



RESEARCH ON THE CUSTOMIZATION OF THE DESIGN METHODS OF THE POST-MASTECTOMY BRA PRODUCT

RARU Aliona^{1,2}, FLOREA-BURDUJA Elena^{1,2},
FARÎMA Daniela², IROVAN Marcela¹

¹ Technical University of Moldova, Faculty of Textile and Polygraphy, 4 Sergiu Radautan Street, Chisinau MD-2000, Republic of Moldova

² Gheorghe Asachi Technical University of Iasi, Faculty of Industrial Design and Business, 29 Mangeron Street, Iasi 700050, Romania

Corresponding author: Raru Aliona, E-mail: aliona.raru@adm.utm.md

Abstract: *It is known that the functionality of the product is determined by its structure, namely the textile structure, the constructive solution, the processing technology. The present paper concerns the aspect of the reasoned constructive functional design of the post-operative bra type products. The methods used to refer the matter included researches in the field using the specialized literature, patents, scientific articles, discussions with colleagues and specialists in related fields, as well in the medical field. The paper presents the results of the analysis of constructive statistical parameters of post-mastectomy bra type products, comparative analysis of the values of the constructive parameters of the patterns with the dimensions of the mammary gland and external breast prostheses. The actuality of the theme is determined by the lack of researches that would be the basis of the functional constructive design of the clothing products intended for women with amputations of the mammary glands. The work aims to identify the design method of bra products that allows the adaptation of the construction algorithm to the requirements and the characteristics imposed on the post-operative bra product and the development of the custom design algorithm. For the constructive parameters specific to the studied product, the statistical parameters are calculated. The results obtained are summed up by analyzing them in the form of graphs. The study includes the identification of the initial data that need to be included in the design algorithm of the construction of the basic printing for main elements of the post-operative bra. The results of the study, the elaborated design algorithm will be used to elaborate the constructions necessary for further experiments.*

Key words: *Constructive parameters, post-operative bra, design algorithm, functional design, customization.*

1. INTRODUCTION

In the previous studies, a comparative analysis of the basic patterns' construction methods for the bra product has been performed. The following aspects were analyzed: the initial data necessary for the construction; stages of construction; the number of the basic construction patterns details; values and variation of the constructive parameters on the front symmetry line, the symmetry line of the cup, the lateral line, below the IV bust line, on the rear symmetry line. [1-3]

At this stage, the being solved problem is the identification of the bra products designing method which allows the adaptation of the construction algorithm to the requirements and characteristics imposed on the product post-operative bra and developing the custom design algorithm.



2. CONSTRUCTIVE STATISTICAL PARAMETERS OF THE POST-MASTECTOMY BRA PRODUCTS

At the stage of carrying out the construction of the basic pattern, it is necessary to solve the problem of ensuring the dimensional correspondence between the body and the product, by obtaining the constructive elements that correspond to the specific functions, requirements and characteristics imposed on the type of product designed. [4-6]

In the previous studies, the constructive parameters specific to the analyzed product have been identified: the height of the bra cup on the front symmetry line, the height of the bra cup on the symmetry line of the cup, the height of the bra cup on the side line, the width of the supporting element of the bra cup below the bust line, the width of the supporting element on the front symmetry line, the width of the rear part on the sideline, the width of the rear symmetry mark on the rear symmetry line. [2]

The methods selected for the study carried out above are distinguished from each other by the number of anthropometric dimensions used in the calculation of the construction, the type of calculation formulas of the constructive segments, the construction stages of the patterns.

At this stage for the above-mentioned constructive parameters, the statistical parameters shall be calculated, the results obtained will be presented in Table 1.

