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## REZUMAT – ABSTRACT

### Îmbunătățirea ajustării pe corp a uniformelor din laboratoare și ateliere de lucru

*Confortul îmbrăcăminteii poate fi descris ca fiind un sentiment de satisfacție fiziologică, psihologică și fizică și de echilibru în ceea ce privește îmbrăcăminte și condițiile actuale de mediu.*

*Scopul acestui studiu este de a evalua confortul de mișcare a corpului în uniforme de lucru purtate de personalul care lucrează în laboratoare și ateliere prin intermediul studiilor de uzură, pentru a determina potențialii factori care afectează negativ confortul de mișcare a corpului, pentru a efectua modificări de model în scopul asigurării satisfacției utilizatorilor și propunerii unui exemplu de tipar de uniformă de lucru.*

*La sfârșitul studiului, s-au făcut unele modificări privind tiparul de bază al uniformei de lucru pe baza datelor obținute din parametrii de cercetare.*

*Cuvinte-cheie: ajustare pe corp, uniformă de lucru, modificări ale tiparului, confortul mișcării corpului*

### Improving fit of work uniforms used in laboratories and workshops

*Clothing comfort can be described as an individual's feeling physiologically, psychologically and physically satisfied and balanced in that clothing and under current environmental conditions.*

*The purpose of this study is to evaluate the body movement comfort of work uniforms used by people working in laboratories and workshops through wear trials, to determine the factors, if any, that negatively affect the body movement comfort, to make pattern modifications to ensure user satisfaction, and to propose an example work uniform pattern model.*

*At the end of the study, some modifications were made on the basic work uniform pattern based on the data obtained from research parameters.*

*Keywords: fitting, work uniform, pattern modifications, body movement comfort*

## INTRODUCTION

Clothing comfort can be described as an individual's feeling physiologically, psychologically and physically balanced and satisfied in that clothing and under the current environmental conditions [1, 2]. In other words, all functions of a clothing such as providing movement comfort physiologically and psychologically to the wearer, acting as a thermo-regulation system against ambient temperature changes, and making a person psychologically happy with their appearance as well as their aesthetic and attitude features can be defined as clothing comfort. Improvement of clothing comfort raises people's living standards [3].

Clothing comfort consists of the sub-components of thermal comfort, sensory (tactile) comfort, body movement comfort and psychological (aesthetic) comfort [4]. Body movement comfort which is the topic of this study has an important place among the components of comfort.

In terms of clothing comfort, it is vital that the clothing does not restrict body movements and adapts itself to these movements [5, 6]. That the clothing does not restrict body movements and adapts itself to these movements can only be possible if the clothing pattern is prepared suitably for the body.

Several studies conducted on this topic were summarized as follows.

In their studies, Choi and Ashdown (2002) developed clothes for the farmers that picked pears in the city of Naju, Korea. In the first phase of the study, field observations, interviews and surveys were conducted regarding both female and male farmers. The survey was administered to 113 people; 42 females, and 71 males. In accordance with the survey results, 4 prototype samples consisting of jacket and trousers for females were developed. The aim was to improve the working performance and clothing comfort of the workers while developing the samples. At the end of the study, the samples were subjected to wear trials, and were evaluated by the female workers and experts in terms of fit, function and aesthetics, and the optimum clothing was tried to be discovered [7]. Schofield et al. (2006) examined the relationship between the body shapes of people over 55 years old and the sizes and patterns of the trousers they wore. They tested the trousers with two different fit types on 176 subjects and compared the results [8]. Ho et al. (2008) tested eight sports outfits on 14 pregnant women around 32.3±4.2 years old. Within the study, the thermo-physiologic, tactile and body movement comforts of the clothes were examined. At the end of the wear trials, it was stated that the clothing types and models affected the body movement comfort [9].

Çoruh (2009) examined the ergonomics of jeans. Within the study, a survey was conducted in order to examine the ergonomics of jeans, to determine the problems that the individuals wearing jeans encountered, and to propose design for the ergonomics of jeans patterns based on these problems. The problems identified were categorized into 4 factors including discomfort of tightness, discomfort of climbing up stairs, discomfort of strain and discomfort of waist-baring. As a result, some recommendations were made on jeans patterns for the purpose of making ergonomic jeans [10].

