

A SCALE DEVELOPMENT STUDY TO EVALUATE THE PHYSICAL COMFORT OF DENIM JEANS

DENİM PANTOLONUN FİZİKSEL KONFORUNU DEĞERLENDİRMEK İÇİN BİR ÖLÇEK GELİŞTİRME ÇALIŞMASI

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ABSTRACT

In this study, a scale was developed in order to evaluate the physical comfort of denim jeans. During the scale development process, young people were interviewed about the problems they experience regarding the denim jeans they wear in their daily lives, the previous studies on garment comfort were reviewed and also experts working in the ready-to-wear industry were interviewed. As a result, a 19-item scale was developed to evaluate the physical comfort of denim jeans based on the information obtained from the previous studies and the people interviewed. Cronbach's Alpha (α) reliability coefficient was found 0.91 for the whole scale during the internal consistency test. Experts' views, taken for the definition of items in the scale to evaluate the physical comfort of denim jeans, were considered to be adequate and valid for the content and the reliability of the scale. As a result of the factor analysis to test the construct validity of the scale, it was found that factor loading was quite high and the items in the scale were gathered under four factors. According to the obtained findings, it was discovered that, the scale is a valid and a reliable tool, which can be used to measure and evaluate the problems of physical comfort which denim jeans users experience.

Key Words: Physical comfort of garments, Scale development, Denim, Jeans.

ÖZET

Bu çalışmada, denim pantolonun fiziksel konforunu değerlendirmek amacıyla bir ölçek geliştirilmiştir. Ölçek geliştirme sürecinde, gençlerin günlük yaşamlarında denim pantolon ile ilgili karşılaştıkları problemlere ilişkin görüşleri alınmış, giysi konforu konusunda yapılmış çalışmalar gözden geçirilmiş ve aynı zamanda hazır giyim alanında çalışan uzmanlar ile görüşülmüştür. Elde edilen bilgilere dayalı olarak denim pantolonun fiziksel konforunu ölçmeye yönelik 19 maddeden oluşan bir ölçek hazırlanmıştır. Ölçeğin tümü için iç tutarlılık sınavında Cronbach Alpha (α) güvenilirlik katsayısı 0.91 bulunmuştur. Denim pantolonun fiziksel konforunu ölçmek için maddelerin belirlenmesinde alınan uzman görüşleri, ölçeğin kapsam geçerliliği için yeterli ve geçerli sayılmıştır. Ölçeğin yapı geçerliliği sınavı için yapılan faktör analizi sonucunda, faktör yüklerinin oldukça yüksek olduğu ve ölçekteki maddelerin dört faktörde toplandığı belirlenmiştir. Elde edilen bulgulara göre ölçeğin güvenilirlik ve geçerliğe sahip bir araç olduğu, denim pantolon kullananların fiziksel konfor ile ilgili yaşadıkları problemleri ölçüp değerlendirmede kullanılabilecek bir ölçek olduğu ortaya çıkmıştır.

Anahtar Kelimeler: Fiziksel giysi konforu, Ölçek geliştirme, Denim, Pantolon.

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1. INTRODUCTION

In today's world, changing expectations and increasing awareness of consumers have caused the ready-to-wear industry to develop production strategies. Garments of good quality need to be manufactured in order to create awareness in the ready-to-wear industry. The ease of movement and the comfort feeling that garments provide overlap the idea of producing good quality garments. Therefore, it is observed that the quality expectations of consumers and the comfort of garments are integrated.

A hectic business life and race against time encourage people to buy comfortable garments, which are easier to use and make them feel more comfortable (1). The comfort of garments plays an important role in textiles, sportswear, casual clothes and especially garments worn in work environments (2).

Comfort is a pleasant state of harmony between a human being and his environment (3) and ease of movement is determined by the adaptability of the clothing to body movements (4).