Table 1: Bra type product constructive statistical parameters

Statistical parameters	Dimensiuni ale detaliilor, cm						
	cup			cup support element		back	
	On the centre front line	Centre cup line	On the sideline	Below the bust line IV	On the centre front line	On the sideline	On the centr back line
Arithmetic mean	12.85	23.98	12.83	1.52	10.12	14.93	5.83
Standard error	1.30	1.06	1.95	0.65	2.63	1.95	1.27
Minimum	9.60	21.40	7.50	1.00	10.20	7.60	2.50
Maximum	18.60	28.40	17.90	4.00	22.60	22.00	11.00
Amplitude	9.00	7.00	10.40	3.00	12.40	14.40	8.50
Median	12.4	23.75	13.5	2.05	13.95	14.85	5.2
Average quadratic deviation	3.19	2.60	4.78	1.30	5.26	4.78	3.10
Dispersion	10.17	6.77	22.87	1.70	27.71	22.86	9.63
Coefficient of variation	0.25	0.11	0.37	0.86	0.52	0.32	0.53

Considerable amplitude value 9.0 cm for cup height on the front symmetry line, 7.0 cm on the cup symmetry line, 10.4 cm on the side line; 3.0 cm the width of the supporting element of the bra cup below the bust line, 12.40 on the front symmetry line; 14.40 cm width of the rear marker on the side line, 8.50 cm on the rear symmetry line - high values for the analyzed constructive parameters for a product that will meet the requirements of shape-size-body-product correspondence. The value of the coefficient of variation indicates the average height of the cup on the symmetry line, for the height of the cup on the face symmetry line the average value is sufficiently representative, and for the rest of the analyzed indicators the arithmetic mean is not representative.

In order to summarize the values of the measured constructive parameters, they are represented in the form of graphs (fig. 1-3).

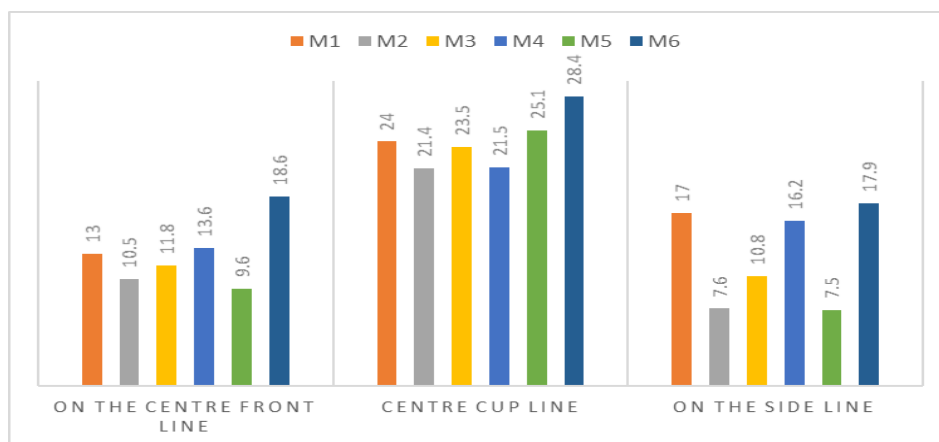


Fig.1 Variation of the constructive parameter values characteristic of the bra cup

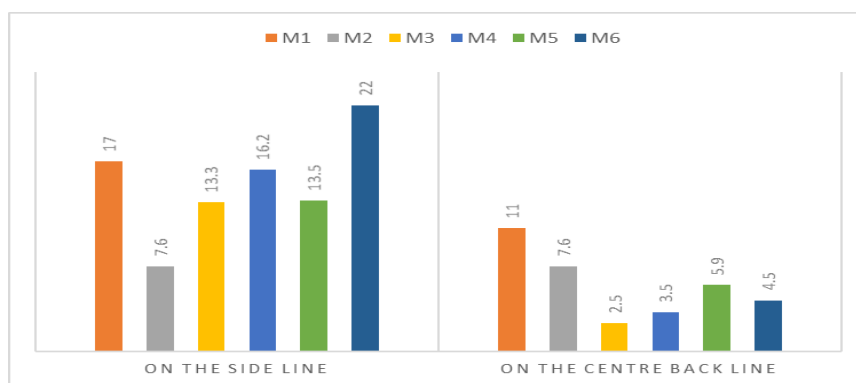


Fig. 2 Variation of the constructive parameter values characteristic of the support element of the bra cup

