BODY SHAPES OF TURKISH WOMEN: IN TERMS OF THE READY-TO-WEAR INDUSTRY

TÜRK KADINLARININ VÜCUT ŞEKİLLERİ: HAZIR GİYİM AÇISINDAN

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ABSTRACT

The aim of this study is to determine the size distribution of Turkish women, identify their body shapes and analyze the correlation between their body measurements and body shapes in terms of the ready-to-wear industry. In a study done for this purpose, it was found that the average height of Turkish women is 161cm. The body shape distribution of Turkish women participating in the study was designated as 37% hourglass, 31% triangle, 19% rectangle, and 13% inverted triangle. It was determined that the body shapes and height of Turkish women are in close correlation, but that, there are differences in bust, waist and hip measurements. It was found that the bust measurement of Turkish women with inverted triangle body shape is significantly different from that of Turkish women with the other three body shapes. Similarly, it was observed that there are also differences between the waist and hip measurements of Turkish women with inverted triangle body shape and that of Turkish women with the other three body shapes. While bust and waist measurements are close to each other in Turkish women with triangle, hourglass, and rectangle body shape, there are differences in their hip measurements.

Key Words: Body shapes, Body measurements, Body sizes, Ready-to wear industry.

ÖZET

Bu çalışmanın amacı; Türk kadınlarının beden dağılımının belirlenmesi, vücut şekillerinin saptanması ve vücut ölçüleri ile vücut şekli arasındaki ilişkinin hazır giyim açısından incelenmesidir. Bu amaçla yapılan araştırmada, Türk kadınlarının boy ölçüsünün ortalama 161cm olduğu belirlenmiştir. Araştırmaya katılan Türk kadınlarının %37'sinin kum saati, %31'inin üçgen, %19'unun dikdörtgen ve %13'ünün ters üçgen vücut şekline sahip oldukları belirlenmiştir. Türk kadınlarının vücut şekilleri ile boy ölçülerinin birbirine yakın olduğu; fakat göğüs çevresi, bel çevresi ve kalça çevresi ölçülerinde farklılıklar olduğu saptanmıştır. Ters üçgen vücut şekline sahip kadınların göğüs çevresi ölçüsünün diğer üç vücut şeklinden de önemli bir düzeyde büyük olduğu görülmektedir. Aynı şekilde ters üçgen vücut şekline sahip kadınların bel ve kalça çevresi ölçülerinde de farklılık gözlenmektedir. Üçgen, kum saati, ve dikdörtgen vücut şeklinde göğüs ve bel çevresi ölçüleri birbirine yakın iken kalça çevresi ölçülerinde farklılıklar vardır.

Anahtar Kelimeler: Vücut şekilleri, Vücut ölçüleri, Beden ölçüleri, Hazır giyim endüstrisi.

1. INTRODUCTION

The most important factor of the ready-to-wear industry is to meet the garment demands of a broad range of consumer expectations. Therefore, the garment should primarily be in harmony with body shapes in order to meet the demands of consumers. One of the most important problems of the Turkish ready-to-wear industry is that there is no detailed research into the standardization of body measurements. The prerequisite in the garment production is to be aware of the body measurements of the consumers.

To fit consumers, each manufacturer must successfully interpret body measurements and produce apparel that satisfies their customer's fit preferences (1). However, a good fit goes beyond a set of body measurements. Women, for example with the same bust, waist, and hip measurements, can be completely different body shapes with variations in posture, back curvature, hip positions, bust shape, legs, etc. This is a problem because manufacturers use dress forms, and live fit models to test the sizes and fit of garments (2). Therefore, using the right sizes and preparing the patterns properly would

overcome the problems experienced in fitting garments to the body (3).

In 1942, the U.S. Department of Commerce developed sizing data based on the actual measurements of 10.000 American military women (2). Standardized sizing systems for women's apparel in North America have been based on the U.S. Department of Commerce, Voluntary Product Standard PS42-70: Body Measurements for the Sizing of Women's Pattern and Apparel. This sizing system was developed from body measurements of approximately 15.000 women (4). In Canada, the Canada Standard System (CSS) for

Sizing Women's Apparel was based on the PS42-70. The CSS was intended to be a comprehensive sizing system representative of the majority of Canadian women regardless of age (5). In conclusion, most of the sizing systems developed in the USA, Austria, England, Germany, Hungary, Japan, and South Korea examined classified women's figures in order to give consumers an acceptable fit (6).

