(REFEREED RESEARCH)

# EFFECTS OF FABRIC CONSTRUCTIONS ON PATTERN DESIGN IN WOMEN TROUSERS

## BAYAN PANTOLONUNDA KUMAŞ YAPILARININ MODEL VE KALIP TASARIMINA ETKİLERİ

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**ABSTRACT**

In this research, the effects of fabric constructions having surface extension ability and different fibre construction on model and pattern designs were examined in women's trousers in ready wear sector. The aim of this research is to determine the effects of especially cotton fabrics having different extension ability and different fibre construction on trousers patterns' model and pattern design process. In the scope of the research, the prepared trousers patterns were applied on 6 different fabrics selected from between fabric being denim, cotton, having washing and elasticity and they were produced in the same conditions in the establishment medium. Later they were treated with washing operation and evaluated on 24 live mannequins through evaluation scale. Trousers which showed utmost change within 6 different fabrics were re-produced with the amended pattern and evaluated. In certain parts (hips, knee, waist etc.)of denim surfaces used in the research, it was determined that the applied pattern took form proportional to elasticity of the fabric and couldn't keep form in certain parts (waist, loins etc.). It was observed that the ratio applied on the pattern did not become adequate according to elastane ratio of denim surfaces, whose elastane ratios are different, selected in the research. In this research, it has been put forward to necessity to carry out necessary amendments on the patterns according to the elastan ratios and fabric constructions in order to design suitable patterns to the bodies.

**Key Words:** Denim surface, Jean trousers, Elasticity, Clothing, Model design, Pattern.

**ÖZET**

Bu araştırmada, hazır giyim sektöründe bayan pantolonunda, yüzey esneme kabiliyetine ve farklı lif konstrüksiyonuna sahip kumaş yapılarının, model ve kalıp tasarımına olan etkileri incelenmiştir. Denim kumaştan üretilen jean pantolon, hazır giyim sektöründe önemli bir paya sahiptir. Bu araştırmanın amacı, özellikle farklı esneme kabiliyetine ve farklı lif konstrüksiyonuna sahip olan pamuklu kumaşların, pantolon kalıbının model ve kalıp tasarım sürecindeki etkilerini belirlemektir. Araştırma kapsamında, demin, pamuklu, yıkamalı ve elastikiyet kabiliyeti olan kumaşlar arasından seçilen 6 farklı kumaşa, hazırlanan pantolon kalıp uygulanarak, işletme ortamında aynı şartlarda üretilmiştir. Daha sonra yıkama işlemine tabii tutularak, değerlendirme ölçeği ile 24 canlı manken üzerinde değerlendirilmiştir. Değerlendirme sonucunda elde edilen bulgular doğrultusunda, kalıp üzerinde gerekli düzeltmeler yapılmıştır. 6 farklı kumaş içerisinden en çok değişim gösteren pantolon, düzeltilmiş kalıp ile tekrar üretilmiştir ve değerlendirilmiştir. Araştırmada kullanılan denim yüzeylerden üretim ve yıkama sonrası vücudun belli bölümlerinde, (basen, diz, kalça vb.) uygulanan kalıbın, kumaşın elastikiyet oranına göre form aldığı, belli bölümlerin de ise (kalça, bel vb.) formu koruyamadığı tespit edilmiştir. Araştırmada seçilen elastan oranı farklı denim yüzeylerin elastan oranına göre kalıp üzerinde düşülen oranın yeterli gelmediği gözlenmiştir. Bu yüzeylerin hepsi uygun kalıp kotrüksiyonu gerçekleştirildiği taktirde, pantolon üretimine uygun olacağı tespit edilmiş ve bunun için çözüm öneriler geliştirilmiştir.

**Anahtar Kelimeler:** Denim yüzey, Jean pantolon, Elastikiyet, Giyim, Model tasarımı, Kalıp.

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### 1. INTRODUCTION

Today, it is fact that design, fashion, innovation, quality, fabric and accessory properties are the most important elements determining competition power of ready-wear products. The success probability in the market increases if only these elements are brought together (1). The most important phase in ready-wear is design and pattern preparation. Raw material used in the fabric, the fabric's weave structure, cultivation operations which are exposed on it, pattern, colours etc. properties bear importance in the points of making comfortable production and forming products in desired quality (2) .

