

# ANALYSIS OF MODERN DESIGN METHODS IN THE PRODUCTION OF SPECIAL CLOTHING

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## Abstract

This article analyzes modern design methods used in the production of special clothing, in particular, items used for medical purposes. As a result of the development of digital technologies, the possibilities of 3D modeling, virtual clothing testing, creating precise designs, and optimizing ergonomic design solutions are increasing. The study examines the functional capabilities of CLO 3D, Marvelous Designer, and traditional 2D design programs, their influence on production efficiency, and their role in simplifying technological processes. Also, the advantages of digital design in improving the quality of special clothing, reducing production time, and ensuring the compatibility of the product with human anatomy are scientifically substantiated. The obtained results indicate the importance of modern design approaches in the production of special clothing.

**Keywords:** Special clothing, modern design, 3D modeling, CLO 3D, Marvelous Designer, 2D construction, ergonomics, digital technologies, medical device design.

## Introduction

Special clothing, in particular, medical corsets, plays an important role in maintaining human health and the rehabilitation process. Waist corsets perform orthopedic functions: support the position of the spine, reduce pain, and prevent overload of muscles and ligaments. Therefore, their construction, materials, and anatomical compatibility must be developed with high accuracy.

Traditional design methods - based on 2D construction and stitching - may require a lot of time in the production of waist corsets, may not fully reflect human anatomical changes, and may be limited by the need to identify errors through prototype testing. Therefore, modern digital technologies, in particular 3D modeling programs such as CLO 3D and Marvelous Designer, significantly optimize the process of constructing, modeling material, and assessing ergonomic compatibility.

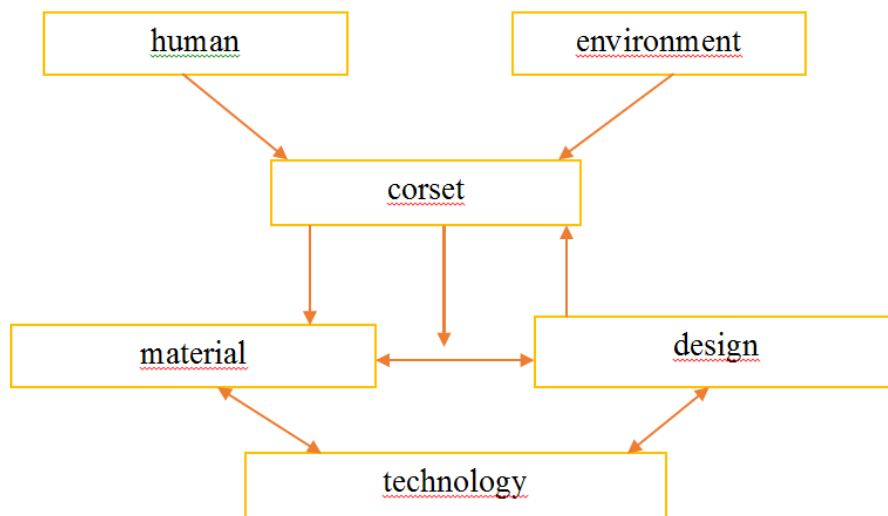


This article examines, on a scientific basis, the comparison of traditional and modern methods in the process of designing medical corsets, the analysis of their advantages and effectiveness, as well as the role of modern 3D programs in the production of medical special clothing.

### LITERATURE ANALYSIS AND METADALOGY

A corset (French corset, Latin corpus - "body") is a firmly shaped corset item that tightly wraps around the chest and waist, serving to thin the figure. A half-corset is a corset item encircling the lower part of the body below the waist, i.e., the area under the abdomen, thighs, and gluteal (round) muscles, designed to form the soft tissues of the abdomen, buttocks, and thighs [1].

At all stages of design and production of the corset, it is necessary, on the one hand, to ensure medical-functional and ergonomic properties, depending on the structure of the human body and the state of the musculoskeletal system (MSA), and on the other hand - to ensure the adaptability of the product to the conditions of the human environment (Fig. 1).



**Figure 1. Structural diagram of the relationship between the design of a special corset, the person, the environment, and the harmony of the corset.**

According to the research results, an integrative approach plays an important role in ensuring the effectiveness of medical corset design. Since the structure of the corset depends on the consumer's body structure and the state of the musculoskeletal system (MSA), it is pointless to consider it separately from a person.

As an object that directly interacts with a person, the corset must have properties, form, and structure that correspond to the individual characteristics of the person. The specific function of the corset is to exert a therapeutic effect in the environment in which the consumer lives (under therapeutic, domestic, or industrial conditions). At the same time, the corset should protect the person and the result of the therapeutic effect from the deforming influence of the external environment, and also be a means of allowing the presence of a person with damage to the musculoskeletal system in this environment.