In Turkey, ready-to-wear companies basing their sizing chart according to international sizing standards leads to the fact that manufactured garments do not fit Turkish people and also garment sizes vary from one company to another (7). The Turkish Standards Institute has carried out studies regarding women's body sizes, display of size on children's and women's apparel (TS 4346) (8). However, there has been no research into the body shapes of Turkish women.

The clothing industry has changed from mass production to mass customization, and has needed to develop new production technologies (9). Therefore, industries around the globe have become intent on investing in the latest technology to maintain a competitive edge (2). In the apparel industry, body scanning technology has advanced to the stage of being useful in collecting body measurements to be used to produce patterns (1). Today body scan technology also allows researchers to look at the body in very different ways relative to pattern development for apparel production (10).

Apparel scholars are challenged to explore the possible applications of scanning technology to develop new sizing systems, pattern-drafting methods, grading systems, 3D draping, virtual clothing interaction, etc (11). The software Female Figure Identification Technique (FFIT) for Apparel © was developed as a starting point for the representation of female body shapes in a mathematical way (12). Besides, some body scanning centers have developed shape analysis tools for use in pattern development (10).

It can be realized that even through a simple observation there are significant differences in people's bodies and there are different types of body shapes. It can be observed that there are differences in the relative proportion of body parts as well as the differences in body shapes.

The statistics gathered in Turkey, in 2008, showed that the population of women aged between 18 and 50 is 16.064.000, 75% of whom live in cities and towns (13). Therefore, by looking at these data, it can be said that there are approximately 12 million women consumers aiming for ready-to-wear garments. The body features should be known in order to meet the garment expectations of this large population. The literature scan results revealed that there is no research into the body shapes and size distribution of Turkish women. Therefore, ready-to-wear industry for women apparel need to know this distribution.

The aims of this study are; a) to determine the size distribution of garments, b) to determine the body shapes according to four categories, c) to analyze the relation between the body shapes and body sizes, and d) to determine the similarities and differences between the various foreign countries and discuss the results in terms of the ready-to-wear industry.

The study findings will bear important implications for the ready-to-wear industry to meet their needs as a result of identifying Turkish women's garment size distribution. Furthermore, the ready-to-wear industry will be aware of their consumers better as a result of identifying Turkish women according to their body shapes. This study will also be important for Turkish women since they will encounter fewer problems regarding body-garment fit as a result of the production taking their body shapes into consideration.

2. METHODS

2.1. Participants

In this study, the sample group consists of 936 randomly selected women, who are Turkish citizens living in Turkey, aged 18-50, having completed their physical development, with no deformation due to menopause and who also have no physical disabilities. The women participating in the study have different levels of education and represent all the geographical regions of Turkey. Furthermore, there are single and married participants who have given birth in various numbers and also ones who have not yet given birth. Therefore, it is apparent that the sample group consists of women from different geographical regions and with different education levels, marital status and number of births.

2.2. Questionnaire

A questionnaire was developed in order to be used in the study. The questionnaire consisted of three sections.

- *Demographic characteristics* section consists of the data regarding participants' marital status, number of births, education levels and birthplaces and which regions those places belong to.
- *Body shapes* section consists of four categories, namely, triangle, hourglass, rectangle and inverted triangle shape. The participants were asked questions regarding their demographical characteristics and their responses were filled in the form by the researcher.
- *Body sizes* section consists of the data regarding participants' height, bust, waist, and hip measurements in centimeters. These measurements are taken and written in the questionnaire by the researcher.

Body shapes are given in Figure 1.

