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Camisole Modification Based on Human Physiology and Fashion Aspect for Diponegoro University Students

D Nurkertamanda¹, A S Utami¹, Sriyanto¹ and Y Widharto¹

¹Industrial Engineering Department, Faculty of Engineering, Diponegoro University

nurkerta@gmail.com

Abstract. Camisole is one of the supporting equipment of the kebaya which functions to cover the body in the upper part of the woman and serves to form the curves of the body. This function causes inconveniences such as feeling tight, feeling pain in the back, feeling hot. This must be supported by camisole modifications that pay attention to wearer's physiology and fashion to support the user's confidence. This study was conducted to assess the application of ergonomics in a camisole. This study uses real experimental research using cross-design two periods with subject or treatment by subject two period crossover design involving 10 subjects of the Hindu student community at Diponegoro University. Data measured were age, height, weight, body mass index, pulse and filled out a fashion questionnaire with 4 Likert scales. This research uses t-paired test to compare the existing products with modified products. The results of the descriptive analysis showed a significant decrease in the pulse with the average product of the existing chemise (product A) of (113.89 ± 5.01) and the modified camisole product (product B) of (107.17 ± 4.14) dpm significantly increase fashion by 80% on the wearer.

1. Introduction

Fashion becomes an identity that can show the characteristics of a nation. From the fashion worn by a person, it can be easily known where the person came from. According to [1] the definition of fashion is "everything that's used from the tip of the hair to the tip of the foot". Indonesia has established a kebaya which is one of Indonesia's cultural heritages as a national costume by President Soekarno, because kebaya is considered the most ideal to reflect the elegance of an Indonesian woman figure. [2]. In general, kebaya consists of several parts such as jug (Stagen), camisole, and jarik cloth, to support elegance in wearing kebaya. Every part of kebaya has a function for the body of women wearing it. "Kendit" or known as "stagen" is a long strand of cloth about 20-30 cm in width with a length varying from 2-4 meters, the type of fabric used is rather flexible and can stretch but with a strong weaving structure. Kendhit functions to form the body especially in the abdomen so that the stomach does not stand out [3]. According to [4] jarik cloth is a long cloth that has a rectangular shape with an average length of 2 meters to 2.5 meters, and a width of approximately 1.05 to 1.1 meters. This jarik is useful for covering the lower limbs. Camisole or also called strapless, a combination of bras and short bodice with elastic width on the sides of the panel and equipped with bones [5].

From the preliminary questionnaire result which was obtained from 13 respondents of Semarang "Diajeng" community, and the Hindu student community who wore camisole stated that at least once a month the respondents used camisole. Camisole users feel that camisole they use is less practical, less modern, less suitable mode if used with "kebaya kutu baru", less comfortable, feeling hot because the fabric does not absorb the sweat, the movement is not free, there is back pain and tightness in the breath.



In this study user complaints that become researcher concern are complaints about feels hot and short of breath when wearing a camisole. This study not only pays attention to physiological responses in the use of camisole. Fashion also needs to be considered in the fashion world. From the results of the preliminary questionnaire that was obtained, the respondents still prioritized camisole mode that was in accordance with the era. The approach used in this study is a systemic, holistic, interdisciplinary, and participatory (SHIP) approach. This approach prioritizes the problems that need to be solved, namely discomfort and lack of confidence in using a camisole

2. Research Methodology

In this study, the researcher conducted an experimental study using a cross period design with the same subject or treatment. In this study, there were 2 groups of subjects, namely subject group A and subject group B. Each subject group will use product A and product B, product A is a product of existing camisole and product B is a camisole product that has been developed. This study also has 2 periods, namely in period 1 the subject of group 1 performs a predetermined activity using product A. After that the subjects in group 2 do the same activity with the subject group 1 but use the camisole B. In period 2 the first activity group 2 subjects using product A, and then group 1 subjects did the same activity with group 2 subjects using product B. To explain the design of this study, it can be illustrated in figure 1 in the form of a research design scheme to be carried out.

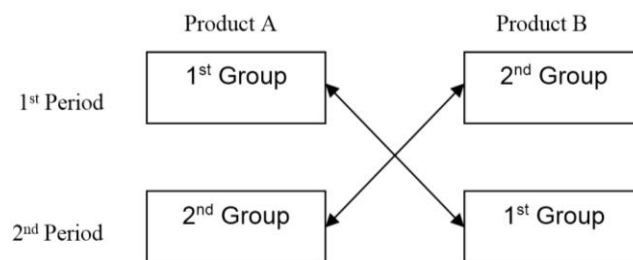


Figure 1. Research scheme design

In this study also provided a fashion closed questionnaire the researcher presents a choice of statements so that the subject can only provide limited responses to the choices given.

