frac{m\pi}{\tau}}{[(1-k)(n_0 + \Delta p \cos(\varphi_2))]^2 + \left(\frac{m\pi}{\tau}\right)^2} * \left[\frac{-\frac{1}{2} \sin\left(\frac{m\pi}{\tau}\right) \cos\left(\frac{m\pi}{\tau}\right) + \frac{1}{2} \left(\frac{m\pi}{\tau}\right)}{(m\pi) * 1/\tau} \right] \right]$$

Find the integral I 34(t):

$$I_{34}(t) = p_1 \Delta p \sin(\varphi_2) \left[-\frac{m\pi Na}{\tau} \cos(\varphi_1) * \frac{(1-k)(n_0 + \Delta p \cos(\varphi_2))}{[(1-k)(n_0 + \Delta p \cos(\varphi_2))]^2 + \left(\frac{m\pi}{\tau}\right)^2} * \left[\frac{-\frac{1}{2} \sin\left(\frac{m\pi}{\tau}\right) \cos\left(\frac{m\pi}{\tau}\right) + \frac{1}{2} \left(\frac{m\pi}{\tau}\right)}{m\pi} \tau \right] - \frac{\frac{m\pi}{\tau}}{[(1-k)(n_0 + \Delta p \cos(\varphi_2))]^2 + \left(\frac{m\pi}{\tau}\right)^2} * \left[-\frac{1 \cos\left(\frac{m\pi}{\tau}\right)^2}{2m\pi} \tau \right] \right]$$

Let's proceed to calculating the integral I44(t):

$$I_{44}(t) = p_1 n_0 \left[\frac{m\pi Na}{\tau} \sin(\varphi_1) * \frac{\frac{m\pi}{\tau}}{[(1-k)(n_0 + \Delta p \cos(\varphi_2))]^2 + \left(\frac{m\pi}{\tau}\right)^2} * \left(-\frac{\tau}{m\pi} \right) \cos\left(\frac{m\pi}{\tau}\right) - \frac{(1-k)(n_0 + \Delta p \cos(\varphi_2))}{[(1-k)(n_0 + \Delta p \cos(\varphi_2))]^2 + \left(\frac{m\pi}{\tau}\right)^2} * \left(\frac{\tau}{m\pi} \right) \sin\left(\frac{m\pi}{\tau}\right) \right]$$

Calculate the integral I 54(t):

$$I_{54}(t) = p_1 \Delta p \cos(\varphi_2) \left[\frac{m\pi Na}{\tau} \sin(\varphi_1) * \frac{\frac{m\pi}{\tau}}{[(1-k)(n_0 + \Delta p \cos(\varphi_2))]^2 + \left(\frac{m\pi}{\tau}\right)^2} * \left[-\frac{1 \cos\left(\frac{m\pi}{\tau}\right)^2}{2m\pi} \tau \right] - \frac{(1-k)(n_0 + \Delta p \cos(\varphi_2))}{[(1-k)(n_0 + \Delta p \cos(\varphi_2))]^2 + \left(\frac{m\pi}{\tau}\right)^2} * \left[\frac{\frac{1}{2} \sin\left(\frac{m\pi}{\tau}\right) \cos\left(\frac{m\pi}{\tau}\right) + \frac{1}{2} \left(\frac{m\pi}{\tau}\right)}{m\pi} \tau \right] \right]$$

Consider the integral I64(t) as a result we get:

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$$I_{54}(t) = p_1 \Delta p \cos(\varphi_2) \left[\frac{m\pi Na}{\tau} \sin(\varphi_1) * \left[\frac{\frac{m\pi}{\tau}}{[(1-k)(n_0 + \Delta p \cos(\varphi_2))]^2 + \left(\frac{m\pi}{\tau}\right)^2} * \right. \right. \\ \left. \left. * \left[\frac{\frac{1}{2} \sin\left(\frac{m\pi}{\tau}\right) \cos\left(\frac{m\pi}{\tau}\right) + \frac{1}{2} \left(\frac{m\pi}{\tau}\right)}{m\pi} \right] \tau - \frac{(1-k)(n_0 + \Delta p \cos(\varphi_2))}{[(1-k)(n_0 + \Delta p \cos(\varphi_2))]^2 + \left(\frac{m\pi}{\tau}\right)^2} \left[-\frac{1 \cos\left(\frac{m\pi}{\tau}\right)^2}{2m\pi} \tau \right] \right. \right]$$

Next, we define the integrals I2(t), I3(t):

$$I_2(t) = cNa \left(\frac{m\pi}{\tau} \right) \sin\left(\frac{m\pi}{\tau} - \varphi_1 \right)$$

$$I_3(t) = \int k_2 p_1 N_p(t) dt,$$

where N_p is the quantity of goods on the market determined from the expression:

$$N_p(t) = -\frac{m\pi Na}{\tau} \cos(\varphi_1) * \left[\frac{(1-k)(n_0 + \Delta p \cos(\varphi_2))}{[(1-k)(n_0 + \Delta p \cos(\varphi_2))]^2 + \left(\frac{m\pi}{\tau}\right)^2} * \sin\left(\frac{m\pi}{\tau}\right) - \right. \\ \left. - \frac{\frac{m\pi}{\tau}}{[(1-k)(n_0 + \Delta p \cos(\varphi_2))]^2 + \left(\frac{m\pi}{\tau}\right)^2} * \cos\left(\frac{m\pi}{\tau}\right) \right] + \frac{m\pi Na}{\tau} \sin(\varphi_1) * \\ * \left[\frac{\frac{m\pi}{\tau}}{[(1-k)(n_0 + \Delta p \cos(\varphi_2))]^2 + \left(\frac{m\pi}{\tau}\right)^2} \sin\left(\frac{m\pi}{\tau}\right) + \frac{(1-k)(n_0 + \Delta p \cos(\varphi_2))}{[(1-k)(n_0 + \Delta p \cos(\varphi_2))]^2 + \left(\frac{m\pi}{\tau}\right)^2} \cos\left(\frac{m\pi}{\tau}\right) \right]$$

As a result, we get:

$$I_3(t) = k_2 p_1 \left(\frac{m\pi Na}{\tau} \cos(\varphi_1) * \left[\frac{(1-k)(n_0 + \Delta p \cos(\varphi_2))}{[(1-k)(n_0 + \Delta p \cos(\varphi_2))]^2 + \left(\frac{m\pi}{\tau}\right)^2} \left(-\frac{\tau}{m\pi} \right) \cos\left(\frac{m\pi}{\tau}\right) - \right. \right. \\ \left. \left. - \frac{\frac{m\pi}{\tau}}{[(1-k)(n_0 + \Delta p \cos(\varphi_2))]^2 + \left(\frac{m\pi}{\tau}\right)^2} \left(\frac{\tau}{m\pi} \right) \sin\left(\frac{m\pi}{\tau}\right) \right] + \frac{m\pi Na}{\tau} \sin(\varphi_1) * \right. \\ \left. * \left[\frac{\frac{m\pi}{\tau}}{[(1-k)(n_0 + \Delta p \cos(\varphi_2))]^2 + \left(\frac{m\pi}{\tau}\right)^2} * \left(-\frac{\tau}{m\pi} \right) \cos\left(\frac{m\pi}{\tau}\right) + \frac{(1-k)(n_0 + \Delta p \cos(\varphi_2))}{[(1-k)(n_0 + \Delta p \cos(\varphi_2))]^2 + \left(\frac{m\pi}{\tau}\right)^2} \left(\frac{\tau}{m\pi} \right) \sin\left(\frac{m\pi}{\tau}\right) \right] \right]$$

The built model allows you to take into account the processes that occur in the production, sale and storage of finished products, as well as in the field of

its repair. In addition, based on this mathematical model, the company's management can reasonably

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make management decisions to regulate the level of output.

Let's consider an illustrated example based on the model considered. To do this, in table 2, we present the initial data for solving this economic and mathematical model.

Table 2 uses the following symbols:

t – current time, weeks;

C – the total cost of the product (pair of shoes) rub.;

R-return on sales, %;

P1-the originally planned selling price of a pair of shoes, rub.

P2-price at the discount (surcharge) entered, under the influence of market factors, in rubles.

DR1 – the difference between the original price p 1 and the price p 2, RUB.

S - the amount of the discount (surcharge) in % of the price;

k2-payment for storage of a unit of goods per unit of time t, in % of the cost price;

Na-the amplitude value of the Shoe production volume for the period, PCs.;

Nmax-production of footwear at maximum capacity utilization, PCs.;

Nmin-the expected production of shoes to meet the most likely needs of regular customers of the enterprise (set by the management of the enterprise based on the real situation on the market), PCs.;

t – the period of one turnover of the company's working capital, weeks;

k-coefficient of repaired products;

m, n0-constant coefficients;

φ1, φ2-phase angles.

Let's say a Shoe manufacturing company has an order for the production of 500 pairs of shoes at the price of 395 rubles per pair, 625 pairs at the price of 375 rubles per pair. The production capacity of the company allows you to produce 2000 pairs of shoes for a period of 4 months. The head of the company must decide how much it is possible to "fully load" the production capacity of the company in order to sell the remaining part of the possible production of shoes on their own.

Table 2. Initial data for calculating EMM-forecasting the company's profit in the conditions of unstable demand for children's shoes

t	C	p1	p2	Δp1	k2	Na	Nmin	Nmax	τ	k	m	n	φ1	φ2	n0
1	305	395	350	45	0,3	112,5	100	125	12	0,01	-1	3,14	65	45	1
2	305	395	350	45	0,3	112,5	100	125			-1		60	45	
3	305	395	350	45	0,3	112,5	100	125			-1		60	45	
4	305	395	350	45	0,3	112,5	100	125			-1		45	45	
5	305	395	350	45	0,3	112,5	100	125			-1		45	45	
6	305	395	350	45	0,3	112,5	100	125			-1		45	45	
7	305	395	350	45	0,3	112,5	100	125			-1		45	45	
8	305	395	350	45	0,3	112,5	100	125			-1		45	45	
9	305	395	350	45	0,3	112,5	100	125			-1		50	50	
10	305	395	350	45	0,3	112,5	100	125			-1		55	55	
11	305	395	350	45	0,3	112,5	100	125			-1		60	60	
12	305	395	350	45	0,3	112,5	100	125			-1		65	65	
13	305	395	350	45	0,3	112,5	100	125			-1		70	70	
14	305	395	350	45	0,3	112,5	100	125			-1		75	75	
15	305	395	350	45	0,3	112,5	100	125			-1		80	80	
16	305	395	350	45	0,3	112,5	100	125			-1		85	85	

Let's say the company's management decided to additionally produce (in addition to orders) another 475 pairs of shoes and implement this volume independently.

Thus, the program for the production of children's shoes for the period will total 1625 pairs.

Solving this EMM model with basic conditions: production program-1600 pairs; possible discount up to the price level for a pair of up to 350 rubles, in MS Excel we get the following data, shown in figure 8.

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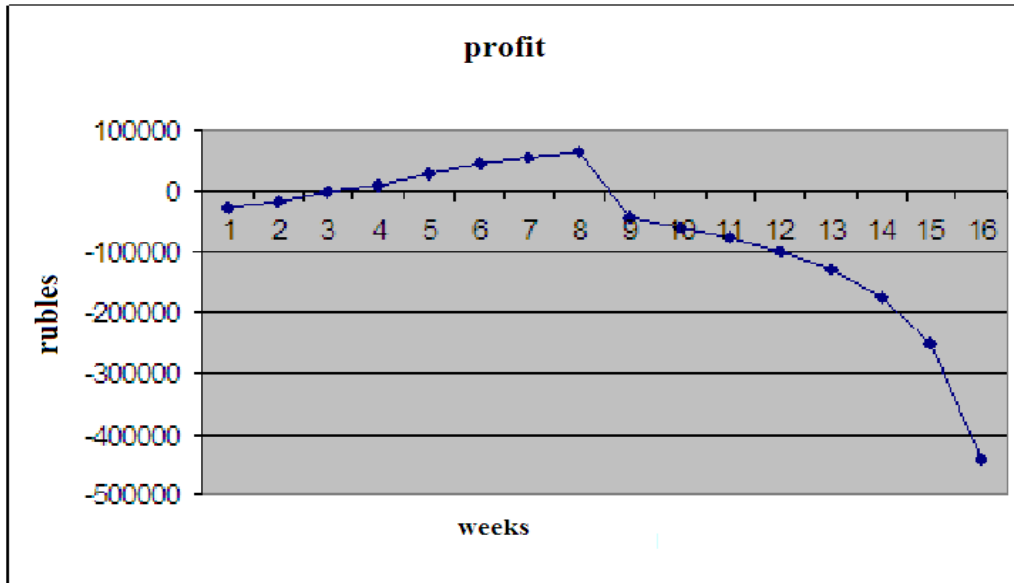


Fig. 8. Dynamics of the company's profit

Thus, from figure 8 it is clear that the company in the production of shoes under these conditions will make a profit for 5.5 weeks. Somewhere from the middle of the third week to the end of week 8,

further production of children's shoes of this type becomes impractical. Table 3 shows the values of profit dynamics.