Clothing design: means the design of fabric, accessories and lines of a model (3). Minimum 70% of the garment is fabric design and 30% of it is its style. Sample parts are mostly the most expensive (where the highest costs occur) parts of enterprises. Before starting sewing of samples, first, one size and mostly 38-40 size clothing pattern is prepared. After amendments are made on the sample, all patterns in all sizes are prepared and controlled for making them suitable for serial production.

Only good design, that it bears fashionable properties and that fabric is qualified doesn't bear all criteria for high quality clothing production. To transform two-dimensional fabric into three-dimensional clothing can be possible with applying true pattern that

is suitable for the performance of the fabric to the fabric (4) Good appearance of a dress depends on the fabric's structural and mechanical properties and the harmony of the fabric with the pattern. Performance and quality of a dress produced in a similar way depend on various factors such as pattern construction, properties of production operations (5). All these factors contribute that production model, which is accepted as one of the most important aspects of clothing science, to be in desired quality. In general, pattern work in clothing manufacture has an important place especially in jean trousers production. If trousers weren't produced in appropriate pattern to the fabric structure, they would not suit on the body of the person and would not be in harmony with the body (6).

According to the research Frumkin, Bradley and Hegde made, it was determined that people showed more interest to dresses peculiar to themselves and the first condition they looked for in dresses was harmony with the body, the second one was price convenience and lastly comfort (7).

Serial production has an important place in many ready-wear sectors in recent years (8). In textile and clothing industry the entrepreneurs give big importance to serial production. It's necessary for a dress to be in harmony with the bodies of people. Moreover with the deflection of consumer demands, today it reveals that we should work with a great variety of models and fabrics except classical models. With the change in model, pattern properties and fabric properties show change as well (9). Since in classical clothing production a dress is produced special to the person, such necessity occurs (10).

In the fashion, which re-synthesizes and brings the past to today, while styles, images, silhouettes are presented by interpreting again, it is seen that real innovations and changes are lived in fabrics. For example, when fashion interprets 60's again, it uses fabrics of 90's. It's observed that technological changes in fabrics are the most important emphasis of the fashion. Fabrics' combinations, weights, voluminousness, coarseness and softness or extension abilities give direction to the model designer and dresses take shape with their fabrics. Seeing these criteria, for ready-wear producer and designer, the most important factor is seen as fabric which can be presented being transformed in changing seasons (11).

In fashion sector, performance and ability become more important day by day. Customers have started more commonly to use fibres and fabrics having high performance especially like flexible fabrics and fabrics produced with advanced technology. Polyester and cotton products are still mostly used fibres no matter they compose these fibres wholly or compose more than 50% (12).

In clothing design so much geometrical measurements are used for measuring the body. However in special clothing less numbers of measurements can be used to provide comfort. The body measurements concerning the model are selected by designer. Practically these kinds of personal information can not be normalized and every designer selects the measuring system suitable for himself, being different than others. If small differences in the body measurements cause big changes in comfort of the dress, then this measurement is called sensitive variable. If big differences in the body measurements cause small changes in comfort of the dress, then this measurement is called non-sensitive variable (13). Moreover in practice the situations being uncomfortable in the body measurements become important in clothing choice by the user.

Quality can not be defined only according to that clothing is esthetical or functional. In the meantime comfort in wear is evaluated mechanically and physiologically in terms of suitable fabric and the shape. Like new technologies produced with personal sizes meeting the requirements of individual customers, to know and forecast their properties composing of visual parts such as especially fabric and harmony is important as well as engineering plans of new model and collection qualities. Only fabric quality doesn't meet all criteria for high quality clothing production. To transform two-dimensional fabric into three-dimensional dress includes many much more interactions such as forming suitable pattern form, selecting suitable stitch yarn, the best stitch parameter, easiness in transforming fabric into the dress and real performance of the fabric stitched in sewing process of the dress (14).

