Inclusiveness in Clothing Design

T A Zaytseva\textsuperscript{1,a}, L A Koroleva\textsuperscript{1,b}, I A Slesarchuk\textsuperscript{1,c}

\textsuperscript{1}Vladivostok State University of Economics and Service (VSUES)
Russia, Vladivostok, 690014, Gogolya Street, 41

E-mail: \textsuperscript{a} tatyana.zaitseva@vvsu.ru, \textsuperscript{b}ludmila.koroleva1@vvsu.ru,
\textsuperscript{c}irina.slesarchuk@vvsu.ru

Abstract. The article discusses the development of inclusive design in clothing, designed to ensure versatility, accessibility and compliance with modern fashion trends for different audiences. Based on the principles of an integrated approach to the design of inclusive clothing, the directions of implementation for the choice of design solutions have been developed. The result of the research was the development of new patentable functional and constructive solutions for models of inclusive women’s waistcoats, which make it possible to use various groups of consumers, for example, women with atrophy of the lower extremities and moving in a wheelchair.

1. Introduction

Over the past decades, a new direction of inclusive design has been developing in design, designed to make the world comfortable for a variety of people [1]. Companies around the world are using inclusive design to make their designs accessible and appealing to different audiences. In a broad sense, now inclusiveness means expanding the experience of interacting with people excluded from it for any reason: age, race, cultural differences, body shape, and health limitations [2].

For the first time, the term came into use in connection with the need to ensure a full life for people with disabilities, since ordinary items and services produced without taking into account their needs and capabilities brought such people significant inconvenience [3]. However, people with abilities do not only experience difficulties. For many decades, most household items, cars and urban objects were created for the "average person". Based on its physical characteristics, an impressive part of objects and interfaces is made. Inclusive design allows you to customize an item, service or urban environment for a user with specific needs.

One important area in which inclusive design principles are applied is clothing. It should be comfortable for people with different needs, fit well and at the same time still remain modern clothing, and not look like a disability uniform.

In Russia, inclusive design, and, in particular, in clothing, is still focused mainly on people with various types and degrees of disabilities, of whom, according to statistics, there are currently a fairly large number (more than 9 million people). The sociocultural isolation of such people due to the lack of not just comfortable clothes, but blurring the line between relatively healthy people and those with disabilities, which allows them to visually look on a par with healthy people, regardless of the existing pathology, is still preserved.

Analysis of scientific literature in the field of creating inclusive clothing (IO) showed that among the reasons that complicate its creation, the main ones are the following: the content of the design
process does not take into account the factor of inclusiveness and is practically no different from traditional clothing; there is no consistency and interconnection in the consideration of various factors that characterize the characteristics of such people; design is carried out without taking into account the achievements of promising technologies. These developments are mainly aimed at solving individual problems related to the consideration of a certain aspect (aesthetic, ergonomic, operational) in the design of clothing for people with various types of disabilities [4] - [10]. Basically, the work of most authors is devoted to the development of general requirements for clothing for people with reduced mobility. As a result, such clothes, designed, on the one hand, to provide a person with increased needs with the greatest comfort and make his life easier, on the other hand, further contributes to isolation from society, involuntarily drawing undue attention to problem areas, thereby aggravating the state of social exclusion. Currently, a practical approach has been outlined for adapting traditional clothing to the specific needs of people with disabilities [11-13].

The main task of this study is to carry out work on the design of models of inclusive clothing that allows people of different sex and age groups with various health disorders and without them to correspond to fashion trends and naturally fit into the social environment.

The aim of the study is to identify color, functional, constructive and technological solutions for models of inclusive clothing, designed, on the one hand, to hide morphological defects, and at the same time to create a fashionable image that increases self-esteem and the quality of life of people.

2. Theoretical part
The authors carried out research, during which the principles of implementing an integrated approach to the design of inclusive clothing were formulated: manageability, utility, ergonomics, versatility, transformability, aesthetics, innovation, targeting, sociality [14]. Based on these principles and conducting a patent search, analysis of the color palette and materials used, approaches to the choice of design solutions for inclusive clothing are formulated (Table 1).

| Design solutions | Implementation directions | Examples |
|------------------|---------------------------|----------|
| Color (fig. 1)   | Harmonization of color relations, taking into account the emotional and psychophysiological effects of color | - monochromatic harmonies; - harmony of related-contrasting colors and contrasting; - the harmony of related colors. |
| Materials used (fig. 1) | 1 Materials with the following properties: hygroscopicity, air permeability, wear resistance, strength, thermal conductivity. 2 It is allowed to use synthetic fibers (from 1 to 30%) to give the materials the properties of flexibility, extensibility, reduction of crease, strength and surface density (not less than 110 g / m2) | 1 Materials based on natural fibers (cotton, flax, silk, wool, nettle, hemp, jute, kenaf, etc.). 2 Adding lycra, spandex, etc. fibers to the materials. |
| Technological    | 1 Availability of functional and technological elements (for example, pockets, fastener in the shoulder seam) 2 Determining the optimal size of elements and their location 3 Application of special | - the presence of functional pockets of optimal sizes located in different places (fig. 1 a, b, c) - the presence of various fasteners using special accessories: a fastener in the side seam with a Velcro tape (fig. 1, d); fastener in the back section with a magnetic button |
fittings

Constructive

1 Provision. freedom of movement in areas with the greatest amplitude

2 Technique for leveling morphological defects

(fig. 1, e); fastener in the shoulder seam with magnetic buttons (fig. 1, f); adjusting the length of the belt using an elastic band with loops (fig. 1 g); fastening of trousers in front of sleep; magnetic buttons and Velcro tape (fig. 1, h); fastener of trousers in the side seam with Velcro tape (fig. 1, i); central fastener of the jacket with magnetic zipper (fig. 1, j)