Table 3. Value net profit dynamics, RUB.

Недели	1	2	3	4	5	6	7	8	ИТОГО
Прибыль	28287,5	17002,6	1217,64	9667,719	27453,06	13956	17135,98	61241,57	82946,6

Table 3 shows that the total profit that can be achieved by the company under these conditions is 82946.6 rubles.

At the same time, when a product is sold at a price in the forecast period that exceeds the original price, for example, by 10 rubles (405 rubles), we get

a completely different character of the schedule (figure 9)

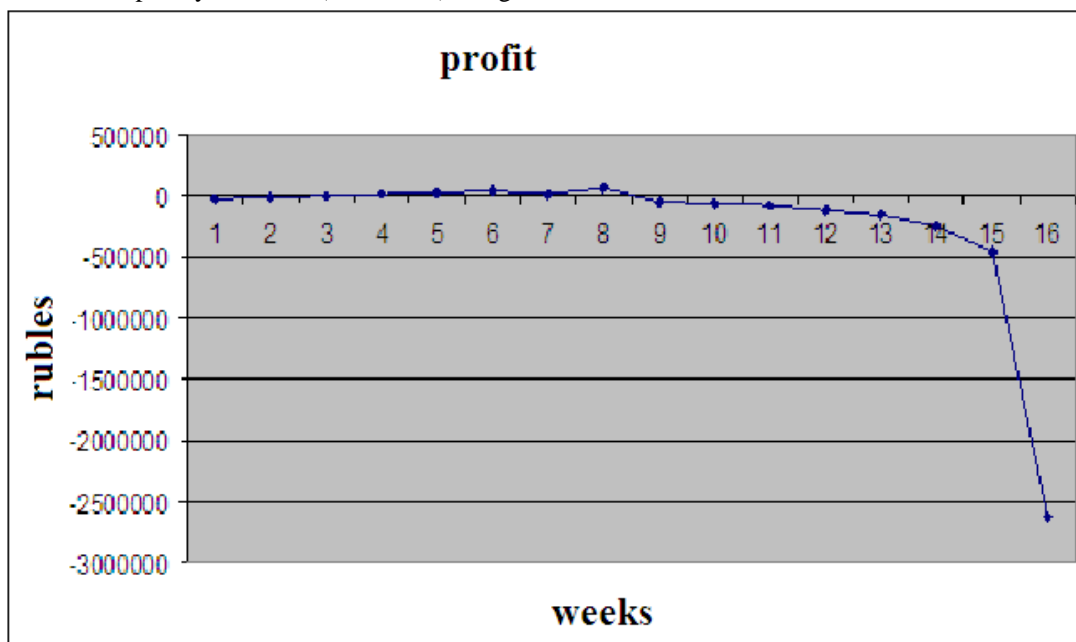


Fig. 9. Dynamics of the Shoe company's profit at the planning allowances

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Figure 9 shows that the company under these conditions will make a profit for only 4.5 weeks. And the size of the total profit for this period will be reduced to 80464.5 rubles (table. 4) Thus, the period of economic life of children's shoes with the introduction of the surcharge will be reduced by 1

week, which will lead to a decrease in the company's profit by 2482.1 rubles. This is due to the fact that at a relatively high price of the product, there is a gradual drop in demand, and consequently, the volume of sales along with profit

Table 4. Dynamics of profit at surcharge

weeks	Profit
1	-29116,3
2	-17881,4
3	-2158,25
4	9927,772
5	28222,75
6	11126,32
7	15034,23
8	65309,36
TOTAL	80464,5

Obviously, in this situation, you should not increase the price of the product, and the better solution is to reduce the cost of production. The model equation calculation optimization prices of a specific production program allows us to trace, in what period of time the company's management, it is better to set a maximum price for the products or sell products as the company may incur losses.

When analyzing and predicting socio-economic phenomena, the researcher is often faced with the multidimensional nature of their description. This happens when solving the problem of market segmentation, building a typology of countries based on a fairly large number of indicators, forecasting the market conditions of individual products, studying and forecasting economic depression and many other problems.

The purpose of calculating this economic and mathematical model is to justify the creation of a cluster in the southern Federal district and the Northern Federal district.

Often in economic research there is a problem of analyzing heterogeneous data in some sense. In such cases, before proceeding to the construction of regression models, it is necessary to select homogeneous groups of objects and build regression dependencies within each group. The development of this approach is a variant of classification by several generalizing indicators (main components) obtained using the methods of factor and component analysis

Multidimensional analysis methods are the most effective quantitative tool for studying socio-economic processes described by a large number of characteristics. These include cluster analysis, taxonomy, pattern recognition, and factor analysis. Cluster analysis is one of the multidimensional methods of enterprise classification. It is a set of methods that allow classifying multidimensional observations, each of which is described by a set of initial variables X_1, x_2, \dots, X_M .

The task of cluster analysis is to divide the initial set of objects into groups of similar, close objects. These groups are called clusters. The results of such classification should have a meaningful interpretation.

Cluster analysis methods allow you to solve the following problems:

- classification of objects based on features, reflecting the essence and nature of objects. The solution of such a problem usually leads to a deeper knowledge of the set of classified objects;
- checking the assumptions made about the presence of some structures in the studied set of objects, i.e. search for an existing structure;
- construction of new classifications for poorly studied phenomena, when it is necessary to establish the presence of links within the population and try to bring structure to it.

Cluster analysis is a set of different algorithms for distributing objects across clusters. To date, a huge number of clustering algorithms are known.

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One of the most common methods of cluster analysis is the K-means method, which refers to iterative methods of cluster analysis. It is often referred to as the reference method for cluster analysis. The number of clusters To is set by the user. The procedure is as follows. At the first step, you define the reference cluster Type. Then each object is attached to the nearest reference. The minimum distance within the cluster relative to the average is

used as a criterion. As soon as the object is included in the cluster, the average is recalculated. After the reference is recalculated, objects are again distributed to the nearest clusters, and so on. The procedure ends when the process is stabilized, i.e. when the centers of gravity are stabilized.

The reference companies that are grouped into a cluster are shown in table 5.

Table 5. Reference companies

№	The name of the manufacturer	Release 2019	Volume of sales
1	LLC "Bris – Bosfor»	15064	14310,8
2	Mercury TV LLC»	89,3	84,835
3	OOO "the World»	175,7	166,91
4	CJSC Donobuv, Rostov region.	964,7	916,47
5	SE KBR " Narbek»	43,3	41,135
6	ZAO "Magical»	212	201,4

Find the distance between all six objects. The calculation is performed using the formula (6):

$$\rho(x_i, x_j) = \sqrt{x \sum_{e=1}^k (x_{ie} - x_{je})^2} \quad (6)$$

The results are presented in table 6.

It follows from the matrix that objects 3 and 6 are closest 3.6=50.07 and are therefore combined into a single cluster. In this case the company "the World" and ZAO "Magical".

At the next stage, you need to attach the object to the cluster instead of the object to the object. For example, to calculate the distance between an object and a cluster, use the following formula (7):

$$\rho(S_l, S_{(m,g)}) = \alpha p_{lm} + \beta p_{lg} + \gamma p_{mg} + \delta (p_{lm} - p_{lg}) \quad (7)$$

Table 6. Distance between objects

X1	15064	89,3	175,7	964,7	43,3	212
X2	14310	84,83	166,91	916,47	41,1	201,4
		20654,23	20535,05	19446,77	20717,70	20484,98
	20654,23		119,17	1207,46	63,47	169,24
	20535,05	119,17		1088,28	182,64	50,07
	19446,77	1207,46	1088,28		1270,93	1038,21
	20717,70	63,47	182,64	1270,93		232,71
	20484,98	169,24	50,07	1038,21	232,71	
№	1	2	3	4	5	6

After the calculations, we get table 7.

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Table 7. Distance between an object and a cluster

№1	№2,3,6	№4	№5
	20485,20	19447,30	20718,20
20485,20		1270,90	63,4
19447,30	1038,2		182,40
20718,20	63,4	182,40	

As a result of the model calculation, object #2 was added to the cluster, since they are the closest, 2.3, 6=50.7. In our case, this is the company "mercury TV" LLC.

In the future, the distance between clusters will be found using the "nearest neighbor" principle, using the recalculation formula

Distance between an object and a cluster

№1	№2	№3,6	№4	№5
	20654,70	20485,20	19447,30	20718,20
20654,70		50,70	1207,40	63,45
20485,20	50,07		1088,20	182,40
19447,30	1207,40	1038,2		1270,90
20718,20	63,40	182,40	1270,90	

As a result of the model calculation, object #5 was added to the cluster, since they are the closest, 5.2, 3, 6=63.4. In our case, this is the enterprise of the SE KBR "Narbek".

Table 8. Distance between an object and a cluster

№1	№2,3,6,5	№4
	20485,20	19447,30
20485,20		63,4
19447,30	63,4	

We will join the existing cluster enterprise No. 4 CJSC Donobuv, Rostov region.

The results of hierarchical classification of objects are shown in figure 10 as a dendrogram.

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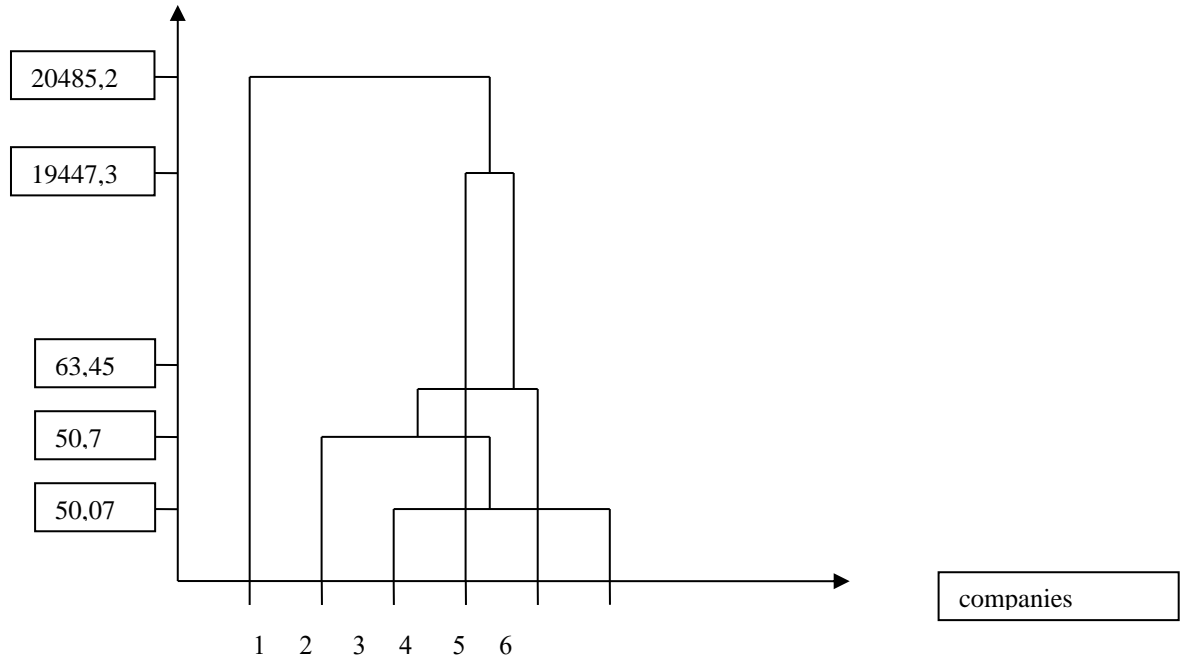


Fig. 10. Dendrogram

As a result of cluster analysis, we will get groups of similar objects. They are objects numbered 2,3,6, 1,4.

In conclusion, various cluster analysis methods allow you to get clusters that differ in size and shape.

A Shoe cluster can be formed in the southern Federal district and the Northern Federal district on a functional basis. When using a mathematical model, it should be taken into account that it groups homogeneous groups of enterprises, combining them according to the minimum distance criterion. Therefore, subclusters can be allocated within a cluster.

Any production of shoes or other goods must begin with a sales plan that is developed by the sales (marketing) Department. This financial forecast should include the planned sales volumes for the period, the planned sales price and the planned profit for this type of product.

For the mathematical model, we selected a type of product such as children's shoes. In the southern Federal district and the Northern Federal district, there is no production of this type of product, and, consequently, all products are imported. Setting up production in our region is considered cost-effective and appropriate.

But in industrial production, you need to know the time when you should stop producing this model of shoes and switch to a new model or sew another model in large volumes (product diversification).