3. Results

Design choices for camisole products can be grouped into 3 groups, namely: fastening attributes, camisole shape design side view, front view camisole design. Alternative design s for camisole products were obtained from various existing products. Alternatives were chosen using suggestions from respondents through the camisole design selection questionnaire. There were 10 responses to the questionnaire by choosing the alternatives and their reasons. Of the 10 responses that have been obtained, the best alternative solutions are chosen, including:

- Fastening attribute design. Of the 3 alternative fastening designs, as many as 90% of respondents chose the right button hook type. Respondent feels that the use of the right button on the camisole is felt to be firmer, stronger, and stick to the body so that it is comfortable to use. Besides the advantages of this right button, the camisole can adjust body size and easily open.
- Rear view shape design. As many as 60% of respondents choose the basic design alternative for the design behind the camisole. This is because the basic cloth is more attached to the body so that it feels tighter and makes the body more proportional.
- Front-view shape design. Of the 3 alternative design fronts, 80% of respondents chose the basic type. This is because the camisole with the basic front shape is comfortable to wear. In addition, respondents also felt more polite and closed using basic designs because they did not emphasize the cleavage like other alternatives



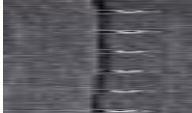





Table 1. Questionnaire variable and indicator

No	Variable	Indicator	Statement	Source
1	Fashion	Stitches	Camisole stitches are neat and nice	[4]
2			Camisole stitches is strong	
3		Model	Camisole model is unique	[4][6]
4			Camisole model is interesting	
5			Camisole model is simple	
6			Camisole support body shape	
7			The model of the Camisole bra is exactly the size of the breast	
8			model where the bra is put does not hurt when used	
9			Hooks are easily adjusted to body size	
10		Colour	Color isn't flashy	[7][6]
11			Colour is soft	
12			Suitable colors paired with other colors (neutral)	
13			Colour follow trend	
14		Material	Easy Absorbing Material	[4][7][8]
15			Material Makes Motion freely	
16			Camisole material is soft	
17		Accessories	Camisole accessories on the abdomen are attractive	[4][6][7][8]
18			Camisole accessories are unique	
19			Camisole accesories are easy to use	

Table 2. Camisole product specifications and design concepts

No.	User Need	<i>“Engineering characteristic”</i>
1	Colour, shape and motives need to look attractive or fashionable, stitches line look neat. That's make user have more self confidence.	Trendy colors, motifs, practical shapes and fashionable looks when worn with kebaya kutu baru and neat stitching lines.
2.	Need materials that are easily absorbed sweat so that the user does not feel hot when wearing	Camisole product material in the form of Japanese cotton cloth.
3.	Need the appropriate pattern and size so that it doesn't feel tight on the body.	The bone used is bone made from plastic and elastic material, and the right pattern.

Table 3. Existing camisole product part

Part	Alternative 1	Alternative 2	Alternative 3
Fastening			
	String	Invisible zipper	Button type
Side view			
	Lowback	Basic	
Front View			
	V Love	Zip fit	Basic

The subject of the study, before being determined to be the subject of the study, was physically measured. The criteria that must be possessed by the subject include women of the age between 18-23 years and have a Body Mass Index (BMI) of 17-23 kg /m². Body Mass Index (BMI) is derived from body weight divided by squared height. Subjects were students of Diponegoro University. Data on the subject of the study and the normality test are presented in **Table 4**.