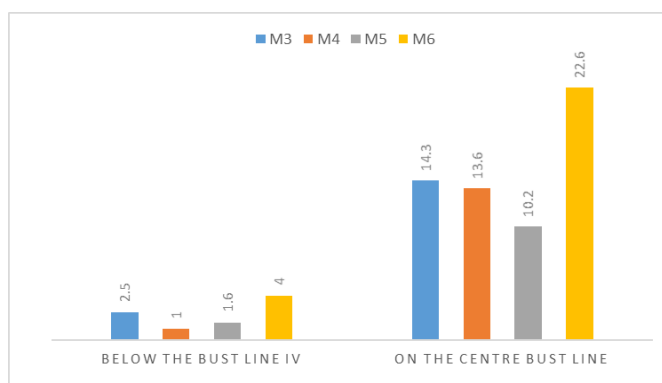


Fig. 3 Variation of the constructive parameter values characteristic of the rear landmark of the bra

The values of the print constructive parameters, obtained by the method of the Russian author L. Serova, have maximum values except for the width of the rear reference mark on the symmetry line, which recommends the method in order to personalize the construction of the post-mastectomy bra pattern.

Figure 4 shows the results of the comparative analysis of the bra cup height on the symmetry line with values of the dimensions of the mammary gland, prosthetics, and dimensions of a pattern selected for comparison.