For this purpose, you can use an indicator such as price elasticity. It shows the percentage change in sales as a result of a 1% price change and can be compared for different product brands. Price elasticity, which is related to the sales function considered here, has the following properties:

- its absolute value increases as it increases positive or negative values of deviation from the price of competitors;
- the sales function in question does not prescribe an unambiguous dynamics of price elasticity over time (it may increase, decrease, or remain unchanged);
- since the impact of absolute prices is not significant,

that is, price changes do not lead to a decrease in primary demand, but to a change in market share. direct price elasticity and cross - price elasticity (the percentage change in sales with a one-percent change in the price of competitors) are the same in size and there is no need to distinguish them.

At the first stage of building the model, we predict the ideal scheme for the sale of children's shoes by the manufacturer through the store. The company incurs additional costs for hiring staff and renting a trade pavilion. The amount of additional costs may vary depending on market conditions.

The initial data of the ideal model is summarized in table 9.

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Table 9. Source data

Indicator, rubles:	The amount
Variable costs	302,95
Fixed costs	5598,13
Sales price	395
Number of units sold	2000
Sales volume at the point of sale	5000
The wages of the seller	5000
Number of sellers	2
The sales area, sq m	100
Rent per 1 sq. m	100

Sales volume forecast for 1 month (25 business days).

Sales volume increases by 5 pairs per day. The company will start making a profit on the 10th day of sales, when the volume of sales per day reaches 65 pairs of shoes. Until then, the company must sell 360 pairs.

If the company's additional costs increase, the break-even point will move to the right, so the company will receive a smaller amount of profit (the profit is shown as a shaded triangle on the graph).

Let's build a break-even chart based on table 10.

Using the break-even chart in this form, you should keep in mind the following:

- calculating break-even conditions and plotting charts

- break-even rates are just tools for analyzing price decisions, but not a tool for predicting future commercial results;

- the break-even chart as shown in figure 11 is based on the possibility of a linear increase in production (sales) without any consideration for seasonality. Meanwhile, for many types of products, ignoring the seasonality is illegal. For example, for production, where the costs are carried out mainly at the beginning of a long production cycle, and the sale

of finished products-only after its completion (this can work, for example, a Shoe company that prepares the entire batch of products for wholesale to trading firms on the eve of the new season);

- Analyzing the conditions for achieving break-even, we must not forget that this is just an intermediate finish on the way to the main goal – to achieve the highest profitability of sales.

When calculating break-even conditions or building appropriate schedules, it is important to correctly set data on the degree of capacity utilization and sales conditions for products. For example, the above graph was built for the conditions of full, one-hundred-percent use of production capacity and full sale of all manufactured products, that is, it characterized the company's result at all maximums: output, sales, revenue.

In practice, such an overly optimistic approach is simply dangerous to adhere to, and all conditions must be adjusted downward. Thus, the use of production capacity should be taken at the level of 75-80 %. The calculations should also take into account the possibility of some of the manufactured products settling in the inventory due to the slow implementation process.

Table 10. Sales volume of children's shoes

Number	Number of prod. Pairs	Sales volume	Post. cost	AC. cost	Total costs	Profit	Add. Cost.
1	20	7820,00	5598,13	6059	11657,13	-3837,13	80
2	25	9775,00	5598,13	7573,75	13171,88	-3396,88	100
3	30	11730,00	5598,13	9088,5	14686,63	-2956,63	120
4	35	13685,00	5598,13	10603,25	16201,38	-2516,38	140
5	40	15640,00	5598,13	12118	17716,13	-2076,13	160
6	45	17595,00	5598,13	13632,75	19230,88	-1635,88	180

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7	50	19550,00	5598,13	15147,5	20745,63	-1195,63	200
8	55	21505,00	5598,13	16662,25	22260,38	-755,38	220
9	60	23460,00	5598,13	18177	23775,13	-315,13	240
10	65	25415,00	5598,13	19691,75	25289,88	125,12	260
11	70	27370,00	5598,13	21206,5	26804,63	565,37	280
12	75	29325,00	5598,13	22721,25	28319,38	1005,62	300
13	80	31280,00	5598,13	24236	29834,13	1445,87	320
14	85	33235,00	5598,13	25750,75	31348,88	1886,12	340
15	90	35190,00	5598,13	27265,5	32863,63	2326,37	360
16	95	37145,00	5598,13	28780,25	34378,38	2766,62	380
17	100	39100,00	5598,13	30295	35893,13	3206,87	400
18	105	41055,00	5598,13	31809,75	37407,88	3647,12	420
19	110	43010,00	5598,13	33324,5	38922,63	4087,37	440
20	115	44965,00	5598,13	34839,25	40437,38	4527,62	460
21	120	46920,00	5598,13	36354	41952,13	4967,87	480
22	125	48875,00	5598,13	37868,75	43466,88	5408,12	500
23	130	50830,00	5598,13	39383,5	44981,63	5848,37	520
24	135	52785,00	5598,13	40898,25	46496,38	6288,62	540
25	140	54740,00	5598,13	42413	48011,13	6728,87	560
Σ	2000	782000		605900	745853,25	36146,75	8000

Downward adjustments are also desirable in order to take into account possible failures in the process of production, transportation, or organization of sales of goods.

Let's take the built ideal model as a forecast presented by the company's marketers. Let's see how the profit value will change depending on the influence of seasonality.

Sales of shoes are growing disproportionately

(faster) than in the previously reviewed model (table 11).

With increased sales growth by the end of the month, the company will have to produce about 4,000 pairs of children's shoes of this model, but the production program is designed for 2000 pairs. In order to reach a new level of production and sales, it is necessary to invest in the purchase of additional equipment and the construction of a new shop.

Table 11. Sales growth

day	Number of prod. units., steam	Price, RUB	Sales volume	Additional costs	Post. cost	AC. cost	Total expenses	Profit
1	20	395	7820	80	5598,13	6059	11657,13	-3837,13
2	25	395	9775	100	5598,13	7573,75	13171,88	-3396,88
3	30	395	11730	120	5598,13	9088,5	14686,63	-2956,63
4	35	395	13685	140	5598,13	10603,25	16201,38	-2516,38
5	40	395	15640	160	5598,13	12118	17716,13	-2076,13
6	46	395	17986	184	5598,13	13935,7	19533,83	-1547,83
7	53	395	20723	212	5598,13	16056,35	21654,48	-931,48
8	61	395	23851	244	5598,13	18479,95	24078,08	-227,08
9	71	395	27761	284	5598,13	21509,45	27107,58	653,42

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Therefore, the firm's management should consider increasing the price by 10 % instead of increasing the scale of output, in order to reduce the amount of demand to the level provided by the current capacity of the firm. Naturally, the company's management hopes to gain profit by selling at prices with a higher unit gain (sales price minus variable costs). As it is easy to calculate, it will increase accordingly by 39.5 rubles, that is, it reaches the value of 131.55 rubles or 30.28 % of the new price. You need to check the conditions for successful implementation of this policy.

First, we will determine the extent of the break-even reduction in sales after the price increase. The relative break-even change in sales will be (%):

$$BSCp = -\square P / (CM + \square P)100 = -39,5 / (92,05+39,5)100 = -30,$$

where BSCp is the break-even increase in sales as a result of price changes,%;

$\square P$ -price change;

CM-specific gain.

When we determine the break-even change in sales in absolute terms, we take the expected sales volume as the starting point, not the one that has already been achieved (after all, we want to prevent it from being achieved). Then the break-even change in sales is equal to (par):

$$Bssa = 4000(-0.3) = 1200.$$

Thus, if after increasing the price of shoes, the volume of its sales decreases by less than 1200 pairs, the company will receive a larger profit than before. If the volume of sales falls by more than 1200 pairs, the firm will face a reduction in profit from sales (the price effect will be less than the volume effect).

We must also take into account the benefits of the prevented increase in fixed costs. According to the company's engineering service, the purchase of equipment that would allow the company to produce up to 4,000 pairs of shoes per month would require expenses in the amount of 100,000 rubles. Hence, based on prevented the need to bear these costs, the firm with higher prices will lose and in that case, if

its sales decline even more than 30 %, namely 30% plus reduction in break-even sales, which nullifies the winning firms are prevented from increase of fixed costs. The calculation of such a complex break-even reduction in sales (in which we show the amount of costs for non-purchased equipment, respectively, with a minus sign) gives us the following result:

$$BSCp = -30 + (-100000) / (131,554000)100 = -30 - 19 = -49 \%;$$

$$Bssa = -0.494000 = -1960 \text{ (pair of shoes).}$$

To make the economic boundaries of the decision to reduce the price more obvious to us, we will summarize them in table 13.

Let's pay attention, first of all, to options 3, 6 and 8. Option 3 corresponds to a situation when a decline in sales after a price increase allows the company to produce the same volume of products, that is, investing in additional equipment is unnecessary. From this point on, the company begins to earn additional profit by saving on fixed costs. Therefore, from this level of sales reduction, the value of equipment purchase costs equal to 100,000 rubles appears in column G. Since these are saved costs, we show them with a minus sign.

Option 6 corresponds to a situation where the price effect and the scale effect balance each other and the gain gain becomes zero. In other words, the increase in winnings after the price increase (39.5 rubles), multiplied by the entire volume of possible future sales (4000 pairs), is equal to the reduction in winnings, defined as the product of the new absolute value of the winnings (131.55 rubles) by the reduction in sales compared to the possible future level (1200 = 4000*0.3).

But since the firm also saves conditional fixed costs, in fact, at this point, its profit change has not yet become zero. It still receives a profit increase in the amount of the amount of notional fixed costs saved (100,000 rubles).

Table 12. Determining break-even sales volume when the price increases

Options	The scale possible reduction sales volume		Change the total amount of the company's gain from sales, RUB.			Prevented the growth conditionally fixed costs, RUB	Change total amount of profit after price changes (HEDGEHOG)
	%	couples (4000*%) /100	Increase based on possible future sales volume (39.5*4000)	Decrease based on reduced sales (131.55*In)	TOTAL (G+D)		
A	Б	B	Г	Д	E	Ж	З
1	0	0	158000	0	158000	0	158000
2	10	400	158000	-52620	105380	0	105380

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3	15	600	158000	-78930	79070	0	79070
4	20	800	158000	-105240	52760	-100000	152760
5	25	1000	158000	-131550	26450	-100000	126450
6	30	1201	158000	-158000	0	-100000	100000
7	40	1600	158000	-210480	-52480	-100000	47520
8	49	1961	158000	-258000	-100000	-100000	0
9	50	2000	158000	-263100	-105100	-100000	-5100
10	60	2400	158000	-315720	-157720	-100000	-57720

And only in option 8, the company's profit growth really becomes zero. Only with such a drop in sales volumes – by 1,961 pairs against a possible future level of 4,000 pairs – does the volume effect fully balance both the price effect and the savings in fixed costs.

This means that if a 10% increase in the price causes a 50% or more drop in the number of sales, then the company should look for another price solution.

This is even more clearly seen in figure 12.

As we can see, when sales are reduced in the range of 0-800 pairs, the firm receives an additional profit (+ΔP) due to the fact that for each unit sold, it receives a greater gain than at the previous price, and its amount exceeds the loss of winnings as a result of reduced sales. When the reduction in sales reaches 800 pairs, the situation changes: the company's profit

growth is also affected by savings on unrealized fixed costs. Therefore, the break-even point is actually shifted from the position of 1201 pairs to the position of 1961 pairs of sales reduction. At this point, losses due to the volume effect cancel out all gains from the price effect and prevent the growth of fixed costs.

If, however, the drop in sales exceeds this threshold, the firm will start to suffer direct losses (-ΔP).

As a result of the 10% price increase, sales of children's shoes increased by 15 % from the previously planned sales of 2,000 pairs to 2,300 units. Since the company had a stock of production capacity, it was able to increase production without additional fixed costs. For more information on Shoe sales, see the App.