Comfort, at its highest level, is important for the body to feel comfortable (2). An individual's feeling of self-comfort is possible through wearing comfortable garments that both fit his/her body and provide him/her with an ease of movement (5). Garment comfort ensures some functional properties to co-exist such as ease of movement, comfort feeling, and garments' fitting the body like a second skin (6) and also involves the production and the use of garments in terms of thermo-physiology, psychology, aesthetic and

ease of use which arouse a comfort feeling in an individual (2).

Denim jeans, a kind of trousers previously worn by prospectors looking for gold in the USA, spread throughout the world during World War II (7). In the last 50 years, jeans have frequently been used as the street clothes of the young, gradually and steadily moving up-market and have easily become ubiquitous. They are the universally worn garment of man and boy, woman and girl (8). Jeans are also leisure wear which, owing to their comfort, are very commonly worn, particularly by millions of young people. Even though jeans are designed to enhance comfort, they can negatively affect physical activities by reducing movement.

Although denim jeans are preferred because they are comfortable, durable, easy to maintain, and are worn through all four seasons, some problems have been experienced during their purchase and use (9). According to studies by Kurt Salmon Associates (2000), more than half of the female population in the US cannot find apparel in the marketplace to fit (10). In other studies, women have reported trying on as many as twenty pairs of jeans before they find a pair that fits (11). In another study, it was found that young women expressed the most dissatisfaction with lower body fit at the waist, hip, and thighs, and were least satisfactory with the fit of pants compared to all the other apparel products (12). According to another study carried out in Turkey, young people expressed their dissatisfaction with the fit of pants, compared to all the other apparel products, making it the most problematic garment (72%) (13).

It is likely that jeans may mechanically restrict the physical activities of the young but do not affect their making such necessary physical activities as sitting, squatting, stepping up, bending, etc. Consequently, a study of jeans may enable a better evaluation of jeans and ultimately, young people may benefit through reduced impediment from their jeans in the physical activities undertaken in their daily life (14).

In Turkey, there has been no scale development study of scientific quality to evaluate physical comfort of apparel products. Therefore, some studies on physical comfort need to be carried out in order for the Turkish ready-to-wear industry to enhance the quality of their products. This study, geared towards the above mentioned need, aims to develop a measurement tool to evaluate the physical comfort of denim jeans. This study is considered to be significant for ready-to-wear companies manufacturing denim jeans.

2. METHOD

In this study, aiming at evaluating the physical comfort of denim jeans, the development process of the measurement tool involves defining the problem, determining the items, preparing the scale design, getting expert opinion, putting the scale into practice and analyzing the reliability and validity of the scale.

Defining the problem: An extensive literature review has been done in order to define the problem. In addition to this, denim jeans users and sales staff of the stores selling these apparel products were interviewed and their comments on the problems they experience received and recorded. As a result of the analysis, it was discovered that young people wearing denim jeans experience problems when they undertake daily physical activities such as sitting down, squatting down, stepping up stairs and bending.

Identifying the items: During this process, studies on physical comfort of garments were reviewed, denim jeans users and suppliers were interviewed and the items were identified in accordance with the information obtained from both denim jeans users and suppliers.

Preparing the scale design: A scale format was given to the identified items and Likert-type degrees was carried out. Then, 20 items found on the item list were sorted one under the other and the answer options; namely, always (5), usually (4), sometimes (3), rarely (2) and never (1), were put next

to the each item and the data set was entered into SPSS (Statistical Package for Social Sciences) program.

Getting expert opinion: The opinions of statisticians and experts on this field were supported in order to test the scope validity of the statements in the scale. The experts were asked to evaluate the items in the scale in terms of content validity. The items criticized by the experts were modified and the inappropriate ones were removed from the scale.

Putting the scale into practice: The scale was piloted on 50 people, and necessary improvements were made in accordance with the circumstances that were observed during the implementation. The scale was implemented on students studying at Gazi University by making use of the Random Sampling Technique. The number of students participating in the study was 750.