The product's adaptation to humans and the surrounding environment should be expressed not only in the product's medical and functional compatibility with the conditions of use, i.e., the physical environment, but also in its compatibility with the social environment, without



disrupting the consumer's psychophysiological state

For the object under consideration - "corset," the properties of the elements "human" and "environment" are considered as input factors into the system. When analyzing the interaction between these elements, the most important parameters are: anthropometric and biomechanical characteristics of the user, as well as ergonomic aspects, taking into account the conditions of product use. In recent years, digital technologies have significantly improved the design processes of the light industry and clothing. In particular, modern 3D modeling programs - CLO 3D and Marvelous Designer - significantly optimize the design process. With the help of the programs, patterns are created in a virtual environment, the fit of the clothing and the movement of the fabric are tested on the avatar, prototype errors are detected in advance, and technical patterns ready for production are created [4., 2].

Traditional 2D design requires several tests to draw patterns on paper, sew prototypes, and adapt them to human anatomy. This process requires a lot of time and resources and limits the possibility of fully reflecting human anatomical changes [3]. The results showed that prototypes made using the 2D method are developed within 5-7 days and require additional corrections due to several sewing errors.

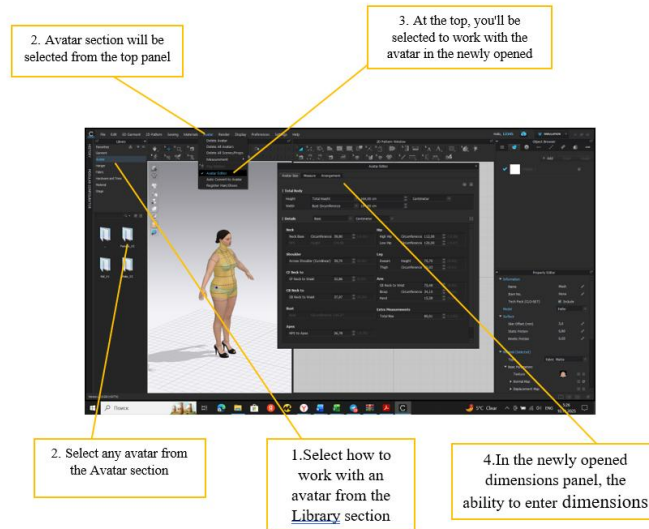
The results showed that the creation of a virtual 3D prototype and fit assessment is carried out within 1-2 days, which accelerates the production process by 3-4 times compared to traditional methods [5]. Also, 3D modeling allows predicting ergonomic compatibility. Such parameters as the drape and elasticity of the fabric, the fit of the corset to the body, and the comfort of movement are tested in a virtual environment, which helps to avoid harm to human health and improve the quality of the finished product [6].

Marvelous Designer is a professional 3D clothing design program that allows you to create a clothing model in a digital environment, starting with a 2D pattern. The program simulates the physical properties of a real fabric (filling, stretching, hanging), as a result of which the clothing is correctly placed on the avatar - the human body - and also looks natural in motion. There is also the possibility of integrating ready-made clothing with other 3D programs, animation, and game engines [2., 7].

## RESULTS

The practical significance of this approach for a medical waist corset lies in the fact that it allows for the implementation of design based on individual anthropometric data, the creation of a model corresponding to the physiological state and ergonomics of movement of the patient, and the possibility of virtual assessment of the deformation analysis, pressure distribution, and ergonomics of movement of the CLO 3D program in the design of rehabilitation products plays an important role in improving design and functionality.

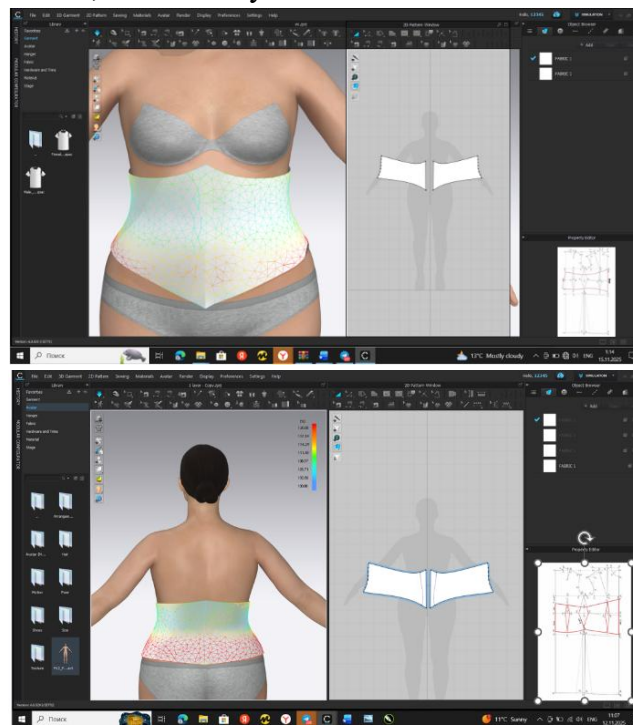




**Figure 2. Creating an avatar based on size in CLO 3D**

Therefore, in this work, the design of the medical waistcoat was created in a digital environment in the CLO 3D program, which, unlike traditional paper design, provides high accuracy, the ability to quickly change size, and the convenience of analyzing visual results. For the construction, an avatar (virtual mannequin) was created on CLO 3D based on dimensions 164-104-120 of the GOST 17522-72 standard [8] (Fig. 2).