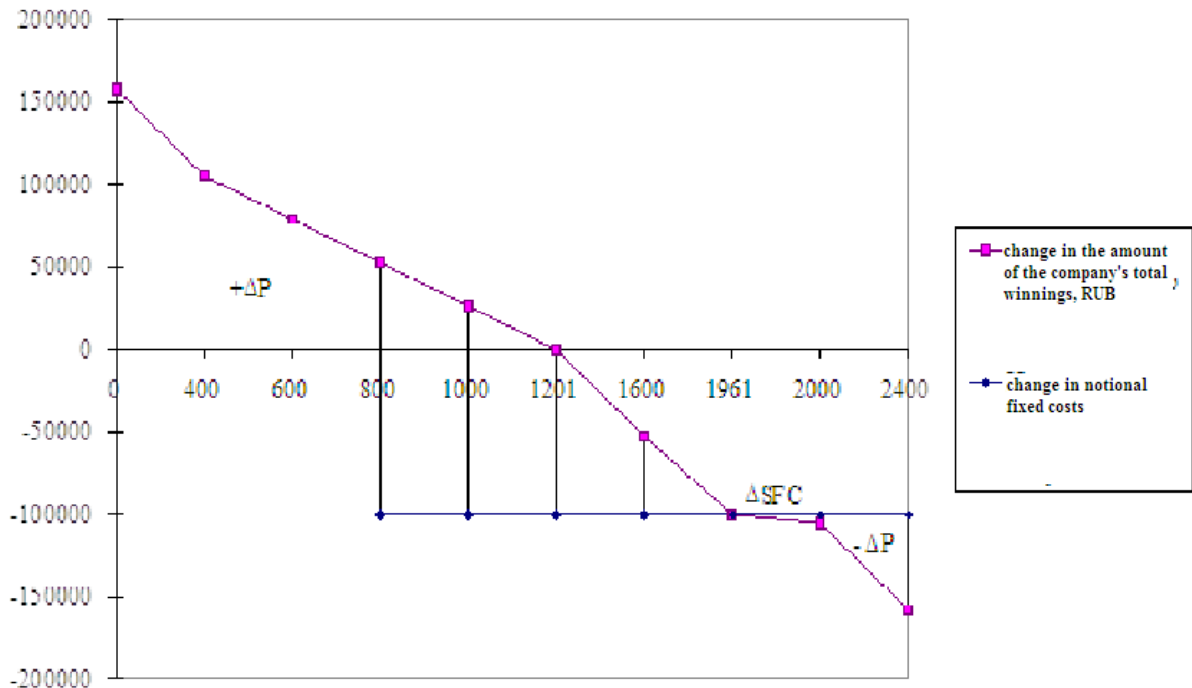


Fig. 12. the Economic consequences of raising the price and preventing investment in capacity expansion: +ΔP, -ΔP – respectively increase and decrease in the firm's profit □s SFC-change in fixed costs Now let's look at a situation where a company is forced to reduce the price of shoes, as well as incur additional fixed costs.

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First, let's consider the case when the demand for shoes has an elasticity equal to one, and therefore

the sales volume increases by exactly the same percentage as the price decreases (table 13).

Table 13. Conditions for a firm to break even with a price reduction by 5 %

Change indicators conditions of the company's activity	Value	
	Source	After price reduction
Price for a pair, RUB.	434,5	412,8
Price change, %	-	5%
The firm's specific gain, RUB.	131,55	109,8
Winnings, % of the price	30,28%	26,61%
Break-even change in sales volume, %	-	19,8%
Break-even change in sales volume, pairs	-	455
Total sales, pairs	2300	2755
The company's total winnings, RUB.	302565	302565

The break-even change in sales volume is equal to:

$$BSCp = -(-21,7) / (131,55 + (-21,7)100) = 18,9 \%$$

Thus, a 5% reduction in the price will pay off for the company only if the number of pairs of shoes sold increases by 18.9 % or 455 pairs.

Let's model several scenarios, including different levels of demand elasticity—both less and more than one (table 15). This will help us analyze the financial consequences for the company of a combined decision: to reduce the price and purchase additional equipment in order to increase the production of shoes to meet the increase in demand after the price decrease.

To make the logic of its construction more clear, let's analyze for example option 3, in which the increase in the number of pairs of shoes sold (after a single 5% price reduction for all the analyzed options) will be 15 %. Without calculations, we would estimate this elastic change in demand as a very favorable scenario. But we'll do the math.

So, an increase in the number of sales by 15 % will mean that the company will be able to sell 345 more pairs of shoes every month, that is, the number of sales will increase to 2645 pairs. But since they will now be sold at 21.7 rubles cheaper (not at 434.5 rubles, but only at 412.8 rubles), then based on the

previous sales volume (2300), the company's losses (the price effect) will be -49967.5 rubles. Obviously, this value is the same for all the options under consideration.

But the increase in sales will also bring the company an increase in winnings. Since variable costs are not affected by changes in prices and remain at the same level – 302.95 rubles, the new value of the specific gain after the price reduction will be 109.8 rubles (412.8-302.95). Multiplying it by the increase in the number of pairs of shoes sold, we get an increase in the company's winnings (the volume effect). It will be 37889.63 rubles (109.8345) for this option.

In total, the resulting change in the value of the firm's gain under the influence of the price effect and the scale effect will be -12077.9 rubles.

$$(-49967.5 + 37889.63).$$

Since the company could not provide such an increase in output on the existing fleet of equipment, it purchased additional equipment, which led to an increase in the amount of its fixed expenses per month by 10,000 rubles. This leads to an even greater reduction in the amount of her winnings. It will be -22077.88 rubles for this option.

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Table 14. Modeling the financial consequences of reducing the price and purchasing additional equipment

Options	Scope of the possible changes in sales volumes, %	Increase in the number of products sold, pairs, 2300*B / 100	Change in the total amount of the company's gain from sales, RUB.			Incremental fixed costs per month, RUB.	Change in total profit after the price changes, RUB. (E-W)
			Reduction based on previous sales volume (21.7*2300)	Increase in calculation on sales growth (109.8*V)	TOTAL (G+D)		
A	Б	B	Г	Д	Е	Ж	З
1	0	0	-49967,5	0	-49967,5	0	-49967,5
2	10	230	-49967,5	25259,75	-24707,8	10000	-34707,75
3	15	345	-49967,5	37889,63	-12077,9	10000	-22077,88
4	19,8	455	-49967,5	49967,5	0	10000	-10000
5	23,7	546	-49967,5	59967,5	10000	10000	0
6	30	690	-49967,5	75779,25	25811,75	10000	15811,75
7	40	920	-49967,5	101039	51071,5	20000	31071,5

Therefore, this option, despite a 15 % increase in the number of pairs of shoes sold, will be unsuccessful for the company. Her monthly winnings will be reduced by -22077.88 rubles.

The company will only be able to get an increase in winnings if the increase in the number of sales is more than 23.7 %.

But let's pay attention to option 7, where we modeled the most favorable development of the situation – an increase in the number of sales by 40%, or 920 pairs of shoes. This increase in volume can be achieved by the enterprise at an additional fixed cost of 20,000 rubles. But the gain will also be the largest of all the options under consideration, which will be provided by an extremely large amount of the volume effect – it will bring the company an increase in winnings in the amount of 3,1071. 5 rubles.

Let's look at our sales forecast again. As a result of the 5% price reduction, sales increased by 39.1 % to 3,200 pairs of shoes per month. The company was

also forced to purchase additional equipment (10,000 rubles) to ensure sales growth

Let's look at another situation when variable costs for products (a pair of shoes) change. Let's look at the above BSCp formula. To do this, we need to simply subtract the variable cost change from the price change before calculating the break-even change in sales (%). Please also note that, in contrast to the calculation that we performed for an isolated price change, in this case, the values used for the calculation must be expressed in absolute monetary units (in rubles or another currency). And then the equation will take the following form:

$$BSCp = - (\Delta P - \Delta VC) / (CM0 + (\Delta P - \Delta VC))100,$$

where BSCp is the value of break-even sales growth, %;

ΔP - price change;

CM0 – the previous absolute value of the specific gain;

ΔVC - change in the value of variable costs.

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Returning to the problems of our company, we use this formula to calculate the required break-even sales growth. Let's say the changes in variable costs were 15 rubles. Therefore, the change in the specific gain for it will be equal to:

$$\square CM = (\square P - \square VC) = -21,7 - (-15) = -6,7.$$

Since we previously established that the specific gain before the price change was equal to 131.55 rubles, now nothing prevents us from calculating the break-even change in sales volume.

$$BSCp = -(-6,7) / (131,55 + (-6,7)) \cdot 100 = 4,85 \%$$

In real terms, this will amount to, respectively: $23000 \cdot 0,0485 = 111$ pairs.

Now let's look at the impact of possible changes in fixed costs on break-even sales growth. The formula for calculating this effect is as follows:

$$BSV = \square FC / CMa,$$

where BSV is the break-even sales volume, NAT. units.

FC FC-increase in the amount of fixed costs, RUB.;

CMa-specific absolute winnings, rubles

Since we remember that the unit gain is equal to the price minus variable costs, we can easily find for this example that the break-even increase in sales required to compensate for this increase in fixed costs is equal to:

$$BSV = 10000 \text{ rubles} / (412,8 \text{ rubles} / \text{pair} - 302,95 \text{ rubles} / \text{pair}) = 91 \text{ pairs}$$

Now the company's managers will be able to make a decision that will depend on the following conditions:

1. How likely is it in the current market situation that will you be able to sell the required volume of products on a monthly basis?

2. How big is the risk that the sales volume will be "and the firm will start to suffer losses?"

3. is it Possible to abandon the chosen pricing strategy and how can this be done quickly?

These are the questions that marketers will have to solve.

Let's turn back to the model. On the 60th day of Shoe sales, the price effect ceases to apply and sales begin to decrease. The company again decides to reduce the price of products, but demand is less responsive to this change. Here the firm must increase sales through marketing promotions, brand development, retail merchandising, etc. These activities will increase the maturity stage of the Shoe's life cycle and generate additional revenue.

But when the demand for shoes ceases to respond to price changes and other non-price factors, the company must stop producing this model. At this point, demand elasticity will begin to increase and the maturity stage will go into a decline stage (figure 13). The trend line drawn by the elasticity of demand showed that this brand of children's shoes from day 1 to day 49 was at the growth stage, from day 49 to day 73-at the maturity stage, and from day 73 to day 100-at the decline stage.

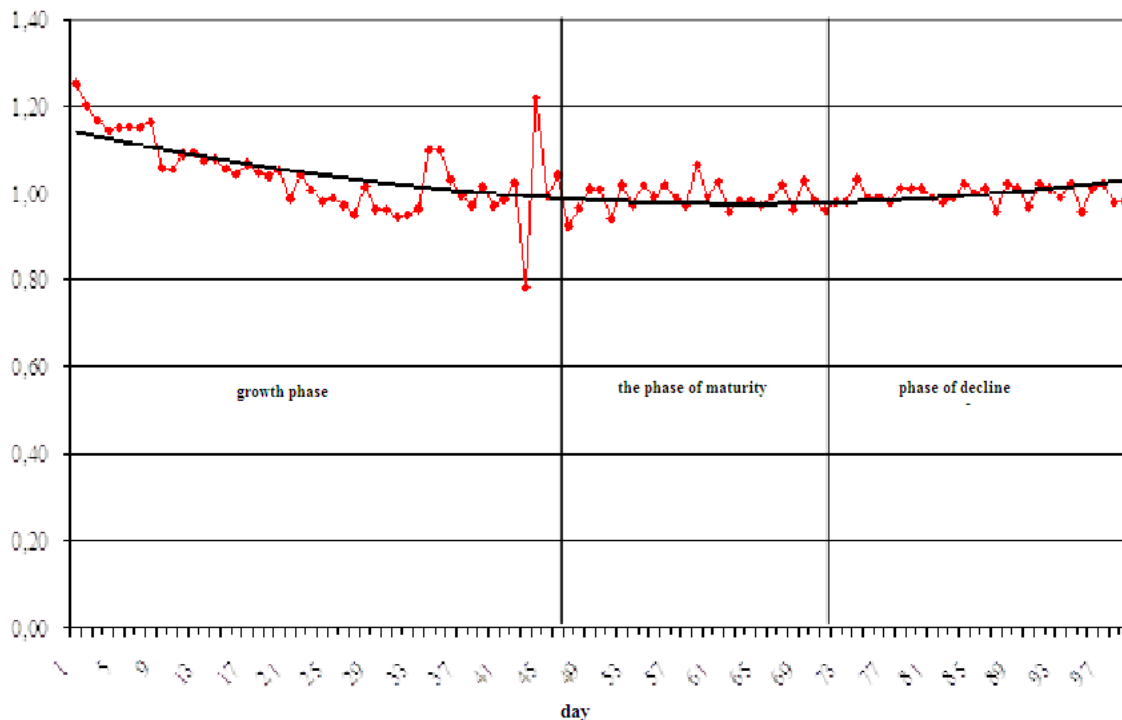


Fig. 13. The elasticity of demand

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Let's analyze the change in profit during the life cycle of shoes (figure 14).