- *Inverted triangle shape,* is depicted by broad shoulders and smaller hips (2).
- *Triangle shape,* is characterized by broader hips than shoulders (2).
- *Hourglass shape,* is shown with full shoulders and hips and waist definition (2).
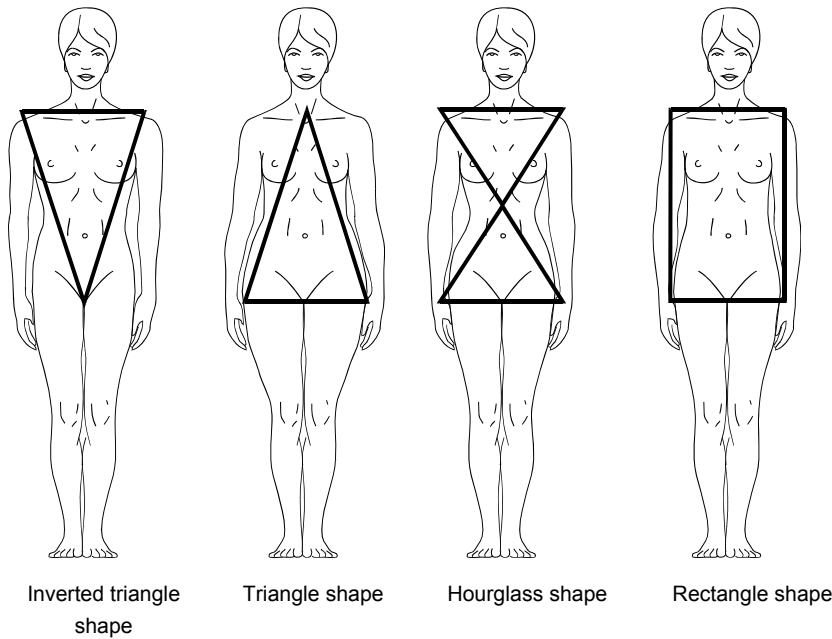- *Rectangle shape,* is characterized by straight up and down proportions with very little waist definition (2).

| Inverted triangle shape | Triangle shape | Hourglass shape | Rectangle shape |

Figure 1. Body shapes

Table 1. The body shapes of Turkish women according to the body sizes *(n=936)*

	Body Shapes								TOTAL	
	Inverted triangle shape		Triangle shape		Hourglass shape		Rectangle shape			
Body Sizes	f	%	f	%	f	%	f	%	f	%
34	1	0.1	8	0.9	28	3.0	15	1.6	**52**	**5.6**
36	5	0.5	35	3.7	74	7.9	20	2.1	**134**	**14.3**
38	13	1.4	44	4.7	64	6.8	32	3.4	**153**	**16.3**
40	9	1.0	62	6.6	72	7.7	37	4.0	**180**	**19.2**
42	9	1.0	46	4.9	40	4.3	22	2.4	**117**	**12.5**
44	9	1.0	45	4.8	24	2.6	23	2.5	**101**	**10.8**
46	31	3.3	29	3.1	29	3.1	19	2.0	**108**	**11.5**
48	23	2.5	21	2.2	13	1.4	9	1.0	**66**	**7.1**
50	19	2.0	3	0.3	1	0.1	2	0.2	**25**	**2.7**
TOTAL	**119**	**12.7**	**293**	**31.1**	**345**	**36.9**	**179**	**19.1**	**936**	**100.0**

A prerequisite for conducting anthropometric survey and for preparing patterns for garment manufacturing purposes is a list of appropriate body dimensions, which are adequately defined. International Standards defines the location of body dimensions taken on anthropometric surveys and for the preparation of garment patterns and garment stands, and specifies a standard procedure for measuring the body (14). In this study, the measurements of Turkish women's bust, waist and hip circumferences and their heights are taken according to International Standards. The method of taking these body measurements is given below.

- **Height:** Measure from the top of the head to the soles of the feet in a standing position (15).

- **Bust:** Measure the circumference of the body over the fullest part of the breasts and parallel to the floor (16).

- **Waist:** Measure the waist circumference horizontally around the body at waist level (15).

- **Hip:** Measure the buttocks circumference horizontally around the body at the level of maximum circumference (17).

Form fitting tape measures are used to take body measurements in this study,

which aims to develop garment patterns (18). National and international standards are taken into consideration while taking these body measurements.

In this study, body shapes were determined through the front view of the body and with reference to hip and shoulder outer lines. Moreover, the study is limited to determining the body shapes and ready-to-wear industry sizes of Turkish women aged between 18 and 50.