In the CLO 3D program, there is an opportunity to adapt medical corsets to the individual body size of the patient. This, unlike traditional paper design, increases accuracy, reduces errors, and shortens the preparation time, and allows you to know in advance what the corset will look like.



**Figure 3. Virtual analysis of the waist corset pressure distribution of the CLO 3D program.**



The figure shows the degree of the corset's impact on the body through various colors, with red zones indicating areas with the highest pressure stresses. According to the analysis results, red areas were clearly observed in the upper and lateral regions of the lower back. This indicates an increase in pressure in these zones due to excessive compression of the material and the woman's body's misalignment with the natural hip-thigh transition line. In other words, the shape of the corset did not fully replicate the anatomical curve of the female body between the back and hips. As a result, there is a possibility of tissue compression in areas of high red pressure, partial circulatory disorders, and in the long term, discomfort and a decrease in therapeutic effect. Consequently, the pressure distribution is uneven, which reduces the ergonomic adaptability of the corset.

## DISCUSSION

The obtained results showed that the advantages of 3D digital modeling in the design of medical belts have a significant advantage over traditional methods of 2D design. Since the traditional 2D drawing method is built on the basis of flat geometry, it does not fully cover the complex anatomical relief of the human body - the waist-hip line, muscle and tissue deformation, changes in the shape of movement. Therefore, matching errors are common in prototypes made in this way, and several restoration stages are required to eliminate them.

In 3D modeling, since the avatar is created based on anthropometric standards or individual dimensions, the shape of the corset is adapted to the human body in an environment close to real conditions. Analysis of the pressure distribution, performed in the study on the CLO 3D platform (Fig. 3), showed the presence of high pressure stresses in some zones of the corset, expressed in red. This deformity is precisely the result of anatomical imbalance, which is difficult to determine by traditional methods. Through 3D simulation, these errors are detected before the transition to the finished prototype stage, allowing immediate corrections to be made to the design. In addition, in the process of 3D modeling, the real physical properties of the fabric - drape, tension, hardness, elasticity - are observed in a virtual environment, which contributes to the development of optimal design solutions, taking into account ergonomic and therapeutic requirements. As the results showed, the process of creating a 3D prototype takes 1-2 days, which is 3-4 times faster than traditional methods. In general, this study scientifically confirms that 3D technologies in the process of designing medical corsets are more accurate, ergonomically more reliable, and more productive than traditional 2D methods.

## CONCLUSION

The study showed that modern 3D modeling programs (CLO 3D and Marvelous Designer) in the design of special clothing, in particular medical waist corsets, have significant advantages over the traditional 2D design method. With the help of 3D programs, the design process is accelerated, ergonomic compatibility is assessed in advance, and prototype errors are reduced. At the same time, the skills of designers in 3D modeling are important for improving product quality and ensuring production efficiency. As a result, modern digital approaches to the production of medical corsets and other special clothing optimize the production process, help save time and resources, and ensure the creation of high-quality and ergonomic products.



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**REFERENCES**

1. Ю.А.Шаммут. Совершенствование процессов конструкторско-технологической подготовки производства корсетных изделий специального назначения. Дис. ... канд. техн. наук: Иваново 2005г. -14с.
2. Support.MarvelousDesigner.com. (2025). What is Marvelous Designer? Retrieved November 26, 2025, from <https://support.marvelousdesigner.com/hc/en-us/articles/360036924912-What-is-Marvelous-Designer>
3. Seft.world. (2023). What is CLO 3D? The future of fashion design software explained. Retrieved from <https://www.seft.world/what-is-clo-3d/>
4. Support.CLO3D.com. (2023). What is the difference between CLO and Marvelous Designer? Retrieved November 26, 2025, from <https://support.clo3d.com/hc/en-us/articles/115012666547-What-is-the-difference-between-CLO-and-Marvelous-Designer>
5. Invidia-textile.com. (2022). 3D software for clothing design: Save time, cut costs and reduce waste. Retrieved November 26, 2025, from <https://www.invidia-textile.com/fi/news/3d-software-for-clothing-design-save-time-cut-costs-and-reduce-waste/>
6. ZealousXR.com. (2023). CLO3D vs Marvelous Designer: Best software for you. Retrieved November 26, 2025, from <https://www.zealousxr.com/blog/clo3d-vs-marvelous-designer>
7. CGChannel.com. (2024). CLO Virtual Fashion releases Marvelous Designer 2024.1. Retrieved November 26, 2025, from <https://www.cgchannel.com/2024/06/clo-virtual-fashion-releases-marvelous-designer-2024-1/>