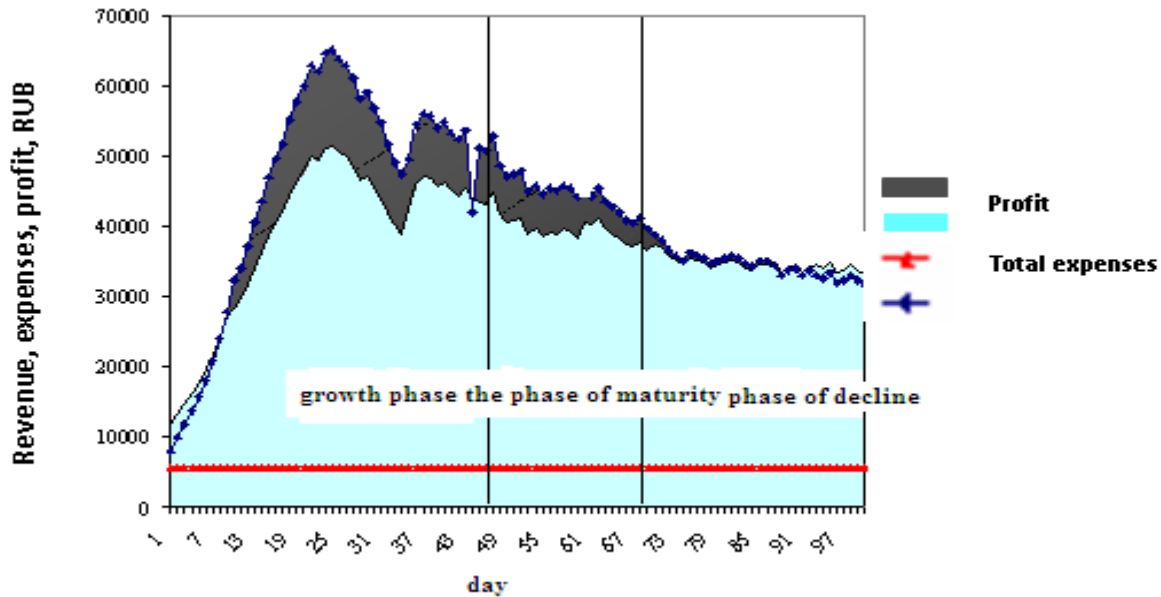


Fig. 14. sales of shoes during the life cycle of shoes

As can be seen from figure 14, the company received a maximum profit at the growth stage and a minimum at the decline stage.

Let's compare the results with the profitability of 1 pair of shoes over the life cycle of a child's Shoe model (Fig. 15).

Fig. 15. Elasticity of demand and profitability of 1 pair of shoes depending on the stage of the life cycle

At the growth stage, the profitability of 1 unit (pair) reaches the maximum value (about 20 %), at the maturity stage it decreases to 15% and by the decline stage it reaches the minimum values.

Let's compare the elasticity of demand and the daily sales volume divided by the average sales volume for the period (figure 16).

The average sales volume over the life cycle was 105 pairs. The maximum excess over the average level is observed at the growth stage. Slightly above the average value at the stage of maturity and below the average value at the stage of

decline. At the stage of maturity, the company had to apply one of the above recommendations to increase sales, so as not to receive losses in the future.

Add to the graph shown in figure 17 the break-even sales volume for each day of the Shoe brand's life cycle.

The break-even sales schedule intersects with the average sales schedule during the transition from the maturity stage to the decline stage. Thus, when the company for individual category (mark) of products there are the following facts:

1. The elasticity of demand increases.
2. The profitability of 1 of a unit of production is reduced.
3. Reduced sales.
4. Sales volume approaching break-even sales volume, firm.

It is necessary to stop producing this brand of shoes or modernize it, that is, to give additional properties necessary for consumers.

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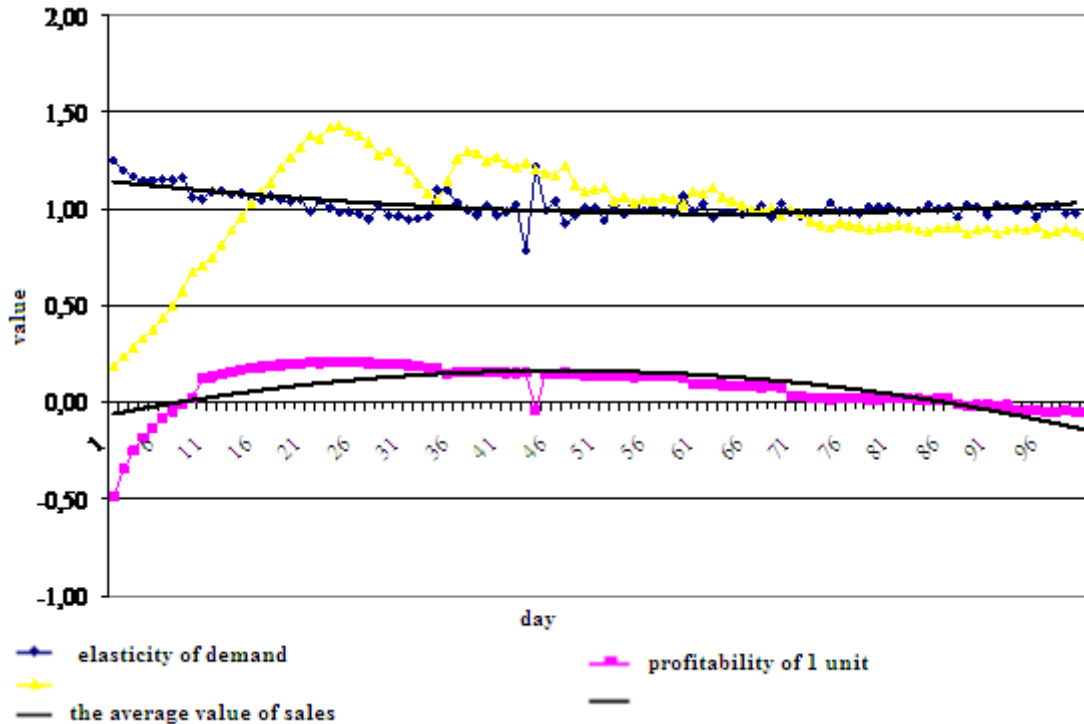


Figure 16. Daily sales

divided by average sales

The company must stop producing shoes of this model in the period between 60 and 70 days of sales. Further production will bring losses, as the demand for this model becomes inelastic.

$$PR = V (C - Z_{\text{perem.}}) - Z_{\text{post.}}$$

The amount of profit depends on the number of pairs of shoes sold, the difference between the price of a pair of shoes and the amount of variable costs associated with it, i.e. the amount allocated to cover fixed costs, and the amount of fixed costs.

When using operational leverage, business leaders have the ability to influence three main elements: fixed costs, variable costs, and prices, each of which is related to sales volume in one way or another. Consider the effect of changes of each of

these elements on the example of LLC "Bilrost" when we release the Cost of preparation and mastering of production of 0.71 RUB;

- the cost of maintenance and operation of equipment – 18,65 RUB;
- overhead costs – of 10.26 RUB;
- raw materials
- General expenses – 114.95 rubles.;
- business expenses – 14.84 rubles.

Thus, fixed expenses amount to 159.41 rubles (21.06%).

The amount of fixed costs in total for the entire production volume is 2486796 rubles, respectively, the amount of revenue minus variable costs (i.e., the amount of fixed costs and profit) per pair of shoes is 292.61 rubles.

2238116.4 rubles other things being equal will cause a reduction in volume,

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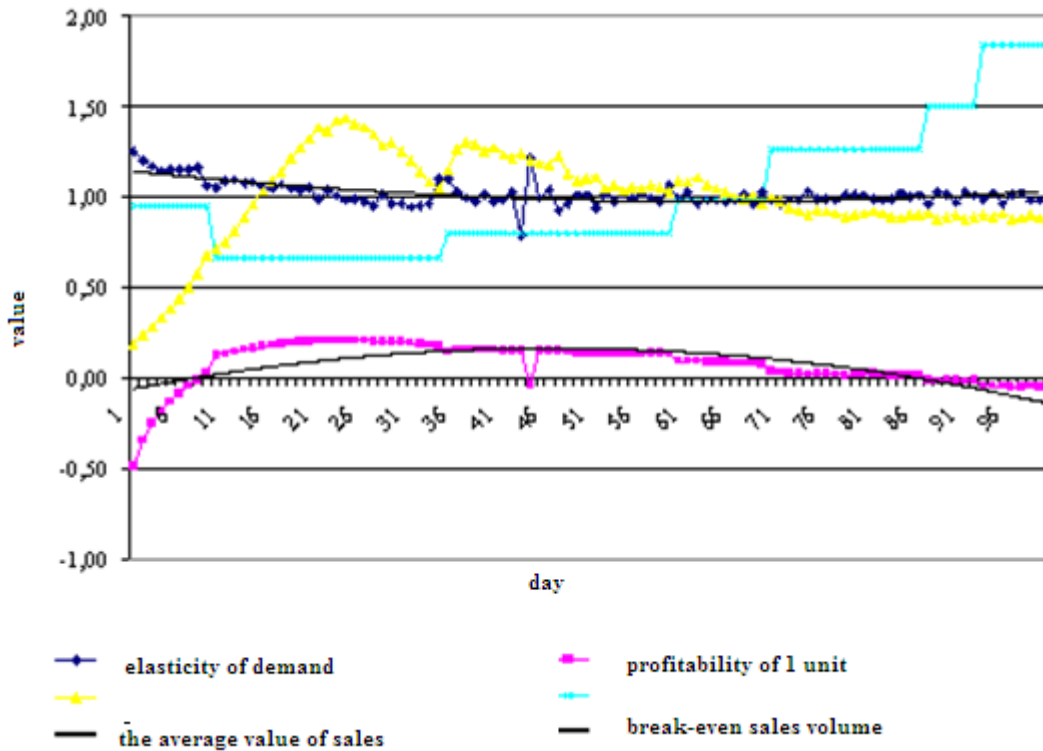


Fig. 17. Break-even volume of sales

CONCLUSION

The processes of globalization and increased international competition that characterize the world economy have become an objective prerequisite for changing the paradigm of managing competitiveness, which consists in abandoning traditional industrial policy and moving to a new industrial policy based on clusters (cluster policy). As a result of globalization, factors of production become mobile and competition between countries increases, so it is not only innovation and education that are important for the development and retention of superiority over competitors, but also the interconnections between enterprises, which has led to the creation of network structures – clusters.

The cluster is considered as a network organization of geographically interconnected and complementary enterprises (including specialized suppliers, including services, as well as producers and buyers), United around a research and education center, which is connected by vertical links with local institutions and authorities in order to increase the competitiveness of enterprises, regions and the national economy.

In the performed research, the issues of forming a regional Shoe cluster in the southern Federal district were considered. As a result of this work, the

prerequisites for creating a cluster were identified, such as:

1. Large concentration of skilled labor.
2. Clear specialization of manufacturer.
3. Long-standing traditions of Shoe craft.
4. Availability of local suppliers of quality raw materials.
5. High demand in the region for high-quality shoes.

We believe that for the development of the footwear cluster in the southern Federal district, it is necessary to:

1. Legalization of preferential taxation of producers.
2. Creation of an effective system of production distribution.
3. Improving the quality and design of shoes.
4. Increasing the assortment.
5. Join forces of players to promote the region's footwear.

In the course of work, it was proved that the cluster is a socio-economic system and belongs to the class of organizational systems.

An organizational system (organization) is a system, i.e. a set of interrelated elements, but it is not

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just a set of elements, but it exists or is created artificially to achieve certain goals, that is, the system is a means to achieve goals.

An economic and mathematical model for creating a cluster in the southern Federal district is also provided. The calculations were performed using multidimensional classification and cluster analysis. As a result of the model calculation, enterprises were merged into a cluster.

The result of the research can be calculated technical and economic indicators. Thus, the expected output of pairs of shoes at the end of the fifth year of operation of the cluster will be 190156000 pairs, which will ensure the cluster's economic stability by this time.

The estimated gross profit at the end of the fifth year of operation of the cluster will be 26928568.4 thousand rubles, the total cost of production, respectively, 162921748.2 thousand rubles. It is planned to create 76268 jobs. The average monthly salary of one worker for the production of men's shoes will be 11761.94 rubles, for the production of women's and children's shoes 10504.46 rubles and 10425.8 rubles, respectively. The most profitable is the production of women's shoes – 18.8%, the profitability of men's shoes will be 16.6%. Less profitable is the production of children's shoes 9.31% and this is not surprising, since the production of shoes for children requires the highest costs. The average return will be 16.64%.

We also considered various options for selling shoes during the month, for example, 100% sales of manufactured shoes, 80% and 50%. Calculations show that with 100% of the sale of shoes in the specified period of time, not only the costs of production and sale of shoes are covered, but also a fairly significant profit is provided. This indicates the effective operation of the Shoe cluster, as well as the correct marketing and assortment policy, and it is also possible to make a profit when selling 80% of manufactured children's, men's and women's shoes.

If only 50% of all shoes are sold, the cluster activity will not bring in revenue, which makes it possible to assert that such cases are unacceptable when the sale of manufactured shoes will be less than 50% within a month. If such a situation occurs, it is necessary to attract borrowed funds to cover costs and subsequent production, which provokes the possibility of the cluster becoming bankrupt.