2.3. Data Analysis

The data gathered in this study should be classified in order to identify the size categories of women. This classification is done according to the measurement standards developed by the German Muller System (19). In this study, bust circumference measurement is taken into consideration since sizing standards are formed according to this measurement.

A cross table was developed in order to analyze the correlation between the body shapes of Turkish women and the size of garments, and their frequency and percentage values are given. In addition to this, basic statistic values, namely frequency, percentage, arithmetic mean and standard deviation, are used in order to analyze the correlation between body measurements and the body shapes of women participating in this study. In this study, Statistical Package for Social Sciences (SPSS) was used to evaluate data.

3. RESULTS AND DISCUSSION

The findings regarding the correlation between the body shapes and sizes of Turkish women are given in Table 1 below.

In Table 1, a total of 936 Turkish women, of whom 345(%36.9) were hourglass body shape, 293(%31.1) were triangle body shape, 179(%19.1) were rectangle body shape and 119(%12.7) were inverted triangle body shape.

The data in Table 1showed the body sizes of 936 Turkish women, of whom 18(%19.2) were 40 body size, 153(%16.3)

were 38 body size, 134(14.3) were 36 body size, 117(%12.5) were 42 body size, 108(%11.5) were 46 body size, 101(%10.8) were 44 body size, 66(%7.1) were 48 body size, 52(%5.6) were 34 body size, and 25(%2.7) were 50 body size. The summary of Table 1 is given below as a line graph.
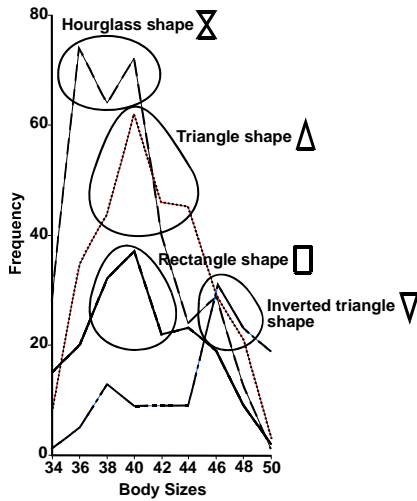

Figure 2. Body shapes as line graph

Women's body size categories manufactured in the Turkish ready-to-wear industry consist of two groups called "misses" and "plus" sizes. However, when the similar applications in the world are examined, it can be seen that women body sizes consist of three groups called "misses", "women's" and "plus" sizes. Therefore, it was determined that there is a need for a women's body size category for Turkish women between misses and plus sizes in the light of the findings from this study. Body size categories, size distribution of categories and percentages in the population are given in the table below so that they could guide women's apparel manufacturers operating in the ready-to-wear industry in Turkish domestic market.

When the body distribution table is examined, of the women placed in the "plus" size category, approximately one third were triangle shape, more than one fourth were inverted triangle shape, one fourth were hourglass shape and one sixth were rectangle shape. Therefore, these results revealed that

Table 2. Suggested body sizes for Turkish women

Size categories	Sizes in categories	Percentages in population*
Misses	34-36-38-40-42	67.9
Women's	40-42-44-46	54.0
Plus sizes	44-46-48-50	32.1

*The values were developed according to the percentages in Table 1.

Table 3. The results of the study between the body shapes and the body measurements *(n=936)*

Body Measurements	Body Shapes	f	%	Mean	SD
Length (cm)	Inverted triangle shape	119	12.7	159.21	5.92
	Triangle shape	293	31.1	160.20	5.94
	Hourglass shape	345	36.9	161.13	5.75
	Rectangle shape	179	19.1	161.53	6.40
	TOTAL	**936**	**100.0**	**160.67**	**5.99**
Bust Circumference (cm)	Inverted triangle shape	119	12.7	102.42	9.93
	Triangle shape	293	31.1	94.35	8.08
	Hourglass shape	345	36.9	90.95	7.91
	Rectangle shape	179	19.1	92.83	8.43
	TOTAL	**936**	**100.0**	**93.84**	**9.06**
Waist Circumference (cm)	Inverted triangle shape	119	12.7	86.01	10.74
	Triangle shape	293	31.1	76.25	8.38
	Hourglass shape	345	36.9	73.44	7.97
	Rectangle shape	179	19.1	74.14	9.02
	TOTAL	**936**	**100.0**	**76.05**	**9.55**
Hip Circumference (cm)	Inverted triangle shape	119	12.7	105.92	8.52
	Triangle shape	293	31.1	102.86	7.32
	Hourglass shape	345	36.9	97.26	6.28
	Rectangle shape	179	19.1	97.84	6.68
	TOTAL	**936**	**100.0**	**100.22**	**7.72**

triangle body shaped women have the highest ratio in the plus size. This result is considered to be important for the plus size manufacturers.