In their studies, Çivitçi and Çakmak (2009) examined the effect of fabric structures with surface extension ability and different fiber construction on model and pattern designs of female trousers in ready-made clothing sector. Accordingly, they conducted wear trials on 24 people with six different fabric types, and necessary modifications were made on the trousers patterns thanks to the findings obtained at the end of the evaluation [11].

In their studies, Çoruh et al. (2011) developed a scale in order to evaluate the physical comfort of jeans. During the scale-development process, young people were interviewed regarding the problems that they encountered related to jeans in their daily life, the literature on clothing comfort was examined, and the experts working in ready-made clothing sector were interviewed. In the light of the information obtained, a scale consisting of 19 items was developed in order to assess the physical comfort of jeans, and validity and reliability analyses were performed [12].

Komarkova and Glombikova (2013) studied the effect of the anatomical changes during pregnancy on the pattern design of maternity wear. Accordingly, they measured the body sizes of the pregnant women at the beginning of their pregnancy and in the 36<sup>th</sup> and 41<sup>st</sup> weeks, and then, they worked on to develop one blouse and one trousers pattern. At the end of the study, they developed patterns suitable for the body types of pregnant women [13].

Utkun (2014) analyzed the body movement comfort performances of three different classical male shirts intended for bellied males through wear trials that were conducted on a group of 10 subjects. The fit of the shirts to the body, as well as their comfort during movement were separately analyzed through these wear trials. At the end of the study, the belly size concept was recommended to be used in the production of classical shirts for males [14].

The purpose of this study is to evaluate fit of work uniforms worn by people working in laboratories and workshops, to determine the factors, if any, that negatively affect the body movement comfort, to make pattern modifications to ensure user satisfaction, and to propose an example work uniform pattern model. For the study, necessary ethical permissions were obtained from the Pamukkale University Ethics Committee with the document no: 20678 on 29.03.2016.

## EXPERIMENTAL PART

### Materials

The materials of the study consisted of 21 females (38-size) who voluntarily attended the wear trials and wore work uniforms in workshops, and one uniform produced out of the 38-size standard female patterns according to the Muller system.

The age of the volunteers who participated in the wear trials ranged from 18 to 23. The average bust measurement of these subjects was  $90 \pm 2$  cm, their average waist measurement was  $66 \pm 2$  cm, average hip measurement was  $94 \pm 2$  cm, average sleeve length was  $6 \pm 2$  cm, and average height was between 155 cm and 170 cm.

Within the study, one standard 38-size female work uniform was produced. The work uniform model is described as men's collar uniform with five buttons in the front, one top pocket and two bottom pockets in the front, removable sleeves, and center back seam (figure 1). The type of the woven fabric used in the production of the work uniforms was alpaca and consisted of 75% cotton and 25% viscose, and its fabric weight was  $180 \text{ g/m}^2$ .

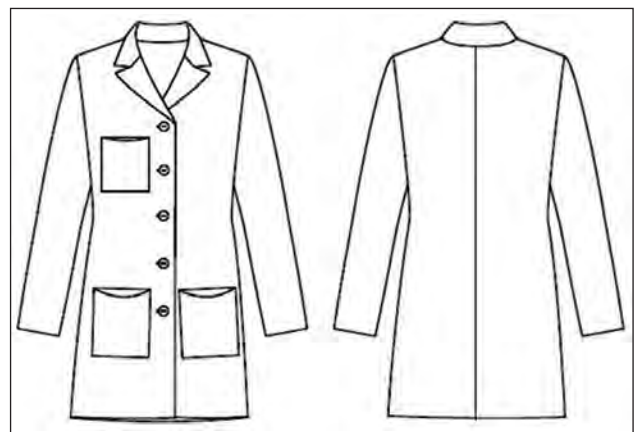


Fig. 1. Classical female work uniform (front and back view)

While preparing the work uniform patterns, primarily the basic work uniform patterns were prepared, and then, the front part and the back part, as well as the sleeve patterns were created. The standard size table used when preparing the basic work uniform patterns was illustrated in table 1. The basic patterns of the front and back part, collar and back yoke of the uniform were shown in figure 2, and the expansion of the patterns was shown in figure 3.

### Method

At the initial phase of the study, one work uniform was produced. This work uniform was subjected to wear trials on 21 females one by one, and the fit of the uniform to the body and their comfort during movement were separately analyzed, and in addition to these, the fit of the length and width of the uniform to the body were observed when the uniform was worn.