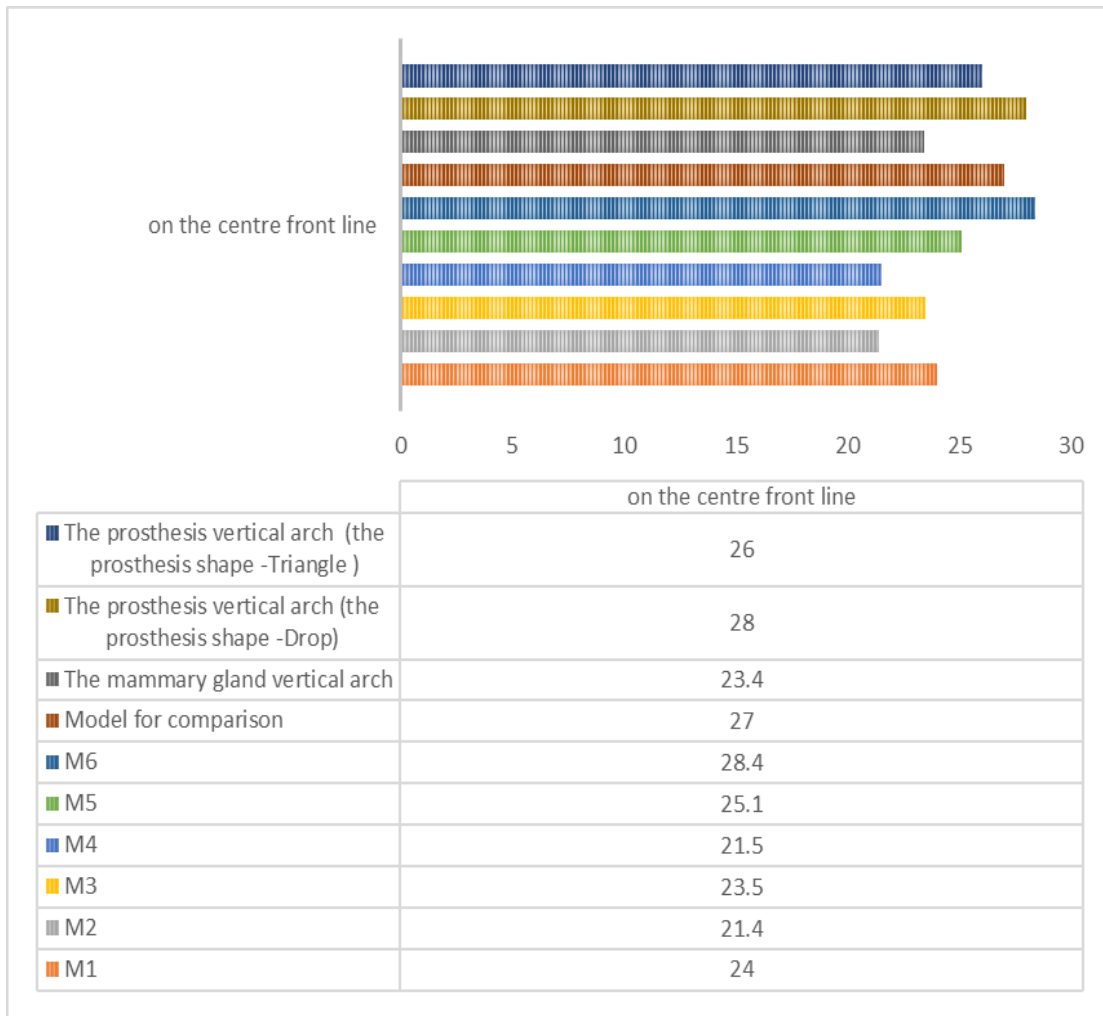


Fig. 4 Variation of the constructive parameter values height of the bra cup in comparison with the dimensions of the mammary gland, external breast prostheses.

The value of the parameter height of the bra cup on the symmetry line is close to the dimensions of the mammary gland in the case of the English Winifred Aldrich method, the method of construction in radial networks, the TNIISHP method and the method of the Russian author L. Serova. In the case of the method of the Russian author L. Serova, this value is also close to the values of the parameter of the model for comparison, but also of the breast prostheses.

3. CUSTOMIZATION OF THE BASIC PATTERN CONSTRUCTION METHOD FOR THE POST-MASTECTOMY BRA PRODUCT

Taking into account that the functional and ergonomic design of clothing products for people with special needs involves the customization (individualization) of the methods of clothing design, according to the requirements of the wearer (type of disability, anthropometric peculiarities) as well as the characteristics of the field of use (environmental and body condition), it is proposed to adapt the construction algorithm by the method of the Russian author L. Serova to the requirements and characteristics imposed on the product post-operative bra (table 2).



**ANNALS OF THE UNIVERSITY OF ORADEA
FASCICLE OF TEXTILES, LEATHERWORK**

Table 2: Elaboration of the custom construction algorithm for the construction of the post-mastectomy bra product pattern