To ensure 100% implementation of footwear developed a competitive range of men's, women's and children's shoes including factors that affect consumer demand: in accordance with the main

fashion trends, economic, social and climatic characteristics of the regions of the southern Federal district, and national peculiarities of the inhabitants of the regions of the SFD. The cluster provides for the production of shoes using both mechanized innovative technological processes and manual labor, which should ensure the demand of both elite consumers and mass consumers, creating prerequisites for the sale of all shoes. Developed innovative technological processes for the production of men's, women's and children's shoes using modern technological equipment produced by leading companies in the world, will allow you to produce shoes in a wide range not only by type, but also by fastening methods, which also guarantees a stable demand for the offered range of shoes. The proposed technological equipment, on the basis of which it is possible to form a technological process for the production of men's and women's and children's shoes, allows you to choose the optimal volume of production of shoes with high TEP, taking into account the available production areas. The decision to create a center for standardization, certification and quality management is justified. Such a center will ensure the preparation of certificates of compliance and declarations of compliance for the entire range of shoes that will be manufactured within the Shoe cluster. The presence of such documents will create trust in the buyer, create an image, and therefore high demand, which from our point of view is a determining factor for the competitiveness of the proposed range of shoes.

Based on the current situation in the economy, in our view, the most important issue in the development of regional consumer market is the lack of a full regulatory framework for the operation of the mechanism of state regulation of consumer market of regions. Thus, state intervention should correct the situation in the footwear market in the SFD and NCFD, and give the opportunity for the development of domestic Shoe industry.

From the analysis, we note the following trends in the development of the footwear industry in the southern Federal district and the Northern Federal district are characterized by a high level of migration of the working-age population to developing industries. The leather and footwear industry for the two districts can be confidently called developing. The southern Federal district and the Northern Federal district occupy the first place among the regions of the Russian Federation in terms of Shoe production.

1. On the territory of the region, there are unused industrial fixed assets that are suitable for restoration.

2. In the SFD and NCFD many specialized educational institutions for training in the field of leather and footwear industry.

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It is also necessary to increase the investment attractiveness of the industry and create conditions for increasing its competitiveness. An important measure is to protect the domestic market from illegal import and turnover of light industry goods, create conditions for increasing its transparency and ensure non-discriminatory access of manufacturers of industry goods to trade organizations. To do this, it is necessary to introduce high duties on the import of finished shoes and low duties on the import of basic and auxiliary materials and equipment. Once again, we have to repeat the need to regulate the level of prices and tariffs, which would guarantee both the producer and the trade not only the reimbursement of reasonable costs, but also the accumulation of funds for the development of production.

It is necessary to allocate funds to Finance the development of technical regulations for light industry products and provide advice on their implementation.

I would like to note that there is a historically developed adaptation of the peoples living in the territory to manual production, the presence of their own national technologies and design of manufactured shoes adapted to the climatic conditions and landscape of the region. The prerequisites for the development of footwear production in the region are very significant.

We offer the following set of measures:

1. Creating a regional development and maintenance program domestic Shoe production in the region.

2. The adoption of measures to reduce imported shoes in region. These measures should include, first of all, the suppression of the trade in shoes smuggled in and without permission to sell them on local markets.

3. Assistance in employment of young professionals and graduates universities, on existing and newly created Shoe companies.

4. Assistance to enterprises in the process of promoting domestic

Shoe brands in local markets. First of all, it is necessary to develop a competent marketing strategy for regional Shoe companies.

5. Creation of a special credit program for enterprises light industry in the region, taking into account the specifics of production: the seasonal nature of products sold and the peculiarity of the turnover of working capital of enterprises in the industry.

In our opinion, the successful implementation of all these measures requires the interest of regional authorities in the formation and development of a Shoe cluster, reducing their prices for components and energy costs, and providing a convenient transport interchange. All this together will allow this formation to have a long life and a stable position not only in domestic but also in foreign

markets. We only need the goodwill and support of all participants in the municipal, regional and Federal branches of government.

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PHYSICAL STYLE OF THINKING - METHODOLOGICAL BASIS FOR THE FORMATION OF A SCIENTIFIC WORLDVIEW

Abstract: The article examines the content and orientation of the scientific worldview as an integral vision and understanding of the world, which is the highest synthesis of knowledge, experience, beliefs, ideals and emotional assessments. The article analyzes the evolution of thinking styles in connection with the change of physical images of the world in the process of historical development of physics. It is proved that modern physics is interpreted as a "natural philosophy", which forms ontological meanings of the picture of the world and its styles of thinking plays a methodological role in the formation of a modern scientific worldview.

Key words: philosophy, physics, learning, scientific, worldview, thinking, methodology, mechanical, electromagnetic, quantum field picture of the world.

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ФИЗИЧЕСКИЙ СТИЛЬ МЫШЛЕНИЯ КАК МЕТОДОЛОГИЧЕСКОЙ ОСНОВА ФОРМИРОВАНИЕ НАУЧНОГО МИРОВОЗЗРЕНИЯ

Аннотация: В статье исследуется содержание и направленность научного мировоззрения как интегральное видение и осмысление мира, являющиеся высшим синтезом знаний, опыта, убеждений, идеалов и эмоциональных оценок. Анализируется эволюция стилей мышления в связи со сменой физических картин мира в процессе исторического развития физики. Обосновывается, что современная физика осмысливается как «натуральная философия», формирующая онтологические смыслы картины мира и своим стилем мышления играет методологическую основу формирования современного научного мировоззрения.

Ключевые слова: философия, физика, обучения, научное, мировоззрения, мышления, методика, механическая, электромагнитная, квантово-полевая картина мира.

Введение

Личностное развитие личности, развитие их творческих и креативных способностей приобретает особую актуальность в эпоху глобализации, кризисов охвативших все сферы жизнедеятельности человечества. Развитие креативных способностей в какой-то степени адаптационная, адекватная реакция человека на изменения происходящие в современном мире и это непосредственно связано с мировоззрением.

Мировоззрение - это система обобщённых взглядов, представлений о мире и его закономерностях, об окружающих человека явлениях природы и общества. По своему содержанию и целостной направленности мировоззрение может быть философским, научным, мифологическим, религиозным. Из них именно научное мировоззрение есть интегральное видение и осмысление мира, оно является высшим синтезом знаний, опыта, убеждений, идеалов и

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эмоциональных оценок. Образуется на основе естественнонаучных, социально-исторических, технических и философских знаний, включая определенную идеологию; его носитель – личность и социальная группа, воспринимающие действительность сквозь призму определения.

Следует сказать, что при анализе любого типа мировоззрения характеристика его взаимоотношения с научным знанием имеет большое значение, поскольку именно этим определяется степень научности, обоснованности каждой из возможных разновидностей мировоззрения. Каждый из отмеченных элементов – необходимая составная часть мировоззрения, отсутствие одного из них изменяет всю структуру мировоззрения как целостного феномена.

В проблеме формирования научного мировоззрения недопустим оттенок созерцательности: ведь человеку необходимо иметь мировоззрение не просто для того, чтобы оно у него было, а для того, чтобы использовать это мировоззрение в практической деятельности – учебной и трудовой для эффективного решения производственных и жизненных проблем. Формирование целостного научного мировоззрения означает всестороннее гармоническое развитие личности в единстве глубоких научных и философски осмысленных знаний и общечеловеческих убеждений при реформировании образования. Исходя из содержания этих принципов как важных средств формирования научного мировоззрения, можно с уверенностью заключить, что в обучении естественнонаучного предмета в различных видах образовательных учреждениях, определение его гуманитарного потенциала является важной задачей обучения. В «Национальной программе по подготовке кадров», принятой Олий Мажлисом Республика Узбекистан, подчеркнуты основные принципы создания и развития непрерывного образования. Из приведенных в ней шести таких принципов двое относятся к формированию мировоззрения. ...Гуманизация образования – формирование у обучающихся эстетически богатого мировоззрения, высокой духовности, культуры и творческого мышления» [1, с. 44-45]. Методологической основой гуманитаризации обучения естественно-научных дисциплин является, что образованность без интеллигентности, без должного формирования диалектического мировоззрения, не готовит для общества ожидаемой всесторонне развитой личности.

Каждая учебная дисциплина должна создавать предпосылки, которые при условии философского обобщения превращаются в основу формирования научного мировоззрения. «Более сложный, на наш взгляд, кажется вопрос – гуманитаризации преподавания физики. ...

Можно лишь напомнить, что физика – это и есть познание окружающего нас мира. Она не может быть только констатирующей наукой. Эта наука – диалектическая (как и всякая другая), ей присущи сравнения, аналогия, систематизация, абстрагирование, моделирование, обобщение, философское осмысление явлений. А всякое размышление – творческий процесс», - пишет Н.Н. Палтышев [2, с.44].

Физическая наука – основной компонент общечеловеческой культуры

Как известно, физика и сегодня образует прочный фундамент всего естествознания; методы физической науки обеспечили мощный прогресс в развитии таких наук, как химия, биология, астрономия, геология и другие технические, в том числе общественных наук. Современная физика осмысливается как «натуральная философия», формирующая онтологические смыслы картины мира [3, с. 444]. Необычайная широта практических приложений физики сделала эту науку основным орудием научно-технического прогресса, так же, «инновации». Инновация в науке открывают новые направления, упрощают производственную деятельность, открываются новые отрасли производства, рабочие места и т.д. Инновация физики, как никакая другая наука, обладает глубоким влиянием на социальные, этические и мировоззренческие запросы людей. Ведь инновации создают люди, не только являющиеся носителями разных ценностно-мировоззренческих установок, интересов, желаний, чувств, но и объединенные определенным типом человеческой активности. Все это настоятельно требует отказа от узко предметного подхода к обучению физики, повышения мировоззренческого и гуманитарного уровня, показывающего физику как один из компонентов общечеловеческой культуры, как результат деятельности людей.

Далее, в условиях экономических, социальных преобразований в нашей стране особое значение приобретают ценностные аспекты современной физики (использование солнечной, ветровой, атомной энергии, борьба с загрязнением атмосферы и решение других экологических проблем и т.д.), неизмеримо возрастают роль и ответственность представителей физической науки перед обществом. По этому, надо понимать, что научное мировоззрение обучающихся может выступать только как результат всего учебно-воспитательного процесса в образовательных учреждениях. В различных видах образовательных учреждений закладываются основы научного мировоззрения: его формирование представляет собой длительный и

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сложный процесс, протекающей одновременно и в единстве с самим процессом обучения.

Эффективность всего процесса формирования научного мировоззрения обучающихся определяется тем, насколько будут учтены следующие условия:

1. Формирование мировоззрения – это процесс самостоятельного прохождения каждым обучающимся всех этапов от овладения знаниями до выработки убеждений. Мировоззрение не может быть просто выучено: мировоззрение должно «пройти» через переживания обучающихся, получить его собственную оценку и убежденность в справедливости этой оценки.

2. Формирование мировоззрения происходит одновременно и в единстве с усвоением физического материала тогда, когда мировоззренческий аспект материала раскрывается целенаправленно и сознательно в явном виде.

3. Формирование мировоззрения будет тем успешнее, чем чаще происходит актуализация мировоззренческих знаний и убеждений в процессе практической деятельности обучающихся по овладению учебным материалом.

Для успешного формирования научного мировоззрения особое место занимают неисчерпаемые связи между научным стилем мышления и физической картиной мира. Потому что, стиль мышления предопределяется научной картиной мира, задающей общие представления о структуре и закономерностях действительности в рамках определенного типа научно-познавательных процедур и мировоззрения.

Стиль научного мышления и физическая картина мира

В философии под стилем мышления понимают систему принципов логического построения знания, включающую методы научного познания. Стиль научного мышления функционирует в науке как динамическая система методологических принципов и нормативов, детерминирующих структуру научного знания, его конкретно-историческую форму. Понятие «стиль научного мышления», отмечает Б.И. Пружинин, более продуктивно для современных философско-методологических исследований, чем «парадигма». Понятие же стиля мышления содержит идею смысловой целостности истории познания, реализующейся в стиле как специфической характеристике языка различных периодов развития науки, а также идею поливариантности, многообразия выражения в научном языке знания об одном и том же фрагменте мира [4, с. 64-74]. И это, составляет содержательные моменты понятия «физический стиль мышления». Использование элементов

методологии науки в школьном и Вузовском курсе физики позволяет выявить новые резервы совершенствования процесса формирования научного мировоззрения обучающихся физическим стилям мышления. М. Борн дает следующее определение термина «физический стиль мышления»: «Я думаю, что существуют какие-то общие тенденции мысли, изменяющиеся очень медленно и образующие определенные философские периоды с характерными для них идеями во всех областях человеческой деятельности, в том числе и в науке. Паули употребил выражение «стили»: стили мышления – стили не только в искусстве, но и в науке. Принимая этот термин, я утверждаю, что стили бывают и у физической теории, и именно это обстоятельство придает своего рода устойчивость ее принципам, обладают селективной функцией по отношению к идеям. Будучи знакомым со стилем своего времени, можно сделать некоторые осторожные предсказания. По крайней мере, можно отвергнуть идеи, чуждые стилю нашего времени» [5, с. 227-228].