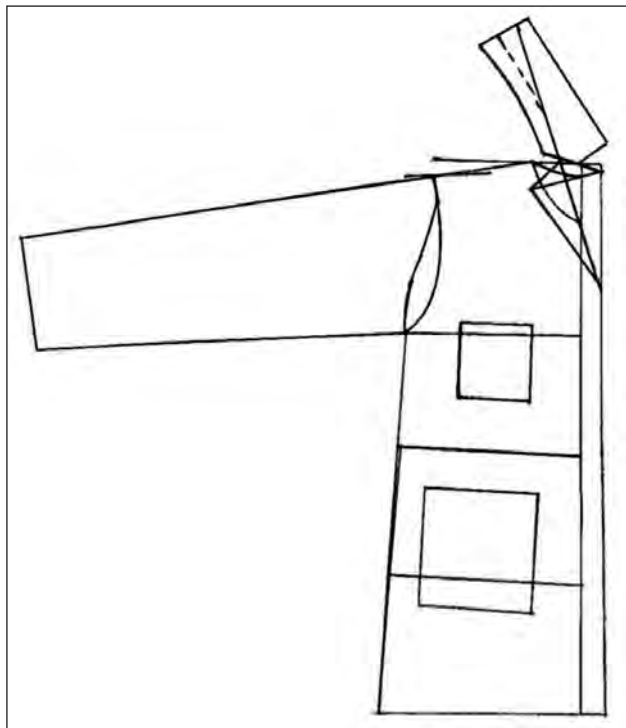


Fig. 2. The basic patterns of the work uniform for front and back parts (view)

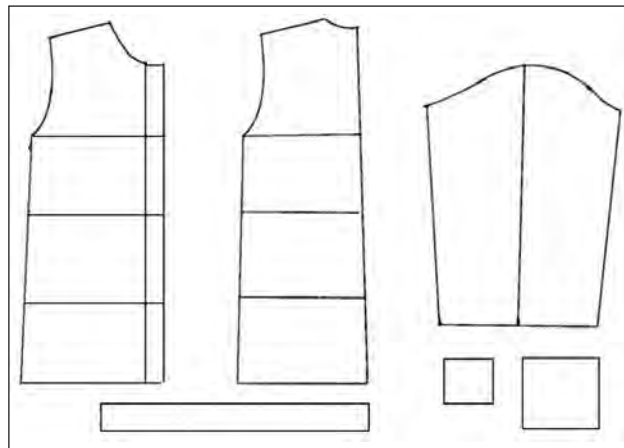


Fig. 3. The expansion of the front and back parts and sleeve pattern

It was determined that although the bust size of these people fitted to 38-size, there were problems with the length and width, and the work uniform did not provide body movement comfort. From this point forth, within the scope of this study, comparative analyses were done based on the frequency analysis, one of the statistical techniques, and modifications were made on the basic work uniform patterns.

Table 1

SIZE TABLE	
Measurements (cm)	Size 38
Length (from shoulder)	82
Chest girth	90
Hip girth	94
Waist girth	66
Shoulder width	15
Collar opening	15
Front collar drop	9
Back collar drop	2
Arm length	60
Wrist width	16
Armhole height	23
Shoulder drop	2.5

The parameters researched during the wear trials were given in table 2, 3 and 4. The parameters analyzed during the wear trials were reviewed by a specialist along with the wearer.

## RESULTS AND DISCUSSION

The frequency analyses of the parameters researched during the study are presented in table 5, 6 and 7.

A total of 23.8% of the survey participants think that their work uniform was suitable for their body movements, 61.9% of them think that it was not suitable, and 14.3% of them were neutral about this issue.

In addition, 14.3% of the participants think that removable sleeves were suitable for their body movements, 71.5% of them think that removable sleeves were not suitable, and 14.3% of them adopted a neutral position.

According to the research results, the majority of the individuals wearing a work uniform believe that their work uniforms were not suitable for their body movements. Based on these results, some modifications were made on the basic work uniform pattern. These pattern modifications are displayed with red lines in figure 4.