When we produce high quality clothes being comfortable and produced to meet personal requirements, it must be paid attention to that clothing should be suitable for anatomic structure of human body and very qualified appearance should be provided. The process of passing from two-dimensional cut model to three-dimensional is directly related to the researches concerning the fabric mechanism. These problems are available in clothes benefitted from various materials such as belt, button, wadding, especially from jacket, trousers etc. different shapes and cuts to smooth or curved models. It is quite difficult to get a suitable shape or appearance for the fabric (15).

In today's conditions, true selection of fabrics bears much importance for producers and designers of ladies' ready-wear. It's necessary to measure the fabrics' ability of taking form and shape in the woman body carrying round lines. We can say that in ready-wear sector ready-wear designer enters to the work after the design of yarn or fabric but can make choice among produced fabrics (16). Here it reveals that there is a significant correlation between the fabric's mechanism, the dress' pattern and production.

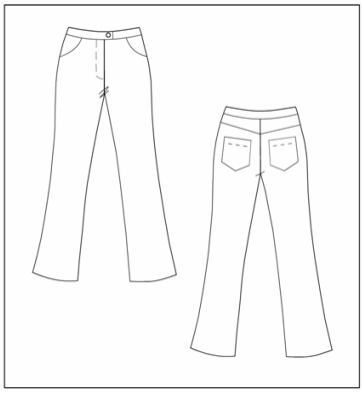
## 2. METHOD

In this study, the effect of fabric constructions on model and pattern designs in women's jean trousers. The materials of the research compose of fabric and auxiliary materials, fabric laboratory results, the data collected with evaluation scale and related sources which have been selected from the collections of the leading firms of Turkey in fabric manufacture and import sector. The field of the

**Table 1.** Fibre ratios of fabrics

| Fabrics | Fibre Ratios (%) | | | | Elastane Ratio (%) |
|---|---|---|---|---|---|
| | Cotton | Polyester | Tencel | Rayon | |
| 01 Supersonic | 96 | - | - | - | 4 |
| 02 Kelly | 67 | 29 | - | - | 4 |
| 03 Caddo | 99 | - | - | - | 1 |
| 04 Cross | 16 | 18 | 53 | 10 | 3 |
| 05 Bsv | 96 | - | - | - | 4 |
| 06 Avon | 50 | 8 | 40 | - | 2 |

**Table 2.** Women's jean trousers model and shape definition

| Women's Jean Trousers Model | | Shape Definition |
|---|---|---|
|  | | - In front trousers 2 trousers side pockets<br>- Fly lining long 16.5cm<br>- Belt width 3 cm<br>- Sport stitch on the mouth of front pocket<br>- In the belt 1 button-hole<br>- Button diameter 1.4 cm<br>- In back trousers bodice study<br>- In the back two appliqué pockets<br>- Sport stitch on the mouth of back pocket<br>- Sport stitch on side stitch<br><br>Stitch shares<br>- waist = 1cm<br>-Side and inner trotters= 1cm<br>- Back fork= 1cm<br>- Front fork = 1cm<br>- Trotters twisting = 2.5cm |
| Part list | | |
| Fabric | Interling | |
| front trousers = 2<br>Back trousers = 2<br>Back bodice = 2<br>Fly lining right = 1<br>Fly lining left = 1<br>Pocket provision= 2<br>Pocket cornice = 2<br>Back pocket = 2<br>belt = 1 | Pocket = 1<br>Belt = 1 | |

research composes of denim, fabrics being washable and having cotton and elasticity ability and the sample of the research composes of 6 different fabrics selected as suitable for today's trends from between denim surfaces having elasticity ability in terms of representing the field accurately. Information about laboratory properties of fabrics were taken from fabric factories (Table 1).