Analyzing the reliability and the validity of the scale: The reliability and the validity of the scale was analyzed by evaluating the data set gathered from 750 university students. Internal consistency was carried out in order to determine the reliability. For this purpose, Cronbach's Alpha coefficient, the most appropriate for Likert-type degrees scales, was calculated. It is a widely used measure of the reliability of items and its high value implies high reliability (15). On the other hand, construct validity and content validity were considered in order to determine the validity. A test was carried out for the content validity because the expert opinion, supported for determining the items in the scale, was found to be appropriate and efficient. And for the construct validity, factor analysis was carried out.

Factor analysis has been carried out by finding patterns among the variations in the values of several variables; a cluster of highly intercorrelated variables being a factor (16). Factor analysis has also been used to cluster variables into subgroups to reduce the data set. This approach is perhaps best suited for garment development studies (17).

3. RESULTS

Physical discomforts of young people wearing denim jeans in their daily

activities were identified through the scale which aims at evaluating the physical comfort of apparel products

and these discomforts are given below item by item.

- I 1. When sitting down, pressurizing the stomach by the zipper or the buttons
- I 2. When sitting down, opening the waist at the back
- I 3. When sitting down, feeling the local discomfort on the front crotch
- I 4. When sitting down, feeling the strain on the back crotch stitches
- I 5. When sitting down, making it difficult to cross legs
- I 6. When squatting down, pressurizing the stomach by the zipper or the buttons
- I 7. When squatting down, opening the waist at the back
- I 8. When squatting down, pressurizing on the legs
- I 9. When squatting down, pressurizing on the knees
- I 10. When squatting down, feeling the local discomfort on the front crotch
- I 11. When squatting down, feeling the strain on the back crotch stitches
- I 12. When stepping up stairs, pressurizing the stomach by the zipper or the buttons
- I 13. When stepping up stairs, opening the waist at the back
- I 14. When stepping up stairs, feeling the strain at the back of the thigh
- I 15. When stepping up stairs, feeling the strain on the back crotch stitches
- I 16. When stepping up stairs, making it difficult to take steps
- I 17. When bending, pressurizing the stomach by the zipper or the buttons
- I 18. When bending, opening the waist at the back
- I 19. When bending, feeling the strain at the back of the thigh
- I 20. When bending, feeling the strain on the back crotch stitches

Table 1. Factor analysis results regarding the physical comfort of denim jeans ($n=750$)

Items' Numbers	Communalities	Rotated Component Matrix	Cronbach Alpha (α)
Factor 1: The Discomforts Of Strain			
I 20. When bending, feeling the strain on the back crotch stitches	.723	.759	.860
I 11. When squatting down, feeling the strain on the back crotch stitches	.640	.731	
I 19. When bending, feeling the strain at the back of the thigh	.637	.629	
I 9. When squatting down, pressurizing on the knees	.654	.615	
I 10. When squatting down, feeling the local discomfort on the front crotch	.581	.632	
I 8. When squatting down, pressurizing on the legs	.643	.556	
Factor 2: The Discomforts Of Stepping Up Stairs			
I 16. When stepping up stairs, making it difficult to take steps	.640	.750	.845
I 15. When stepping up stairs, feeling the strain on the back crotch stitches	.701	.732	
I 12. When stepping up stairs, pressurizing the stomach by the zipper or the buttons	.656	.730	
I 14. When stepping up stairs, feeling the strain at the back of the thigh	.657	.721	
I 13. When stepping up stairs, opening the waist at the back	.677	.708	
Factor 3: The Discomforts Of Tightness			
I 1. When sitting down, pressurizing the stomach by the zipper or the buttons	.726	.764	.793
I 6. When squatting down, pressurizing the stomach by the zipper or the buttons	.701	.751	
I 17. When bending, pressurizing the stomach by the zipper or the buttons	.501	.511	
I 5. When sitting down, making it difficult to cross legs	.449	.475	
I 3. When sitting down, feeling the local discomfort on the front crotch	.439	.417	
Factor 4: The Discomforts Of Opening The Waist At The Back			
I 7. When squatting down, opening the waist at the back	.790	.839	.828
I 2. When sitting down, opening the waist at the back	.732	.824	
I 18. When bending, opening the waist at the back	.730	.794	
Total Variance Explained			
Total: % 64.61			
Factor 1: 18.25%			
Factor 2: 18.06%			
Factor 3: 15.16%			
Factor 4: 13.14%			