Table 4. Characteristics of the research subject and the result of the normality test *Shapiro-Wilk*

No	Variable	Average	Standard Deviation	Significance value for normality
1	Age (year)	21.60	1.07	0.177
2	Weight (kg)	44.40	2.07	0.447
3	Height (cm)	155.50	2.72	0.460
4	Body Mass Index (BMT)	18.37	0.80	0.237

In the range of 20-28 years Indonesian women are generally still at the stage of studying, even though there are some who directly enter the workforce, but only at the initial stage of a career. At this age the body shape has gone through growth, and only entered the beginning of adulthood, where women are at the peak of their beauty with a very prime body condition, so they are freer in choosing various types of clothing [9]. The age range of subjects in this study is 20-23 years because researcher studied community in year of 2018, the organization members ranging in age from 18-24 years. In other studies, the age factor below 25 years, the subject can exercise well physically. As with [10], subjects with tourism high school students were aged 19.47 years, and [11] research with mechanical student subjects aged 19.1. From other studies, it was seen that under the age of 25 years classified as students can be physically active well because at that age muscle strength and physical abilities are still increasing. Characteristics of subjects other than age were weight, height and body mass index. The mean body weight was 44.40 ± 2.07 kg with a mean height of 155.50 ± 2.72 cm. According to [12] Body mass index (BMI) is an objective instrument for measuring health risks and is calculated based on the ratio of body weight in

kilograms to the square of height in meters in the subject in question. In this study, the body mass index of the subject is in the range of 17.22-19.39 kg / m² with a mean of 18.36 ± 0.79 kg / m². According to the [13] the normal body mass index is in the range of 17-23 kg / m². So based on body mass index it can be said that the subject of this study has a normal body weight and height and a body that is in the healthy category. The condition of the body mass index below normal (thin) or body mass index above normal (fat) will affect activity. A person with a body mass index below the normal threshold is very susceptible to experiencing energy shortages and influences activity. While someone with a body index above normal or too fat cannot move agile. The condition of subjects with normal body mass index supports research so that the physical burden that is the focus of the study is external workload without obtaining additional internal workloads. Several other studies that have research subjects with normal body mass index such as the [10] study with a body mass index of 21.53 ± 1.57 kg / m², [14] with a body mass index of 22.59 ± 0.9 kg / m² and [10] with a body mass index of 20.9 ± 0.8 kg / m². From these studies indicate subjects with normal body mass index can do their best. In Table 5 shows the resting pulse data of product A and product B did not differ significantly ($p > 0.05$). The results of the t-paired test on the pulse of activity show that there is a significant difference ($p < 0.05$) between the pulse rate of product A and product B. The difference in pulse activity between products is 6.715. With sig. 0.023.

Table 5. T-Paired test results for basal pulse and pulse activity in product A and product B

<i>Paired</i>	<i>Average difference</i>	<i>95% confidence Interval of The Difference</i>		<i>P</i>
		<i>lower</i>	<i>Upper</i>	
Basal A with Basal B	-0.210	-2.983	2.563	0.868
Activity A with Activity B	6.715	1.344	12.086	0.023


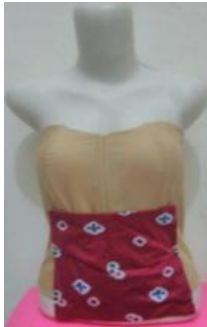


Based on the results of normality test data processing, it was found that rest and activity of the two products were normally distributed ($P > 0.05$). The results of the comparative t-paired test of product A and product B did not differ significantly ($P > 0.05$), indicating that the subject's resting conditions could be considered the same. The difference in results for the mean pulse of product A and product B has a significant difference ($P < 0.05$), this shows that the average pulse of activity between product A is different from the average pulse rate of product B can be said with the average pulse activity among the two products, there is a difference in workload between the two products. The basal pulse values of the two products of 0.868 did not have a significant difference ($P > 0.005$) with a mean (87.52 ± 6.76) dpm for product A and product B averaged (87.73 ± 6.84) dpm. The basal pulse with a mean value of $87.52 - 87.73$ dpm indicates the subject at rest with a light workload category [15]. While the value of the pulse of the second activity of the product amounted to 0.023 with a significant difference ($P < 0.05$) with the mean of product A amounting to (113.89 ± 5.01) and product B amounting to (107.17 ± 4.14). On the pulse of activity with an average value of 113 - 107dpm indicates the subject at the time of activity with the category of moderate workload [15]. From the 2 products of this study, the pulse of activity between product A and product B decreased in product B, the difference in mean rate of activity between product A and product B was 6.715 dpm or 5.90%. Decrease in workload is indicated by a decrease in the pulse of activity, due to improvements in the material and size of products with Japanese cotton, the subject's pulse rate is lower than satin. Cotton is made from 100% pure cotton so that it absorbs sweat [16]. In other studies the pulse rate of subjects in sports compression layers has been shown to decrease the pulse [17]. Research on junior high school students in the application of ergonomics in sports uniforms has no significant decrease or influence. With values of the Control Group (107.03 ± 15.19) dpm and the Treatment Group (106.93 ± 16.37) dpm there was no influence between the two [18]. The results of this comparative test are testing data using the t-paired test used to find out whether there is a significant difference in the fashion questionnaire when the subject uses two

different products. With critical area sig. <0.05. Data on product A and product B fashion questionnaire items can be presented in Table 6