The women's category suggested for Turkish women consists of the two biggest sizes of misses category and the two smallest sizes of plus sizes category since women's category is placed between misses and plus sizes categories. When the percentages in Table 2 are examined, it can be seen that the women's category represents more than half of the population and therefore ready-to-wear manufacturers should attach importance to the consumers in this category. Thus, size distribution should be diversified in three different categories in accordance with the findings of this study. These groups are designated as misses (size 34-42), women's (size 40-46) and plus sizes (size 44-50).

When the body distributions according to the body shapes were examined, it was found that approximately 85% of the women participating in the study fall into the 36-46 size range. Since the great majority of the women fall into this category, it is thought that manufacturing categories should be diversified according to the preference and the garment needs of consumers. Moreover, it was found that approximately more than one third of Turkish women have 44 and over body sizes, which means they are in plus size category. This result also shows that the plus size production in ready-to-wear industry needs to have the same ratio.

In table 3, the results regarding the correlation between body shapes and body measurements are given.

When Table 3 is examined, it can be seen that, of the women participating

in the study, 37% have hourglass body shape, 31% have triangle body shape, 19% have rectangle body shape and 13% have inverted triangle body shape. It was determined that, while the height measurements and body shapes of Turkish women are in close correlation, there are differences in their bust, waist and hip circumference measurements. It can be seen in Table 3 that the bust circumference measurement of women with inverted triangle body shape was significantly bigger than that of the women with the other three body shapes. It is an expected condition, that bust circumference measurement is big in women with triangle body shape. However, when Table 1 and Figure 2 are examined, it can be seen that women with inverted triangle body shapes are accumulated in the big size group causing bust circumference measurement to be significantly large. Similarly, it is observed that there are also differences in waist and hip circumference measurements of women with triangle body shape. While bust and waist circumference measurements of women with triangle, hourglass and rectangle body shapes show similarities, there are differences in their hip circumference measurements. The fact that hip circumference measurement of women with triangle body shape is greater than that of women with hourglass and rectangle body shapes results from the characteristics of triangle body shape.

It was discovered that the average measurements of women with hour-glass and rectangle body shapes are close to each other. Hip stucture highly influences body depth. In this study, body shapes were determined through the front view of the body and with reference to hip and shoulder outer lines. This can be one of the reasons why the average measurements of women with hourglass and rectangle body shapes are close to each other. Furthermore, women with rectangle body shape accumulate between size 38 and 44, while women with hourglass body shape accumulate between size 34 and 46. It is thought that the reason why the average measurement figures are close to each other is also due to the differences in

accumulation of sizes according to body shapes.

As a result of the various studies carried out in the USA, England, France and India, height measurements of women fall into three categories as short, medium and tall (20). When the average height of the medium category is compared with the average height of Turkish women, it was found that Turkish women (161 cm) are shorter than American (165 cm) and West German women (164cm), but are taller than Indian women (156cm) and more or less the same height as English (160cm) and French (160cm) women. In this study, a different height measurement category was not developed since this study is on body measurements and body shapes in terms of the ready-to-wear industry and also height alteration costs are low in Turkey. Therefore, it is thought that a drop system for the height measurements of Turkish women is not needed.

The shape and size of the "ideal" American woman has been changing for decades. In the 1700's women were traditionally pear-shaped. In the 1800's, the American standard for women evolved from a rectangle shape, to a bell from, to an hourglass figure late in the century. From the 1900's to 1940, women's body shapes became rectangular and very slim. From 1940 to 1960, the hourglass shape returned and was epitomized by Marilyn Monroe. The 1980's brought about a strong preference for the muscle-toned look. The early 1990's brought with it the thin waif-like look. Today, in the late 1990's, the ideal woman is thin with body tone. The shapes and sizes of women over the past decades have indeed been changing, however, sizing standards and garment proportions used by the apparel industry have not. In spite of dieting, American women are getting larger (2). Since there has been no research into the body shapes of Turkish women before, a historical assessment cannot be made.