The data set was gathered from 750 university students making up the sampling group. In the data analysis process, factor analysis was carried out for the physical discomforts during the use of denim jeans and statistical results were obtained. In the first factor analysis, the result of KMO and Barlet test was 0.91, $p=0.000$ was found, and the defining total variance percentage of factors was measured as 63.65%. Afterwards, owing to the fact that factor loading of 1.4 (when sitting down, feeling the strain on the back crotch stitches) was so close in two factors, this item was left out of the analysis and the analysis was repeated. As a result of this repetition, 19 items were included in the factor analysis, the result of KMO and Barlet test was 0.90, meaningfulness level p was defined as $p=0.000$. Depending on the results of the factor analysis, the four factors obtained were named and presented as below.

When the "Total Variance Explained" values from Table 1 are analysed, it is found that the 19 items included in the analysis gather under the four factors, the eigenvalues of which are over 1. In the analysis the crucial factor number is defined as four regarding the eigenvalues. The variance these four factors specify related to the scale is 64.61%. It can be said that this variance which is well over the acceptable value of 41% (Kline, 1994) enabled the scale to be evaluated as a four-factor scale. It has also been observed that the communalities of these four factors, which are defined related to the items, fluctuate between 0.439 and 0.790. The first of these four factors, which are defined as significant and crucial, has explained 18.25% of the total variance regarding the scale and the second one 18.06%, the third one 15.16%, and the last one 13.14% of the total variance regarding the scale. According to this, it has also been observed that the four factors together, which are noticeable as crucial and significant in the analysis, have explained most of the total

variance in the items and the variance regarding the scale (Table 1).

However, after rotated factor loading, it was discovered that the first and the second factors of the scale consisted of five items, while the third factor included six items and the fourth was made up of only three items. The rotated factor loading of the items in the first factor varied between 0.556 and 0.759. The same values for the five items for the second factor were between 0.750 and 0.708. The rotated factor loading of the items for the third factor measured between 0.764 and 0.417 and the rotated factor loading of the items for the fourth factor was between 0.839 and 0.794 (Table 1). By taking variables which make up the factors into consideration, the discomforts were named as; Factor 1: The discomforts of strain, Factor 2: The discomforts of stepping up stairs, Factor 3: The discomforts of tightness, Factor 4: The discomforts of opening the waist at the back. The variables, which show similar characteristics, were grouped with the help of the factor analysis.

Moreover, in order to evaluate how reliable were the values obtained from the discomforts felt in the jeans, Cronbach Alpha in the internal consistency test, which are counted according to the items analysis, were taken into account. For the first, second, third, and fourth factors, these parameters were 0.860, 0.845, 0.793, and 0.828, respectively.

4. CONCLUSION

In this study, the items, regarding the problems that denim jeans users experience while they undertake daily physical activities, were identified in order to develop a measurement tool which aims at analyzing the physical comfort of garments and a 19-item scale was developed which enabled denim jeans to be evaluated in terms of physical comfort. As a result of the internal consistency test, Cronbach's Alpha reliability coefficient was found

to be 0.91. This figure shows that the items in the scale have the competence to measure the same characteristic. Expert opinions, which were obtained for the validity of the scope to determine the items, were proved to be appropriate and adequate in terms of the content validity of the items in the scale. As a result of the factor analysis carried out for the construct validity, the items in the scale were gathered under four factors. Therefore, a four-factor measurement tool having reliability and validity was developed in this scale development study aiming at analyzing the physical comfort of denim jeans. The explanations regarding the factors are given below.

- Factor 1, explaining 18.25% of the variance (Cronbach's Alpha=0.863), included six items relating to "*the discomforts of strain*",
- Factor 2 accounted for 18.26% of the variance (Cronbach's Alpha=0.845) and consisted of five items relating to "*the discomforts of stepping up stairs*",
- Factor 3, explaining 15.16 of the variance (Cronbach's Alpha=0.793), included five items relating to "*the discomforts of tightness*",
- Factor 4 accounted for 13.14% of the variance (Cronbach's Alpha=0.828) and consisted of three items relating to "*the discomforts of opening the waist at the back*".