Table 6. Result of t-Paired test for the fashion questionnaire on product A and product B

<i>Paired</i>	Beda Rata	<i>95% confidence Interval of The Difference</i>		P
		Lower	Upper	
Item 1 B - Item 1 A	1.100	0.244	1.956	0.017
Item 2 B - Item 2 A	0.400	-0.291	1.091	0.223
Item 3 B - Item 3 A	1.000	0.326	1.674	0.008
Item 4 B - Item 4 A	1.100	0.572	1.628	0.001
Item 5 B - Item 5 A	1.000	0.416	1.584	0.004
Item 6 B - Item 6 A	0.600	-0.091	1.291	0.081
Item 7 B - Item 7 A	1.200	0.321	2.079	0.013
Item 8 B - Item 8 A	1.000	0.174	1.826	0.023
Item 9 B - Item 9 A	1.000	0.174	1.826	0.023
Item 10 B – Item 10 A	1.200	0.388	2.012	0.009
Item 11 B – Item 11 A	0.900	0.189	1.611	0.019
Item 12 B – Item 12 A	0.700	0.111	1.289	0.025
Item 13 B – Item 13 A	0.700	-0.058	1.458	0.066
Item 14 B – Item 14 A	0.900	0.189	1.611	0.019
Item 15 B – Item 15 A	1.100	0.572	1.628	0.001
Item 16 B – Item 16 A	0.400	-0.369	1.169	0.269
Item 17 B – Item 17 A	1.000	0.326	1.674	0.008
Item 18 B – Item 18 A	1.000	0.326	1.674	0.008
Item 19 B – Item 19 A	1.300	0.542	2.058	0.004
Item 20 B – Item 20 A	1.500	0.727	2.273	0.002

Table 7. Differences in physiological and fashion results on Camisole products

Camisole Product Difference			
Average Activity Pulse		Fashion	
Existing Camisole	Modified Camisole	Camisole Fashion Existing	Modification Camisole
$t = 2,742$ $df = 9$ $P < 0,05$		 <p>This Camisole Front View Product there are no interesting accessories</p>	 <p>The front view of this camisole product there are interesting accessories</p>
133 dpm	107 dpm	 <p>Back view On the back Using rope ties Kain Satin With satin fabric, camisole products cannot absorb sweat Gold colour Gold colour is currently not a trend colour</p>	 <p>Back view On the back Using button strapped Japanese Cotton Fabric With Japanese cotton fabric, camisole products can absorb sweat Cream color The cream color is now a trend color</p>

All items of the product A and product B fashion questionnaires were found to be 80% with significant differences. The difference between the two camisole products is camisole that has been modified have neat and good stitches due to super soft stitching and expert tailors. Camisole modification has a hook that can adjust the wearer's body. There is also the uniqueness of camisole modification, this uniqueness lies in the accessories in the abdomen that attract users to wear it, these accessories are practical to use. Modular camouflage modification. The simplicity of camisole modification is seen from unobtrusive colors and does not seem flashy. The color on the modified

camisole is neutral so that it can be solid match with other colors. Modified Camisole has a flat type bra cup. This type of bra cup can increase comfort for users because the bra cup material used is made from foam without the disposal paper which will shift the position causing pain and discomfort. The material used in this modified camisole is made from Japanese cotton has a high level of perspiration and little movement freely. There are 20% not significantly different. Because there is no difference in the two camisole products that have the same strength in seam quality. Both products both support the wearer's body shape so there is no difference between the two products in terms of the camisole model. In terms of color the subject does not know the color of the current trend so that the subject thinks the colors of the two products do not follow the trend. From the two camisole products, the subject of the second ingredient is fine camisole products. From the results of this study it was found that there were differences in pulse and fashion on the existing camisole products with modified camisole

4. Conclusion

Based on the results of research, and statistical analysis, there are some conclusions can be drawn as follows: Camisole modification based on Physiology significantly reduces user inconvenience and made user more confidence using their fashion.

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