In a study by Lee et al., 2007, a comparison of the body shape and body proportion between USA women and Korean women were made by

analyzing the distribution and traits of body shapes and comparing the differences of body shape according to age. The largest shape category for Korean women was the rectangle shape and the next was the triangle shape, and then spoon, bottom hourglass, hourglass, and inverted triangle shape category followed. The top hourglass shape did not appear in Korean women. The distribution of each shape category in the USA women was different from that of Korean women. The distribution of the rectangle shape, the most frequent shape category in both countries was 70.6% of subjects in Korean women, 49.0% of subjects in the USA women. The hourglass shape category was just 0.5% of subjects in Korean women, but 11.8% of subjects in the USA women. The spoon shape category showed a greater distribution in the USA women (21.5%) than Korean women (8.7%). The triangle shape appeared in 15.6% of Korean women, but in just 4.8% of the USA women. The top hourglass shape that did not appear in Korean women was shown in 3.0% of the USA women. More various body shape categories were found in the USA women than in Korean women (21). While rectangle body shape was the largest category for American and Korean women, this category was in third place for Turkish women. The similarity between Turkish and Korean women is that both have triangle body shapes, and this body shape category was in second place in both countries.

Rectangular, pear and hourglass body shape were more likely to report fitting problems at the bust than the inverted triangular body shape. Fitting problems at the waist, hip, thigh, dress length, and pant length were more likely to be reported by the pear and hourglass body shapes than rectangular and inverted triangle body shapes. The hourglass and the rectangular body shapes reported problems with the sleeve length. The inverted triangular body shapes were the least likely to report fit problems at the crotch. Overall, the inverted triangle body shapes were satisfied with the fit of RTW. The inverted triangle shape also

reported greater satisfaction with their lower body than did subjects with a pear or hourglass shape (1). Some research needs to be conducted into Turkish women's satisfaction with ready-to-wear garments by taking their body shapes into consideration.

In a study by Çoruh, 2009, the results of the study clearly showed that there exists a real problem in the waist area of most jeans. It was found that the participants experienced discomfort when their jeans' waists opened at the back (3). The findings of this study showing 37% of Turkish women have hourglass body shape support that of Çoruh's study since hourglass body shape requires the waist to be narrow. When proper garment patterns are not prepared in accordance with hourglass body shape, which most Turkish women have, it is to be expected that women experience discomfort when the waist area of their jeans opens at the back.

In a study by Ujevic et al., 2006, most countries establish standards according to their criteria, and size systems developed and established in different European countries differ from each other. Most of these systems are based on the body shape determined by body height and differences in bust, waist and hip circumference (22). This study introduces Turkish women's heights and bust, waist, hip circumference measurements according to their body shapes.

In a study by Devarajan et al., 2004, the software "Female Figure Identification Technique (FFIT) for Apparel" was developed as a starting point to classify females based on their body shapes. The nine significantly different body shapes were identified in the software (23). In another study by Cho et al., 2005, using 3D body shape data, an interactive 3D body model suitable for pattern making was developed. As a result, it is possible for customers during the purchasing process to not only modify the body model to match their own body shape, using this system on the internet or catalogs, but also for apparel manufacturers to communicate with their customers by describing the body

model to fit on the screen during the ordering process (9). According to another study by Protopsaltou et al., 2001, a new methodology to create a step by step Virtual Try On has been introduced, starting with the creation of standard bodies, animating them, dressing them and then creating an interface to make them available on a "Virtual Try On" on the Internet (24). According to another study by Connell et al., 2006, experts' knowledge was used to develop a set of scales to assess female body shapes as visualized in body scans, resulting in an instrument that could be applied through software to the analysis of body scan data (25). It is essential for the Turkish clothing industry to invest in advanced technologies and body scanning systems.

4. CONCLUSION

When the data were analyzed, the following conclusions were reached.