In the forming of measuring tools to collect the research data, first, the sources reached in the result of literature scanning were examined and information about the topic was evaluated. In the scope of the research, laboratory properties concerning determined 6 different fabrics were examined. According to Muller's cut system, 4 different jean women's trousers ground pattern in 40 sizes suitable for the fabrics having elasticity ability were prepared (17). 40 body sizes and wideness additions were taken from Muller's standard measurement table (18). In order to decide the women's trousers ground pattern which will be used in the research, prototypes of 4 different grounds were prepared from denim fabric having elasticity ability and they were tried on the person having 40 body sizes and later the most suitable women's trousers ground pattern was determined. In the direction of elastane ratios of fabrics selected for the research, lycra ratios of each fabric on the pattern were assessed and lycra shares were taken out on trousers ground pattern and 6 ground patterns were formed for each experimental fabric. For each fabric the model selected for jean ground patterns got individually was applied. All patterns were made by using Lectra system from CAD-CAM pattern design and ranking (19). In Table 2 it was given women's jean trousers model selected for the research and the shape definition (Table 2).

The prepared 6 trousers patterns were cut individually from the selected fabrics having elasticity ability and produced in the establishment medium by processing (20) in the same physical conditions with a set of treatments. The finished products were treated with washing operation in the same conditions and the operations of 20 minutes Desizing, 50 minutes Pumice/Enzyme, detergent, rinsing, softening, squeezing and drying were applied. 6 women's trousers produced from denim surfaces having 6 different elasticity abilities were checked in quality and were evaluated on 24 live mannequins having 40 body sizes with prepared evaluation scale by a 5 people of jury composing specialist people in their own fields.

In the result of the research, information got through "Women's Trousers Evaluation Scale Form" were analysed in marginal tables. Moreover in the research, patterns, pre-production and postproduction measurements were taken and the data got through "Women's Trousers Size Control List Form" applied on 6 denim surfaces were evaluated by committing to the tables. As a result of these evaluations, the problems in trousers produced from denim surface showing utmost change were determined. In order to solve these problems, a new pattern study was made and 1 woman's jean trousers were produced in the same physical conditions and it was evaluated again by the jury.

## 3. FINDINGS

In this part, first, trousers were compared by taking pre-production and post-production measurements and the data got were shown in "Jean Trousers Measurement Control List as Table 3.

**Table 3.** Jean trousers product measurement control list

| MEASUREMENTS | PREPRODUCTION (cm) | | | | | | POSTPRODUCTION (cm) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Super sonic | Kelly | Caddo | Cross | Bsv | Avon | Super sonic | Kelly | Caddo | Cross | Bsv | Avon |
| Waist Width | 43.5 | 43.5 | 44 | 43 | 43.5 | 44 | 41.5 | 43 | 40.5 | 41 | 40.5 | 43 |
| Hips Width | 52.5 | 52.5 | 51 | 50.5 | 52.5 | 51 | 49 | 52 | 48 | 49 | 48 | 50 |
| Trousers length | 104 | 104 | 104 | 104 | 104 | 104 | 102 | 103.5 | 100 | 102.5 | 102.5 | 103 |
| Fork circumference | 65.5 | 65.5 | 66 | 65.5 | 65.5 | 65.5 | 65 | 66 | 64.5 | 64.5 | 65 | 65 |
| Knee width | 24.5 | 24.5 | 24 | 24.5 | 24.5 | 24 | 23 | 24.5 | 22.5 | 24 | 22.5 | 23.5 |
| Trotters width | 28 | 28 | 28 | 27.5 | 28 | 27.5 | 26.5 | 28 | 26.5 | 27 | 26.5 | 27 |

In Table 3, trousers' measurement values before and after washing during production were given. Change after washing realized in sizes of 6 trousers used in the research. When measurements are examined, it is seen that the product showing utmost change is Caddo. Especially in trousers length, Caddo, Supersonic are products in which utmost size changes occur. This change is followed by Bsv, Cross, Avon and Kelly respectively. After washing, when especially waist and hips width and trousers length measurements are compared, it is observed extension ratio in products by looking at width and length

6 women's jean trousers produced from denim surfaces having 6 different elasticity abilities were checked in quality and evaluation results made, on 24 live mannequins having 40 body sizes, by 5 people of jury composing specialists in their own fields through prepared evaluation scale were given below (Figure 1,2,3,4,5 and 6, Table 4).