Based on the data obtained from the research results, the model length and belt length of the work uniform were shortened, and the top pocket and back pocket height were increased, but the button

Table 2

THE PARAMETERS RESEARCHED DURING THE WEAR TRIALS REGARDING CLOTHING COMFORT					
No.	Clothing comfort questions	Strongly agree	Agree	Neutral	Disagree
1	I think my work uniform adapts itself to my body movements.				
2	I think my work uniform with removable sleeves adapts itself to my body movements.				

Table 3

THE PARAMETERS RESEARCHED DURING THE WEAR TRIALS REGARDING LENGTH MEASUREMENTS			
No	Length Measurements Questions	Short	Normal
3	I think the model length of my work uniform is sufficient.		
4	I think the armhole height of my work uniform is sufficient.		
5	I think the space between the buttonholes and buttons of my work uniform is sufficient.		
6	I think the stitch length (1cm 3stitch) of my work uniform is sufficient.		
7	I think the belt length of my work uniform is sufficient.		
8	I think the arm length of my work uniform is sufficient.		
9	I think the top pocket height of my work uniform is sufficient.		
10	I think the bottom pocket height of my work uniform is sufficient.		

Table 4

THE PARAMETERS RESEARCHED DURING THE WEAR TRIALS REGARDING WIDTH MEASUREMENTS			
No	Width Measurements Questions	Tight	Normal
11	I think the hem width of my work uniform is suitable for my movements.		
12	I think the wrist width of my work uniform is suitable.		
13	I think the shoulder width of my work uniform is suitable.		
14	I think the collar opening of my work uniform is sufficient.		
15	I think the armhole width of my work uniform is sufficient.		
16	I think the collar width of my work uniform is sufficient.		
17	I think the top pocket width of my work uniform is sufficient.		
18	I think the bottom pocket width of my work uniform is sufficient.		

Table 5

RESULTS REGARDING CLOTHING COMFORT				
No.	Strongly agree	Agree	Neutral	Disagree
1	4.8	19.0	14.3	28.6
2	4.8	9.5	14.3	42.9

Table 7

RESULTS REGARDING WIDTH MEASUREMENTS			
No.	Tight (%)	Normal (%)	Large (%)
11	52.4	23.8	23.8
12	9.5	28.6	61.9
13	9.5	23.8	66.7
14	9.5	66.7	23.8
15	61.9	19.0	19.0
16	14.3	71.4	14.3
17	66.7	19.0	14.3
18	47.6	28.6	23.8

Table 6

RESULTS REGARDING LENGTH MEASUREMENTS			
No.	Short (%)	Normal (%)	Long (%)
3	23.8	14.3	61.9
4	14.3	23.8	61.9
5	19.0	57.1	23.8
6	9.5	38.1	52.4
7	14.3	23.8	61.9
8	52.4	14.3	33.3
9	52.4	4.8	42.9

hole-button spacing was not changed. The hem and top pocket of the work uniform were enlarged, and the shoulder width was narrowed, but the collar opening, collar width and the bottom pocket width were not changed.

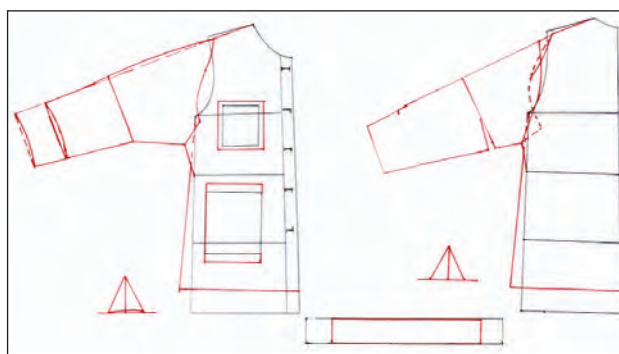


Fig. 4. Pattern modifications of work uniform (front and back part)

Since the majority of the people wearing a work uniform were not pleased with the removable sleeves, a dolman sleeve arm with an extra part in it that came from the body was prepared. Dolman sleeve arm with an extra part in it provides more movement comfort compared to dolman sleeve arms without an extra part. While drawing this dolman sleeve form, the armhole height and sleeve length were shortened, the wrist width was narrowed, and the armhole width was increased.

## CONCLUSION

In this study, it was evaluated fit of work uniforms worn by people working in laboratories and workshops. According to the research results, the majority of the individuals wearing a work uniform believe that their work uniforms were not suitable for their body movements.

Some modifications were made on the basic work uniform pattern based on the data obtained from research parameters.

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