- trousers with a one-piece belt with an elastic band (for adjusting the waist circumference), trousers widened downwards are convenient to wear with orthopedic devices, including for the whole leg (fig. 2, a);
- overalls with one-piece fold-over cuffs, allowing you to change the length of the sleeve and trousers, including by different sizes (fig. 2, b);
- an additional volume of trousers at the bottom allows you to level the morphological defects of the lower extremities; the fastener at the bottom of the side seam of the trousers allows you to remove the orthosis, prosthesis or put on trousers on a cast leg; the increased length of the middle section of the trousers allows you to sit comfortably, including in diapers (fig. 2, c)

**Figure 1.** Examples of technological design solutions.
Taking into account the obtained results of theoretical studies, a project was carried out to develop models of inclusive belt clothing for women with atrophy of the lower extremities, moving in a wheelchair [15]. The most popular assortment of women's waistbands is a skirt that emphasizes the attractiveness of any woman, in particular, one who moves in a wheelchair. The design of clothing for the lower body of wheelchair users is associated with specificity due to physiological changes in the body and prolonged stay in a static sitting position. The purpose of the practical research was the development of modern design solutions that take into account, on the one hand, this specificity, and, on the other, have universal application for a wide range of consumers.

To achieve this goal, a set of interrelated tasks was solved:

- determination of the requirements for waist clothing for women using a wheelchair;
- analysis of existing methods of designing clothing for similar purposes;
- identification of universal ways of potentially possible solutions to the problem posed;
- development of new patentable functional and constructive solutions for the model of inclusive skirts;

- practical implementation in the form of industrial designs.

At the first stage, the living conditions of people with limited motor abilities were studied. The specificity of their lifestyle is finding most of the time (15 hours 15 minutes a day) in a sitting position in a wheelchair [16]. This largely determines various physiological disorders in the body of people with EFA, which inevitably affects the design and technical solution of products. Another important feature of the operation of such products is the presence of a wheelchair that has close contact with clothing. In addition, being in a wheelchair for a long time, a disabled person needs to be able to easily and quickly put on and take off the product, change diapers and carry out the necessary physiological needs and hygienic procedures without outside help. Aesthetic requirements play an important role in the life of women with limited movement, while wanting to lead an active lifestyle, to be a full member of society, to feel attractive and feminine. A feature of the development of a compositional solution that meets modern trends in the fashion of a product is to take into account and hide the morphological defects of a woman, for example, atrophied lower limbs.

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Figure 2. Examples of constructive design solutions.
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An analysis of the lifestyle of women in a wheelchair and related literature, which considers general requirements for clothing [17] and specific requirements for clothing for people with limited mobility [7, 18], made it possible to structure consumer requirements for waist clothing in wheelchair women. The functional, ergonomic, operational, aesthetic, medico-technical and social requirements are highlighted [19]. In accordance with these requirements, inclusive models of skirts have been developed that meet modern fashion trends (Fig. 3).

The first model is a one-seam straight skirt without side seams with a wrap, lined, with an adjustable waist width with an elastic band (Fig. 3, a). The developed constructive solution of the skirt, in addition to being comfortable to wear, when dressing and undressing, in particular, when in a wheelchair, also provides the ability to change the tightness of the fit, taking into account the completeness of the consumer and at the same time has a rather elegant appearance.

![Figure 3. A series of models of inclusive waist products (skirts): a - without side seams with a wrap with a functional pocket; b - with a removable lock.](image)

The distinctive feature of this skirt is the presence of a special functional pocket, located in a one-sided fold and simultaneously serving as a bag. This is convenient, does not require constant attention to the objects in it and does not interfere with movement, which is important for the clothes of people moving in a wheelchair, where pockets carry a large functional load: a sitting person should always have everything he needs at hand.

However, the results of the experimental wearing of the developed skirt models showed the need to take into account the specifics associated with the atrophy of the muscle mass of the lower extremities. The inability to hold the legs in a certain position, caused by paraplegia (damage to the spinal cord, leading to atrophy of the lower extremities), leads to an unaesthetic visual perception of the posture of a seated woman, which interferes with the natural desire to wear skirts.

The task is solved in the second model of the skirt (Fig. 3, b) due to a special removable leg retainer in the form of a 6 cm wide strip, fastened with a loop and a button and covering the lower limbs above the knee level by 5-7 cm. The retainer is attached to the central part, attached to the main part with a through fastener with 8 welt loops and buttons. This makes it easier to put on and take off the product, and also provides self-care with natural physiological functions.

The configuration of the upper section of the skirt takes into account the peculiarities of the position of a person in a sitting position: in front, the upper section of the skirt is underestimated relative to the natural level of the waistline, at the back it is overestimated by the amount necessary to ensure a comfortable state of a seated person, and at the same time it makes it possible to wear a skirt in a standing position. The developed assortment series of skirts models has been experimentally tested in real operating conditions among women of the middle and older age group, including those moving in a wheelchair, and received their positive feedback [20, 21]. It is noted that the design of the skirt allows you to simultaneously adjust the tightness along the waistline and along the hips,
depending on the individual characteristics of a particular figure. The through fastener makes it possible, without assistance, to easily and quickly put on and take off the skirt, change diapers and carry out the necessary physiological needs and hygiene procedures, which, together with the absence of seams, ensures comfortable wearing.

Thus, as a result of theoretical and experimental studies, an inclusive waist-wear that is distinguished by improved ergonomic performance, novelty and originality of appearance has been obtained. The novelty of the developed women's belt clothing is confirmed by patents for a useful model [22, 23].

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