Исследуя историю физики, Ю.В. Сачков выявил три стиля физического мышления: жестко-детерминистический, вероятностный-кибернетический и нелинейно-динамический. Жестко-детерминистический стиль акцентировал отношения однозначного соответствия состояний системы. Вероятностный-кибернетический стиль акцентировал отношения случайных и закономерных событий, для него характерна идея саморегуляции процессов. Нелинейно-динамический стиль мышления основывается на онтологической идее нелинейности мира [6, р. 147] Вспомним, как происходила эволюция стилей мышления в связи со сменой физических картин мира в процессе исторического развития физики. Таких картин мира было три: *механическая, электромагнитная и квантово-полевая*.

Несмотря на различие онтологических основ механической и электромагнитной картин мира, у них единая методологическая основа – один и тот же стиль мышления, называемый *классическим или механистическим*. Основными чертами этого стиля мышления является убежденность в однозначной характеристике сущности явлений и абсолютизация лапласовского идеала причинности. Успех механики Ньютона в значительной мере способствовал абсолютизации ньютоновских представлений, что выразилось в попытках свести все многообразие явлений природы к механической форме движения материи. Природа в картине мира классической физики представлялась некой грандиозной машиной, работающей с абсолютной точностью. В самой физике того времени механистический стиль мышления сыграл положительную роль,

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стимулируя поиски учеными универсальной теории, объясняющей все физические явления и предсказывающей новые на единой основе. В данной парадигме объект рассматривается в качестве строгой механической конструкции. Согласно этому, любое состояние объекта можно определить однозначно.

Однако развитие физики показало несостоятельность такой методологии, поскольку описать тепловые, электрические и магнитные явления с помощью законов механики, а также движение атомов и молекул этих физических явлений оказалось невозможно. Отметим, что механистический стиль мышления классической физики породил и соответствующее естественнонаучное мировоззрение, которое в истории философии получило название механистического (метафизического) материализма. Поэтому, можно сказать, что несостоятельной оказалась не сама механическая картина мира, а ее исходная философская идея – механицизм.

В недрах механической картины мира стали складываться элементы новой – электромагнитной – картины мира. На протяжении XIX в. продолжались попытки объяснить электромагнитные явления в рамках механической картины мира. Но это оказалось невозможным: электромагнитные явления слишком отличались от механических процессов. Наибольший вклад в формирование электромагнитной картины мира внесли работы М. Фарадея и Дж. Максвелла. После создания Максвеллом теории электромагнитного поля стало возможным говорить о появлении *электромагнитной картина мира*.

При переходе от механической к электромагнитной картине мира, ставшей господствующей в конце XIX в., классический стиль физического мышления утвердился в качестве идеала всего естествознания. Теперь он основывался на новой онтологической базе, связанной с идеями поля (близкодействия) и релятивизма. Законы электродинамики и законы классической механики, все еще однозначно предопределяли события, которые они описывали, поэтому случайность пытались исключить из физической картины мира. В классической науке случайное представлялось как нечто нежелательное, связанное с познающим субъектом. Но, проблема случайности, её роль в познании мира всегда интересовала умы человечества.

В истории философии сложились несколько концепций пытающихся объяснить место и роль случайности в научном познании. В отличие от многих древнегреческих философов Эмпедокл в своей космогонии определял место случайного отмечал, что «ход вещей как регулируемый скорее

случайностью и необходимостью, чем целью» [7, с. 35]. Такой подход придает, в отличие от других, другую значимость случайному, при помощи его можно объяснить появление в природе организованных форм случайность связывают с воздействием извне. Проблема случайного и необходимого исследовалась и мыслителем средневековой Центральной Азии. Так Ибн Сино, анализируя предшествующие концепции случайности писал о многообразии подходов в трактовке понятия случайность, «одна из концепций состоит в том, что признает случайность абсурдной и твердит, что каждая вещь имеет определенную причину и не нуждается в случайных причинах. Но этот довод не приводит к желаемому выводу, что неправильно говорить: поскольку каждая вещь имеет причину, постольку нет случайности. Ибо, если причина, обуславливающая вещь постоянна или же не часто повторяющаяся, то она суть случайности» [8, с.31]. В метафизике Ибн Сине место случайности занимает понятие возможность, сохраняющее в то же время и смысл случайности [9, с.178]. Эти идеи высказанные Ибн Синой созвучны идеям позднейших мыслителей, таких как Декарт, Кант и др.

Однако в середине XIX в. впервые появилась фундаментальная физическая теория нового типа, которая основывалась на теории вероятности. Это была кинетическая теория газов, или статистическая механика. Случайность, вероятность наконец то нашли свое место в физике и были отражены в форме так называемых статистических законов, в электромагнитную картину мира вошло понятие вероятности. Электромагнитная картина мира объяснила большой круг физических явлений, непонятных с точки зрения прежней механической картины мира, но дальнейшее ее развитие показало, что она имеет ограниченный характер. Главная проблема состояла в том, что континуальное понимание материи не согласовывались с опытными фактами, подтверждающими дискретность ее многих свойств – заряда, излучения, действия. Механическая и электромагнитная картина мира классической физики не акцентировали внимание на измерительных операциях при изучении природы. Оставалась также нерешенной проблема соотношения между полем и зарядом, не удавалось объяснить устойчивость атомов и их спектры, излучение абсолютного черного тела. Все это свидетельствовало об относительном характере электромагнитной картины мира и необходимости ее замены новой физической картиной мира. По этому, на смену ей пришла новая – квантово-полевая – картина мира, объединившая в себе дискретность механической картины мира и непрерывность электромагнитной картины мира.

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В основе современной **квантово-полевой картины мира** лежит новая физическая теория – квантовая механика, описывающая состояние и движение микрообъектов материального мира. В недрах создавшейся квантово-полевой картины выработался стиль мышления, основанный на включении случайности в ход физических событий. Этот стиль мышления был назван **вероятностным**.

Хорошо известна попытка ряда выдающихся представителей физической науки, таких, как М. Планк, А. Эйнштейн, Л. Де Бройль, Э. Шредингер, воспитанных в классическом стиле мышления, воспрепятствовать установлению нового, вероятностного стиля мышления, казавшегося им логически непоследовательным, временным, чуждым их интеллектуальным вкусам. «Я верю, что Бог, создавая природу, играл в кости», – восклицал А. Эйнштейн. Один из создателей квантовой физики В. Паули отвечал на это следующим образом: «Я уверен, что статистический характер Ψ – функции, а таким образом и законов природы... будет определять стиль законов в течение по крайней мере нескольких столетий. Возможно, что позднее, например в связи с процессами жизни, будет найдено нечто совершенно новое, но мечтать о возвращении к прошлому, к классическому стилю Ньютона – Максвелла – это кажется мне безнадежным, неправильным, признаком плохого вкуса» [5, с. 266]. Этот пример из истории физики показывает психологическую устойчивость стиля мышления, если он положен в основу физической картины мира и переходит в убеждения, в готовность бороться за последнее.

Основные черты современного физического стиля мышления, сформировавшиеся главным образом под воздействием идей квантовой механики, характеризуют в настоящее время любое научное исследование в области физики. Например, квантовая механика позволила определить строение и понять многие свойства твердых тел, последовательно объяснить явления ферромагнетизма, сверхтекучести, сверхпроводимости, понять природу астрофизических объектов – белых карликов, нейтронных звезд, выяснить механизм протекания термоядерных реакций на Солнце и звездах. Объективная диалектика реальных процессов, отражаемая в физике средствами математики, вызвала необходимость рассматривать нелинейность как нечто более общее, а линейность – как ее частный случай. По существу, на это указывал А. Эйнштейн, когда писал, что «истинные законы не могут быть линейными и не могут быть получены из линейных законов» [10]. Темы нелинейности, неустойчивости, хаотизации, самоорганизации, бифуркации постепенно

становятся темами определяющими рост научного эмпирического знания.

Наука о поведении сложных систем Г.Хакен именовал синергетикой. И. Пригожин развил теорию диссипативных структур, М.Фейгенбаум разрабатывал теорию динамического хаоса. По отношению к сложившимся научно-эмпирическим дисциплинам это движение носило междисциплинарный характер. Методом и стилем синергетики является нелинейное мышление, которое органически включает в себя случайность и вероятность.

Классическим примером является образование ячеек Бенара при термодинамической конвенции. Сам этот эффект достаточно прост. При подогреве плоского горизонтального слоя силиконового масла снизу из беспорядочных начальных возмущений возникает упорядоченная структура определенной формы. Причем она не зависит от размеров сосуда и геометрии его боковых стенок [11, с.47-48]. Наш мир обладает свойствами сложности, нелинейности, неопределенности и не прогнозируемости, то есть действительность обладает сложной онтологической структурой, и традиционные схемы и модели а также стили мышления не соответствуют его познанию и отображению. Для познания и понимания сложности сложного мира, сложных систем нам необходимо сложное мышление. Этот стиль мышления являясь современной гносеологией «системное мышление» – новым методом отображения, понимания и познания окружающей среды, где обращается особое внимание на то, что «все связано со всем», данные взаимосвязи имеют нелинейный характер и проявляют цикл обратной связи, система больше, чем простая совокупность ее частей. [12, с. 47]. Системное мышление представляет собой не только части целого, но и способность видеть его синергию, различные связи в системе.

Заключение

Когда человек (а это бывает обычно в юношеские или молодые годы) сформировал определенное мировоззрение (пусть даже неправильное), то в последующем маловероятен переход в «другую веру». Вот почему задача формирования у обучающихся современного стиля мышления должна считаться одной из основных задач обучения физики. Изменение мировоззрения в связи с переходом от одной физической картины мира к другой происходит постепенно (и, как правило через одно-два поколения), оно начинается с обобщения новых экспериментальных фактов, создания или преобразования научных теорий и завершается формированием нового стиля мышления.

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Таким образом, первичным является определенная физическая картина мира, которая приспособливает старый или вырабатывает новый стиль мышления.

Преподаватели Вузов и учителя школ должны знать, как современный стиль мышления в науке связан с индивидуальным стилем мышления обучающихся, существующим как определенный тип мыслительной деятельности, который характеризуется сформированностью у обучающихся обобщенных методов и приемов познания. Под обобщенными методами и приемами познания надо понимать не те конкретные методы и приемы, которые

используются только в данных условиях, в единичных ситуациях, а те, которые сформировались у обучающихся в процессе всей его деятельности и стали устойчивым и собственным стилем умственной работы.

В современном мире такие онтологические смыслы, как динамические системы, нелинейные колебания и волны, хаос, порядок и структуры, бифуркация и катастрофы, аттракторы, фрактальность и стохастичность в их сложных системных взаимоотношениях составляют основание системы категорий мышления нелинейно-динамической картины мира.

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THE FATE OF INTELLECTUAL ELITE IN Z.N. HIPPIUS'S ST. PETERSBURG DIARIES OF 1914-1919

Abstract: *The features of the embodiment of Gippius's artistic thinking including the awareness of the historical upheavals of Russia in early 20th century in her Petersburg diaries have been considered in the article. The role and importance of the writer in the search for new ideas about the freedom of the individual and his choice in the era of historical cataclysms have been grounded. The author substantiates the originality of the author's interpretation of the spiritual perfection of a creative personality in the process of comprehending the cataclysms of the war and revolutionary times, the movement towards the "perfect synthesis" of personal and social imperatives. The principles of the artistic consciousness of Gippius are revealed, the most important of which is the formation of such spirituality, which allows one to withstand the great spiritual upheavals of the era in order to achieve true freedom found in God as a condition for harmonious development.*

Key words: intellectual elite, literary diary, knowledge of God, revolution, freedom, artistic consciousness.

Language: Russian

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СУДЬБА ИНТЕЛЛЕКТУАЛЬНОЙ ЭЛИТЫ В ПЕТЕРБУРГСКИХ ДНЕВНИКАХ 1914 – 1919 ГГ. З.Н. ГИППИУС

Аннотация: *В статье рассматриваются особенности воплощения художественного мышления Гиппиус, связанные с осознанием исторических потрясений России начала XX века в ее Петербургских дневниках. Обоснованы роль и значение писательницы в поисках новых представлений о свободе личности и ее выборе в эпоху исторических катаклизмов. Обосновывается самобытность трактовки писательницей духовного совершенствования творческой личности в процессе осмысления катаклизмов военного и революционного времен, движения к «совершенному синтезу» личного и общественного начал. Выявляются принципы художественного сознания Гиппиус, важнейший из которых – утверждение такой духовности, которая позволяет противостоять великим духовным потрясениям эпохи ради достижения истинной свободы, обретенной в Боге как условию гармоничного развития.*

Ключевые слова: интеллектуальная элита, литературный дневник, Богопознание, революция, свобода, художественное сознание.