Classical (initial) method	Custom method (adapted)
Initial data	
Data on the wearer: Conformation group Bust semiperimeter II – S_{bII} Bust semiperimeter IV – S_{bIV} The distance between the breast points – D_{pm} The mammary gland vertical arch – A_{vgm} The bethel width – l_{bet}	Data on the wearer: Conformation group Bust semiperimeter II – S_{bII} Bust semiperimeter IV – S_{bIV} The distance between the breast points – D_{pm} The mammary gland lower vertical arch – $A_{v.s.g.m}$ The bra upper cup lifting value – $A_{v.i.g.m}$ The bra upper cup lifting value – $Val_{rid.cup}$ The shoulder strap width – l_{bret} The bethel width – l_{bet}
Data on the prosthesis: –	Data on the prosthesis: The prosthesis shape The prosthesis upper vertical arch – $A_{v.s.p.m}$ The prosthesis lower vertical arch $A_{v.i.p.m}$ The breast prosthesis horizontal arch – $A_{o.p.m}$
Bra construction algorithm	
Bra cup construction algorithm: $Ba=Cd = D_{pm}-1,0cm$ $Ab=bD=1/2 AD$ $a_1a=aa_2=b_1b=bb_2=d_1d=dd_2=e_2e=ee_1=1/2 S_{bII}/10$ $Ak=3,0...4,0cm$ $kk_1=1,0...2,0cm$ $Bk_2=3,0...4,0cm$ $Dk_3=1,0cm$ $k_3k_4=1,0cm$ $Ck_5=3,0...3,5cm$ – on the angle bisector C	Bra cup construction algorithm: $AB=CD=S_{bII}/2$ $AD=BC= A_{v.s.g.m}+ A_{v.i.g.m}+ Val_{rid.cup}$ $Ba=Cd = D_{pm}-1,0cm$ $Ab=bD=1/2 AD$ $a_1a=aa_2=b_1b=bb_2=d_1d=dd_2=e_2e=ee_1=1/2 S_{bII}/10$ $Ak=4,0...5,0cm$ $kk_1=2,0...3,0cm$ $Bk_2=4,0...5,0cm$ $Dk_3=1,0cm$ $k_3k_4=1,0cm$ $Ck_5=3,0...3,5cm$ – on the angle bisector C
Construction the cup support: $e_2P=e_1k_2$ $PP_1=0,5...1,0cm$ P_1P_3 – min 3,0cm below the waist line $P_3P_4 = PP_1 + Cd_2 + d_1k_4$	Construction the cup support: $e_2P=e_1k_2$ $PP_1=2,0...3,0cm$ $P_1P_3 = l_{bet}$ $P_3P_4 = PP_1 + Cd_2 + d_1k_4$
Construction of the back landmark: $A_1B_1 = D_1C_1 = S_{bIV} - P_4P_3$ $A_1D_1 = B_1C_1 = P_5P_4 + \kappa_4b_2 + b_1k_1$ $D_1A_1=3,0cm$	Construction of the back landmark: $A_1B_1 = D_1C_1 = S_{bIV} - P_4P_3$ $A_1D_1 = B_1C_1 = P_5P_4 + \kappa_4b_2 + b_1k_1$ $D_1A_1= l_{bet}$
External prosthesis pocket construction algorithm	
–	$A_bB_b=C_bD_b= A_{o.p.m}$ $A_bD_b=B_bC_b= A_{v.s.p.m}+ A_{v.i.p.m}$ $B_ba_b=C_bd_b = A_{o.p.m}$ $A_bb_b=b_bD_b= A_{v.s.p.m}$ $a_{1b}a_b=a_{2b}b_b=b_{1b}b_b=b_{2b}d_{1b}d_b=d_{2b}e_{2b}e_b=e_{1b}=1/2 S_{bII}/10$ $A_bk_b=4,0.cm$ $k_bk_{1b}=2,0cm$ $B_bk_{2b}=4,0cm$ $D_bk_{3b}=1,0cm$ $k_{3b}k_{4b}=1,0cm$



Based on the proposed custom algorithm, the necessary constructions for further experiments will be elaborated.

4. CONCLUSIONS

The values of the constructive parameters of the print obtained by the method of the Russian author L. Serova have maximum values except for the width of the rear mark on the symmetry line, which recommends that method in order to personalize the construction of the post-mastectomy bra type product pattern. Patterns of the basic construction for a wide range of sizes, necessary for further experiments, will be developed using the Software application for the design of the functional-adaptive postoperative bra type product. The elaborated basic patterns are to be used for further research in view of the adaptability and functionality of post-operative bra products.

REFERENCES

- [1] A. Raru, E. Florea Burduja, D. Farîma, M. Irovan, Iu. Lupu, „*Database for post-operative bra type product pattern construction calculating*”, in The 17th International Scientific Conference eLearning and Software for Education, Bucharest, April 22-23, 2021.
- [2] A. Raru, E. Florea Burduja, M. Irovan, D. Farîma, „*Studies on the postoperative functional-adaptive bra design*”, in Journal "Annals of University of Oradea. Fascicle of Textiles, Leatherwork", Vol 22-Nr. 1May, 2021.
- [3] A. Raru, E. Florea Burduja, D. Farîma, M. Irovan, „*Development of a collection of models of post-operative textile products intended for post-mastectomy women*”, in International Symposium „Technical Textiles – Present and Future”, Iași, România, 2022.
- [4] C. Bread, „*Contemporary clothing issues of women who are post-mastectomy*”, in USA: Western Michigan University, 2011.
- [5] U. Chowdhary, „*Clothing and Accessories for Post Mastectomy Survivor*”, in USA: Western Michigan University, 2017.
- [6] D. Gupta, „*Development Functional clothing – Definition and classification*”, in Indian Journal of Public Health Research, 2011.