**Supersonic (96% Cotton, 4% Lycra) Product Evaluation:**

**Figure 1.** 01 Supersonic Product

Supersonic is one of fabrics in which size change after washing is more since it is the surface having utmost cotton ratio as mixture between surfaces. It is observed that 4% lycra is suitable in the point of its harmony during movement and supersonic is suitable for form taking property in the point of its construction and softness (Figure 1).

**Kelly (% 67 Cotton, % 29 Polyester, % 4 Lycra) Product Evaluation:**

**Figure 2.** 02 Kelly Product

Kelly is the surface having highest polyester ratio between fabrics. It is the surface where size change is felt at the least between surfaces. There hasn't become much change especially in trousers length after washing. Kelly was determined the surface having utmost loose property between other trousers since it had much elasticity property in terms of lycra ratio between other surfaces and has less extension ratio after washing (Figure 2).

**Caddo (99% Cotton, 1% Lycra) Product Evaluation:**

**Figure 3.** 03 Caddo Product

The surface in which size change is at the most is Caddo between surfaces used in the research. The most important reason of this is that cotton ratio in the mixture is at the most according to other surfaces. Utmost size change especially in the length occurred in Caddo. So the product was not found out suitable aesthetically. In the meantime Caddo is the surface having the least elasticity property with its 1% lycra ratio. When compared with other surfaces, it did not make a problem in the posture on the body since elasticity ratio in the surfaces having high extension ratio is much (Figure 3).

**Cross (53% Tencel, 18% Polyester, 16% Cotton, 10% Rayon, 3% Lycra) Product Evaluation:**

**Figure 4.** 04 Cross Product

Cross is the surface sheltering utmost synthetic fiber as mixture in its body between surfaces. In the evaluation after washing, a change in big ratio has not occurred. The product did not make so many problems aesthetically in the body thanks to much lycra ratio. It was observed that cross took its form more difficultly according to other surfaces during application in terms of fabric construction (Figure 4).

**Bsv (96% Cotton, 4% Lycra) Product Evaluation:**

**Figure 5.** 05 Bsv Product

Bsv, among the surfaces used in the research, is the surface observed to have taken form easily being quite convenient for application. Since cotton percentage taking place in the mixture was more, size change was determined in Bsv especially in the length. However that lycra percentage was more rather than other surfaces caused the product to take form in the body easily and to be seen suitable aesthetically (Figure 5).

**06 Avon ( 50% Cotton, 40% Tencel, 8% Polyester, 2% Lycra) Product Evaluation:**

**Figure 6.** 06 Avon Product

Avon is the surface which has much synthetic mixture and in which less size change occurs after washing. As in other surfaces, in Avon it was determined situations found out unsuitable in evaluation scale in trousers length. Since generally it had a fine surface construction within other surfaces, it was found out suitable in terms of form taking property during application (Figure 6).

When Table 4 is examined, criteria of all surfaces used in the research, being suitable or unsuitable, found out in evaluation scale after production is seen wholly. It was determined that especially the findings in Caddo surface, rather than other surfaces, formed problems in harmony of sizes with the body, in harmony of trousers in movement and in harmony of the model with the fabric. When other surfaces were examined, it was determined there were problems in all surfaces especially in harmony of sizes with the body. However it was decided to apply changes on Caddo and to take it into production again referring to these findings.

**Changes Made on Caddo After Evaluation:**

In the scope of the research, since Caddo, being one of the surfaces, was the surface in which utmost size change occurred, it was determined to make necessary amendments and to take into production again. Before Caddo was taken to production, arrangements seen necessary were made again on the pattern. Primarily, in trousers length as seen in Table 4, utmost size change realized in Caddo. 104 cm trousers length taken as standard according to the measurement table lived 2 cm size change after washing. So the addition was made in 2 cm trousers length as well as extension ratio. Nevertheless, it was determined problem also in the fork in extension ratio.