Введение

В культуре начала XX века решение проблем взаимоотношения личности и общества,

определение места интеллектуальной элиты в потрясениях эпохи приводит к усилению философского начала, стремлению осмыслить

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социальное окружение и обусловленность поведения индивида, пересмотреть роль элиты в жизни общества. Интеллектуальная элита всегда была источником самых важных для страны и общества событий и процессов, и очевидно, что она имеет отношение к причинам и последствиям существующих в стране проблем, а также возможным вариантам их решения. Для представителей этой группы людей созидание концептов мышления и действия людей представляет собой основное измерение власти и могущества [1, с. 8]. Как отмечал американские социологи, «всякая оценка способности общества справляться со своими проблемами зависит от качества его руководства и характера народа» [1, с. 13].

Проблематика роли элиты в государстве и обществе привлекала внимание очень многих авторов, которые интерпретируют ее значение в условиях стремительного усложнения политических и экономических отношений в мире, меняющегося характера действий крупных корпораций, многообразных социальных, этноконфессиональных групп.

Поэтому становится понятным доминирование в художественном сознании эпохи Серебряного века субъективного, личностного фактора, препятствовавшего развитию эпических жанров. Наиболее популярными и распространенными в этих условиях становятся различные формы автодокументальной литературы, в том числе дневники. Дневник превращается в самостоятельный жанр литературы, являясь одновременно своеобразным документом эпохи, а также личностной интерпретацией мира одним из представителей интеллектуальной элиты – автором такого произведения. Суть деятельности и предназначения интеллектуала лучше всего выражены следующими словами М. Фуко: «Эта работа по изменению своей собственной мысли и мысли других, и представляется мне смыслом существования интеллектуала» [2, с. 38].

В русской литературе начала XX века наиболее своеобразное воплощение подобной проблемы можно проследить в Петербургских дневниках 1914 – 1919 гг. З.Н. Гиппиус, отразившей судьбу России военного и революционного времен. В период написания Петербургских дневников обостряется интерес писательницы к общественным проблемам, главными для нее становятся вопросы свободы интеллигенции, ее выбора в эпоху исторических катаклизмов, судьба творческой личности в период революционной катастрофы, ее отношение к конструктивным и деструктивным началам революции. Попытки решения этой проблемы определили представление Гиппиус о Первой мировой войне как о процессе подавления

свободы и препятствии в движении к Царству «Третьего Завета»: «<...> всякая война, кончающаяся полной победой одного государства над другим, носит в себе зародыш новой войны <...>, рождает национально-государственное озлобление <...>, отдаляет нас от того, к чему мы идем, от «вселенскости». Идет организованное человекоубийство <...>, нет истории, нет движения, нет свободы, нет Бога» [3, с. 101].

В этих условиях основным для Гиппиус становится вопрос о взаимоотношениях русской интеллигенции и власти в условиях ломки привычного уклада жизни и существовавших прежде духовных ценностей. В дневниках Гиппиус просматривается отношение к русской интеллигенции как к социальному феномену, обладающему цельным мировосприятием, при котором отдельные культурные, в том числе политические феномены не воспринимаются автономно друг от друга на уровне символов, но увязываются в сознании индивидуума в рамках единой логически непротиворечивой картины мира [1, с. 76].

Подобный интеллектуализм ярко проявлен в дневниках писательницы в образе творческой личности в период Первой мировой войны и двух революций: Творческие люди, старательно ищущие выход, – это «совесть и разум России», «единственное слово и голос России» [3, с. 3]. Такое понимание статуса творческой личности в период революционных перемен перекликается с мнением М.Л. Гаспарова: «Интеллигенция выступает на первый план в те моменты, когда общество оказывается в непривычной критической ситуации и реакции накопленного опыта не срабатывают» [4, с. 14]. Д.С. Лихачев объясняет это тем, что именно интеллигенции была присуща «независимость мысли при европейском образовании» [5, с. 7].

Сама Гиппиус неоднократно отмечает, что принадлежит к этому широкому кругу русской интеллигенции [3, с. 12]. Исследователи творческого наследия Гиппиус обращают внимание еще и на «поэтическое чутье, провидческий характер ее произведений» [6, с.89]: *Она не погибнет – знайте, / Она не погибнет, Россия, / Они всколосятся, – верьте, / Поля ее золотые. / И мы не погибнем – верьте! / Но что нам наше спасенье? / Россия спасется, – знайте! / И близко ее воскресенье* [7, с. 32].

К вопросу о роли интеллектуальной элиты в кризисное время Гиппиус обратилась еще в 1908 году. Даже свойственные ей растерянность и абсурдные идеи она считает потенциалом позитивного развития: «В окружающем бурлящем хаосе есть зерна истинного сознания, в нем рождается новая мысль, новое ощущение себя, людей и мира, надежда на иное искусство, иное действие» [8, с. 18].

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Но уже в начале 1917 года Гиппиус утверждает: «Через год, через два, но будет что-то, после чего: или мы победим войну, или война победит нас. Ответственность громадная лежит на наших государственных слоях интеллигенции, которые сейчас одни могут действовать» [3, с. 144]. В это время спасение видится лишь в одном – в революции. Поэтому Февральская революция воспринимается как очищение, свобода, «чудо» [3, с. 4], «светлая, первая влюбленность» [3, с. 6]. От Февральской революции писательница ждет пробуждения творческих революционных сил интеллигенции, проявления «нового религиозного сознания» и превращения России в мир свободы, любви, равенства. Именно интеллигенция, по мнению Гиппиус, может уравновесить разрушительную и созидательную силы революции, преобразовать их в «творческую революционную Россию». Уже в начале октября 1917 года она предвидит новое революционное потрясение и записывает: «Готовится «социальный переворот», самый темный и грязный, какой только будет в истории. И ждать его нужно с часу на час» [3, с. 266].

Октябрь 1917 года для Гиппиус ассоциируется с полной утратой нравственных ценностей и святынь, великим общим грехом нации, допустившей к власти политических проходимцев и позволившей издеваться над собой. Октябрьская революция для писательницы – контрреволюционный бунт, торжество «надмирного зла» и зримое пришествие «Царства Антихриста», поправшего свободу индивидуума. Большевиков она воспринимает как с «царство Антихриста», приведшее Россию к небывалому в истории «всеобщему рабству»: «Физическое убийство духа всякой личности... Разрушение, обвал всей культуры. Привыкнув к этому состоянию, человек становится получеловеком – «апатичным и покорным» [3, с. 77]. Большевики уничтожают культуру, которая может противостоять «злу Антихриста» и противопоставить тоталитарному подавлению личности истинную свободу, обретенную в Боге. Ради спасения русской культуры от гибели и забвения писательница пытается призвать западные державы к интервенции в Россию: «Кто бы ни боролся с большевиками – всякому помогать. Ибо жизнь в кровавом колесе, КАЖДЫЙ ЛИШНИЙ ДЕНЬ ИМЕННО БОЛЬШЕВИЦКОЙ ВЛАСТИ – ЛИШНИЙ ГОД ПОЗОРА РОССИИ» [9, с. 44].

Однако последовавший за Октябрьской революцией кризис подталкивает Гиппиус к пересмотру позиции: «Противные, черные, страшные и стыдные дни!», «Бежать некуда. Родины нет» [3, с. 273]. Правда, есть и другой, неприемлемый для Гиппиус путь выживания – сотрудничество с новой властью,

саморазоблачение и предательство. Утверждая, что главный признак творческой личности – это ответственность за свои взгляды и поступки, писательница отказывается простить интеллигентам-перебежчикам соглашательскую позицию. Показательна в этом отношении характеристика А. Блока: Сегодня был А. Блок. В начале-то на войну, как на «праздник» смотрел, прямо ужасал меня: «весело!» Абсолютно ни в чем он никогда не отдает себе отчета, не может. Хочет ли? Сейчас растерян. Спрашивает беспомощно: «что же мне теперь делать, чтобы послужить демократии?» [10, с. 8].

Стремление писательницы выразить свое отношение к судьбе творческой личности в условиях революционных перемен в дневниковом жанре объясняется отчасти усиливающимися цензурными репрессиями. «Писать нигде ничего нельзя, атмосфера удушья», – вспоминает она о революционных событиях в «Живых лицах» [10, с. 219]. Отчасти это попытка предельно точно запечатлеть исторический момент, донести до читателя пережитое и увиденное: «Не надо русскому писателю быть профессиональным политиком, чтобы понимать, что происходит. У нас были только открытые глаза. И мой дневник естественно сделался записью общественно-политической» [3, с. 5].

Попытки осмыслить степень ответственности творческой личности за будущее страны обуславливают не только направленность дневника периода революционных потрясений, но и выбор героя. Много лет спустя писательница признается, что ей хотелось запечатлеть в этих дневниках не только переломные события, свидетелем которых ей довелось быть, но и «каждого человека, его образ, личность, роль в той громадной трагедии» [3, с. 7]. Героями Петербургских дневников становятся представители русской интеллигенции (известные поэты и писатели, юристы и врачи, политические и общественные деятели), которые необходимы писательнице для реализации ее концепции развития мира. Писательница изображает умение представителя интеллектуальной элиты противостоять политическим катаклизмам, охватившим Россию, способность жить в новом общественном строе.

Наиболее разумной, по мнению Гиппиус, оказалась позиция Керенского, на элитарность которого в революционном правительстве она возлагала большие надежды. Однако вскоре председатель Временного правительства становится для писательницы «ходячим абсурдом», символом наступающей катастрофы. Керенскому, у которого «все было сложно, фантастично, туманно, болезненно и <...> преступно», она противопоставляет прямолинейность и конкретность Корнилова [9, с.

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54]. Более того, введенные в текст дневника строки из стихотворения «На поле чести»: *Открой, Господь, поля озаренные / Душе убитого на поле чести* звучат как торжественный гимн Корнилову, готовому пожертвовать своей жизнью в борьбе с воплощенным в большевизме метафизическим злом, и служат его мифологизации. По мнению Гиппиус, имя генерала Корнилова обретет святость и бессмертие, станет прорывом в вечность. Ее восхищает жертвенность русского героя, ставшего символом России, преобразованной под знаком Царства «Третьего Завета».

Тема священной жертвенности и связанной с ней вечной памяти перекликается со стихотворением писательницы «Имя», также посвященным генералу Корнилову. Это произведение звучит как торжественный гимн герою, пожертвовавшему своей жизнью в борьбе с большевизмом, как метафизическим воплощением зла. По мнению Гиппиус, имя Корнилова станет прорывом в вечность в отличие от кровавых событий Октябрьской революции, которым суждено погрузиться в небытие: *Безумные годы совьются в прах, / Утонут в забвенье и дыме / И только одно сохранится в веках / Святое гордое имя. / Твое, возлюбивший до смерти, твое, / Страданьем и честью венчаный. / Проколет, прорежет его острие / Багровые наши туманы* [7, с. 201].

Гиппиус пытается прочесть скрытое пророчество, заключенное в имени и отчестве адресата стихотворения (Лавр Георгиевич): *От страда клевет не угаснет огонь, / И лавр на челе не угаснет, / Георгий, Георгий! Где верный твой конь? / Георгий Святой не обманет* [7, с. 202]. Она создает образ лаврового венка, связанного в

христианстве с представлениями о победе и воспринимающегося как знак вечной жизни. Отчество генерала также воспринимается как сакральное послание, в котором Корнилову предначертан путь христианского святого, великомученика Георгия Победоносца. Стихотворение завершается гневной угрозой, обращенной к революционной России: *Дрожи, чтоб Святой и тебе не отомстил / Твои блудодействия, Россия!* [7, с. 202].

На основании вышеизложенного можно сделать следующие выводы:

– Петербургские дневники Гиппиус 1914 – 1919 годов являются документом эпохи, отражающим судьбу революционной России и манифестом писательницы в защиту интеллектуальной элиты ее времени, способной осуществить «совершенный синтез» личного и общественного начал через отказ от разрушительного потенциала революции, ведущего к утрате нравственных ценностей, и через утверждение необходимости сохранения ею святости и истинной свободы, обретенной в Боге;

– Специфической функцией интеллектуала, воплощенной в Петербургских дневниках, является способность уравновесить разрушительную и созидательную силы революции, преобразовать их в «творческую революционную Россию» и превратить ее в мир свободы, любви, равенства. Носителем этого идеала для Гиппиус является русский интеллигент, умеющий противостоять политическим катаклизмам, охватившим Россию, способный жить в новом общественном строе, духовность которого выражается в способности к сочувствию, состраданию, самоотверженности, праведности.

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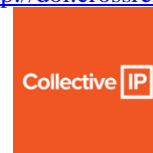
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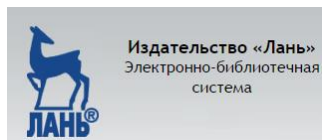
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