The results of this study have shown that the scale developed in this study can be used as a valid and reliable measurement tool. It is thought that this scale will be used by the experts in the ready-to-wear industry who wish to carry out studies on evaluating the physical comfort of garments and also by manufacturers who wish to increase the level of quality. Some scale development studies on physical comfort of the other ready-to-wear products can be carried out as well. Furthermore, this study can be used as a reference for scale development studies to be conducted in the future in order to evaluate physical comfort.

REFERENCES / KAYNAKLAR

1. Toprakkaya, D., 1999, "Termofizyolojik Açıdan Giyim Konforu", *Tekstil ve Konfeksiyon*, 9(5), 403-407.
2. Namlıgöz, E.S., Çoban, S., 2005, "Termofizyolojik Giysi Konforu ve Test Cihazları", *Tekstil ve Konfeksiyon*, 15(4), 245-252.
3. Li, Y., 2001, "The Science of Clothing Comfort", *Textile Progress*, 31, 1-2.
4. Rosenblad-Wallin, 1985, "User-oriented Product Development Applied to Functional Clothing Design", *Applied Ergonomics*, 16(4), 279-287.
5. Kışoğlu, S., Erenler Çakar, G., Bayraktar, F., 2006, "Büyük Beden Tüketicilerin Giysi Problemleri", 12. Ulusal Ergonomi Kongresi, 303-308.
6. Kuru, S., Kaynak, M., 2006, "Büyük Beden Tüketicisi Bayanların Büyük Beden Kıyafetlerden Pantolonda Karşılaştıkları Model Kaynaklı Problemlere İlişkin Görüşlerinin İncelenmesi", 12. Ulusal Ergonomi Kongresi, 290-295.
7. Akçakoca, E.P., 1999, "Denim Kumaşlar ve İndigo Boyamacılığı", *Tekstil ve Konfeksiyon*, 9(2), 136-143.
8. Coates, J.F., 2005, "From My Perspective: The Future of Clothing", *Technological Forecasting & Social Change*, 72, 101-110.
9. Çoruh, M., Vural, T., Çoruh, E., 2005, "Denim Kumaştan Üretilen Pantolonların (Kot Pantolon) Vücut ile Uyumunun İncelenmesi", *Tekstil ve Konfeksiyon*, 1, 40-46.
10. Kurt Salmon Associates, 2000, "Annual Consumer Survey", *American Apparel and Footwear Association Apparel Research Committee*, Orlando, FL.
11. Consumer Reports, 1996, "Why Don't These Pants Fir?", May, 38-39.
12. LaBat, K. and DeLong, M., 1990, "Body Cathexis and Satisfaction with Fit of Apparel", *Clothing and Textile Research Journal*, 8(2), 97-102.
13. Yertutan, C., 2001, "Gençlerin Hazır Giyimde Antropometrik Ölçülerle İlgili Karşılaştıkları Sorunlar", 8. Ulusal Ergonomi Kongresi, 59-65.
14. Çoruh, E., 2009, "An Investigation of The Ergonomics of Jeans", *Tekstil ve Konfeksiyon*, 19(3), 248-254.
15. Groves, R.M., Fowler, F.J., Couper, M.P., Lepkowski, J.M., Singer, E., Tourangeau, R., 2004, "Survey Methodology", A John Wiley & Sons, Inc., Publication.
16. Vogt, W.P., 2005, *Dictionary of Statistics & Methodology: A Non Technical Guide for The Social Sciences*, SAGE Publications.
17. Adams, P.S., Slocum, A.C., Keyserling, W.M., 1994, "A Model for Protective Clothing Effects on Performance", *International Journal of Clothing Science and Technology*, 6(4), 6-16.
18. Kline, P., 1994, "An Easy Guide to Factor Analysis", London: Routledge.

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