That there was much extension in length in Caddo caused change to be much in trousers length measurements after production. So in evaluation findings, fork size caused a tight-fit appearance in trousers and discomfort for individuals in terms of both harmony in movement and harmony of sizes. So the half of the measurement given in the length was reduced in the fork in order to comfort size change lived in the fork after shrinking (1cm). If lycra fabrics are preferred in ladies' body especially in hips area, it is formed a tighter appearance according to other parts of the body. In terms of body characteristics, measurement change determined after washing in hips area during evaluation was added again to the pattern. Lycra ratio reduced for Caddo during production before washing was added to the trousers pattern by assessing again since size change was much after washing. In Table 2, Caddo waist and

**Table 4.** Evaluation of suitable and unsuitable criteria of all surfaces (n=24)

| CRITERIA | 01Supersonic | | | | 01Kelly | | | | 03Caddo | | | | 04Cross | | | | 05Bsv | | | | 06Avon | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Suitable | | Unsuitable | | Suitable | | Unsuitable | | Suitable | | Unsuitable | | Suitable | | Unsuitable | | Suitable | | Unsuitable | | Suitable | | Unsuitable | |
| **Harmony of Sizes with Body** | S | % | S | % | S | % | S | % | S | % | S | % | S | % | S | % | S | % | S | % | S | % | S | % |
| Trousers length | 5 | 20.83 | 5 | 20.83 | 19 | 79.2 | - | - | 7 | 29.2 | 9 | 37.5 | 10 | 41.7 | 3 | 12.5 | 10 | 41.6 | 3 | 12.5 | 11 | 45.8 | 4 | 16.6 |
| Waist width | 9 | 37.5 | 5 | 20.83 | 12 | 50 | 5 | 20.8 | 8 | 33.3 | 6 | 25 | 14 | 58.3 | 2 | 8.33 | 14 | 58.3 | 2 | 8.33 | 15 | 62.5 | 2 | 8.33 |
| Hips width | 12 | 50 | 4 | 16.6 | 15 | 62.5 | 4 | 16.6 | 9 | 37.5 | 4 | 16.6 | 13 | 54.2 | 2 | 8.33 | 13 | 54.2 | 2 | 8.33 | 12 | 50 | 3 | 12.5 |
| Knee width | 13 | 54.16 | 7 | 29.16 | 21 | 87.5 | - | - | 18 | 75 | 1 | 4.16 | 21 | 87.5 | - | - | 21 | 87.5 | - | - | 20 | 83.3 | - | - |
| Trotters width | 21 | 87.5 | 1 | 4.16 | 23 | 95.8 | - | - | 19 | 79.2 | - | - | 23 | 95.8 | - | - | 23 | 95.8 | - | - | 23 | 95.8 | - | - |
| Fork size | 20 | 83.3 | - | - | 18 | 75 | 2 | 8.3 | 16 | 66.6 | 4 | 16.6 | 17 | 70.8 | - | - | 17 | 70.8 | - | - | 18 | 75 | - | - |
| **Trousers Harmony In Movement** | | | | | | | | | | | | | | | | | | | | | | | | |
| Sitting | 17 | 70.83 | - | - | 21 | 87.5 | - | - | 5 | 20.8 | 6 | 25 | 17 | 70.8 | - | - | 17 | 70.8 | - | - | 18 | 75 | - | - |
| Walking | 21 | 87.5 | - | - | 24 | 100 | - | - | 18 | 75 | - | - | 23 | 95.8 | - | - | 23 | 95.8 | - | - | 22 | 91.6 | - | - |
| Bending | 17 | 70.83 | - | - | 23 | 95.8 | - | - | 11 | 45.8 | 6 | 25 | 19 | 79.2 | - | - | 19 | 79.2 | - | - | 21 | 87.5 | - | - |
| Comfortable wear and take out | 21 | 87.5 | - | - | 24 | 100 | - | - | 19 | 79.2 | 2 | 8.33 | 18 | 75 | - | - | 18 | 75 | - | - | 19 | 79.2 | - | - |
| Movement of knee | 23 | 95.83 | - | - | 24 | 100 | - | - | 22 | 91.6 | - | - | 24 | 100 | - | - | 24 | 100 | - | - | 24 | 100 | - | - |
| Comfort of fork | 19 | 79.16 | - | - | 22 | 91.6 | - | - | 16 | 66.6 | 2 | 8.33 | 20 | 83.3 | - | - | 20 | 83.3 | - | - | 20 | 83.3 | - | - |
| Comfort of trotters | 23 | 95.83 | - | - | 24 | 100 | - | - | 23 | 95.8 | - | - | 24 | 100 | - | - | 24 | 100 | - | - | 24 | 100 | - | - |
| **Harmony of Fabric with Trousers** | | | | | | | | | | | | | | | | | | | | | | | | |
| Elasticity of fabric | 21 | 87.5 | - | - | 23 | 95.8 | - | - | 22 | 91.6 | - | - | 23 | 95.8 | - | - | 23 | 95.8 | - | - | 23 | 95.8 | - | - |
| Thickness of fabric | 24 | 100 | - | - | 22 | 91.6 | - | - | 23 | 95.8 | - | - | 24 | 100 | - | - | 24 | 100 | - | - | 24 | 100 | - | - |
| Construction of fabric | 24 | 100 | - | - | 24 | 100 | - | - | 24 | 100 | - | - | 24 | 100 | - | - | 24 | 100 | - | - | 24 | 100 | - | - |
| Softness of fabric | 24 | 100 | - | - | 24 | 100 | - | - | 21 | 87.5 | - | - | 24 | 100 | - | - | 24 | 100 | - | - | 24 | 100 | - | - |
| **Harmony of Model with Fabric** | | | | | | | | | | | | | | | | | | | | | | | | |
| Harmony of sizes | 20 | 83.3 | - | - | 17 | 70.8 | 3 | 12.5 | 18 | 75 | 2 | 8.33 | 18 | 75 | - | - | 18 | 75 | - | - | 19 | 79.2 | - | - |
| Harmony of model | 22 | 91.6 | - | - | 23 | 95.8 | - | - | 22 | 91.6 | - | - | 23 | 95.8 | - | - | 23 | 95.8 | - | - | 22 | 91.6 | - | - |
| Harmony of pattern with fabric | 17 | 70.83 | - | - | 15 | 62.5 | 2 | 8.3 | 13 | 54.2 | 5 | 20.8 | 18 | 75 | - | - | 18 | 75 | - | - | 19 | 79.2 | - | - |
| Aesthetic general appearance | 19 | 79.16 | - | - | 12 | 50 | 7 | 29.1 | 11 | 45.8 | 6 | 25 | 15 | 62.5 | - | - | 15 | 62.5 | - | - | 17 | 70.8 | - | - |

hips width size difference before washing was determined as 3.5 cm. Lycra ratio reduced from pattern before washing was subtracted individually for front and back pattern from 0.2 cm size difference before washing and the found result was added to about 1.5 cm front and back pattern in waist and hips area. Since any problem was not determined in evaluation findings about knee and trotters width, it was not made change in these regions of the pattern (Figure 7). After these changes made on Caddo II pattern, it was treated with washing by making production in the same conditions for making evaluation again and got a trousers product. In consequence of changes, the product had 24 individuals wear and was tested.

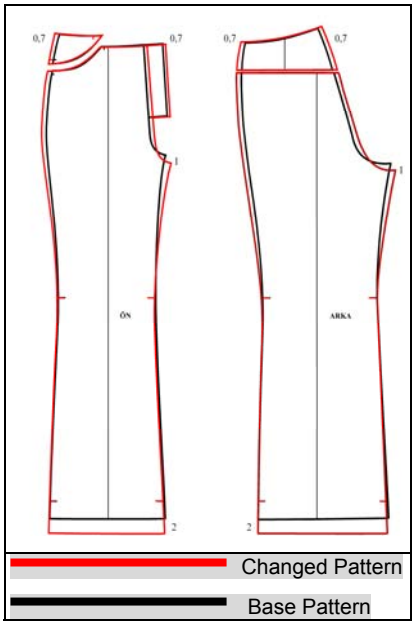



**Figure 7.** 03 Pattern change made on Caddo II

**Figure 8.** 03 Caddo II Product

Any unsuitable finding was not met in Caddo II Product evaluation. In consequence of the changes, it was determined that Caddo II, in terms of harmony of sizes with the body, became suitable only with trousers length measurement partially. That people have the same sizes but not same lengths doesn't create problem for the research. It is observed that Caddo I's measurements being unsuitable with criteria of waist, hips and fork measurements get better in Caddo II after evaluation. When the harmony of Caddo II with trousers was examined during movement, it was determined that it got better than Caddo I's findings in terms of sitting, bending and fork comfortability movements. It was not met any negative finding in Caddo II in terms of the harmony of the fabric with trousers. Caddo I, which was determined unsuitable for especially aesthetic overall appearance and harmony of sizes when the harmony of Caddo II model with the fabric was compared with Caddo 1; it was found out suitable together with the evaluation of Caddo II taken to production after amendments (Figure 8).

## 4. RESULTS AND DISCUSSION

It was observed that the same model applied on 6 different denim surfaces determined in the research couldn't provide the harmony expected by the jury. However denim surfaces providing aesthetical harmony fitted to fashion criteria and true model standards but couldn't arrive to the expected values in terms of consumer tendencies and pattern construction. After washing in denim surfaces used in the research, it was determined that the pattern applied on certain parts (hips, knee, waist etc.) of the body took form according to elasticity ratio of the fabric and couldn't keep form in certain parts as well. After washing it was determined that the ratio poured on the pattern was not enough according to elastane ratio of the surfaces having different elastane ratios which were selected in the research. That especially fabric constructions formed different results (21) after washing but not the evaluation of only lycra ratio was seen necessary to take into account as the reasons of this.

Since Kelly used in the scope of the research was the denim surface having the least size change ratio, that it included much more synthetic than other surfaces, had high lycra ratio caused less size change and it was determined that it so formed looses in the posture on the body. It was determined that denim surfaces which were used in the research and had more cotton component within natural fibres had much more extension ratio after washing. These denim surfaces are supersonic, caddo and bsv.

It was observed that denim surfaces which were used in the research and had more synthetic fibres in their combination had less shrinking ratio in the point of the body form after washing and were able to keep form better. These surfaces are Avon, Kelly and Cross. All of the denim surfaces selected for the research was found out suitable for trousers production provided that it was realized suitable pattern construction. After washing it was determined that warp and weft yarn density from fabrics of natural fibres showed different reaction than warp and weft yarn density in synthetic fibres.

In ready-wear establishments, model and pattern designers should have especially fabric technology information and have experience in the production of fabrics in different structures in realizing model and fabric determination operations in the name of the firm. Pattern designer, especially in pattern designs applied on denim surfaces, must give loose additions suitable for every fabric attentively by taking into account width and length measurements of the pattern which will be applied in lycra fabric constructions. In the production applied on denim surfaces, the differences occurring on the fabric after washing must be taken into account and the changes before and after washing must be determined and so the fabric must be tested with two washing if possible. Paying attention to that in the research findings the denim surfaces having high ratio of natural fibres show better harmony, it can be advised to the firms that the firms acting with this result can more easily make the fabric determinations by fixing technologic structure and target customer mass.

The designer must try the model pattern pertaining to the lycra denim surface the production of which is reliable for him, in the state necessary to be applied individually and ever must not let the fabrics of different constructions be cut by putting one above the other. By the aim of facilitating true decision giving of the designer, the fabric firms must prepare introduction cars stating constructional

and physical properties of the fabrics pertaining to denim surfaces and showing properties of lycra ratios after average washing.

It is necessary for lycra clothes transformed into the product pertaining to denim surfaces to be test by making them to be worn by different individuals having the same sizes (including tolerance shares). The pattern designer necessarily must pay attention to flexibility and voluminousness of the fabrics in fabric buying by the aim of getting easier and better result from lycra denim surfaces. In denim surfaces the same product has been able to form different results after treated with different but the same washing operation.

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