- It was found that of all the women participating in this study 85% were accumulated between size 36-46 (Table 1) and approximately 19% were size 40, 16% were size 38, and 14% were size 36. As a result, these three sizes account for 50% of the whole group.
- It was found that the average height of Turkish women is 161cm (Table 2). Therefore, these findings showed that there is no need to diversify height measurements of women's apparel manufactured for Turkish women. In addition, both standard deviation and arithmetic mean are close to each other when height measurement is examined according to body shapes. Therefore, height measurement is not necessary for women's apparel sizes to be manufactured according to body shapes.
- Of the women participating in the study, 37% have hourglass, 31% have triangle, 19% have rectangle and 13% have inverted triangle body shapes.
- It was found that inverted triangle body shaped women's bust circumference measurement approximately 8-11cm, and waist circumference measurement approximately 10-

13cm, and hip circumference measurement is 3-6cm greater than those of the other three body shapes (Table 3). These findings reveal that most of the women with inverted triangle body shape fall into the big size category.
- It was found that there is, 1-3cm bust circumference measurement difference, and a 2-3cm waist circumference measurement difference among the Turkish women with triangle, hourglass, rectangle body shapes. However, it was determined that the hip circumference measurement of women with triangle body shape is 5-6cm greater than that of the women with hourglass and rectangle body shapes (Table 3). These results show that while the bust and waist circumference measurements of women with triangle, hourglass and rectangle body shapes are close to one another; hip circumference measurements of women with triangle body shapes are greater than those of women with hourglass and rectangle body shapes. This is an expected finding since the hip circumference measurement of women with triangle body shape is affected mostly by weight gain.
- Body measurement values are very close to each other in women with hourglass and rectangle body shapes (Table 3)

In this study, it was found that approximately one third of Turkish women have hourglass body shape, one third have triangle body shape, and one sixth have rectangle and inverted triangle body shape. It is a noticeable result that three fourths of women with inverted triangle body shape fall into plus size category.

The following suggestions based on the study findings have been made;
- It is suggested that the ready-to-wear industry manufacturing women's apparel should develop alternatives for garment patterns, modeling applications and pattern grading for the same model according to different body shapes. These alternatives should be especially developed for women with triangle and hourglass body shapes, which

account for the body types with the highest rate in female population.

- The ready-to-wear industry manufacturing oversized women's apparel should also develop modeling design, pattern preparation and grading procedures by taking inverted triangle body type into consideration.

- Different production patterns and grading should be developed according to the waist measurements of women with hourglass and rectangle body shapes.

- Body shapes of Turkish women should be defined in more detail by making use of body scanners.

- Garment pattern preparation and grading should be carried out for Turkish women with different body shapes.

- Body type analyses should also be carried out for different industries.

- The study findings have revealed that "misses", "women's" and "plus" sizes are the most common in the female population; therefore, these sizes should be considered by manufacturers operating in the ready-to-wear industry.

It was observed that there has not been enough research into the definition of body shapes in Turkey. All industries need both theoretical and practical applications for the definition of body shapes. Therefore, it is thought that the amount of research into the definition of body shapes should increase both qualitatively and quantitatively, and also it is hoped that these studies will gain momentum.

REFERENCES

1. Alexander, M., Connell, L.J., Presley, A.B., 2005, "Clothing Fit Preferences of Young Female Adult Consumers", *International Journal of Clothing Science and Technology,* 17, 52-64.

2. Anderson, L.J., Brannon, E.L., Ulrich, P.V., Presley, A.B., Woronka, G., Grasso, M., Gray, S., 2000, "Understanding Fitting Preferences of Female Consumers: Development an Expert System to Enhance Accurate Sizing Selection", National Textile Center Annual Report: November, 1-11.

3. Çoruh, E., 2009, "An Investigation of The Ergonomics of Jeans", *Journal of Textile and Apparel*, 19(3), 248-253.

4. Woodson, E.M., Horridge, P.E., 1990, "Apparel Sizing as It Relates to Women Age Sixty-five Plus, *Clothing and Textile Research Journal*, 8(4), 7-13.

5. Campbell, L.D., Horne, L., 2001, "Trousers Developed from The ASTM D5586 and The Canada Standard Sizing for Women's Apparel", *Clothing and Textile Research Journal*, 19(4), 185-193.

6. Chun-Yoon, J., Jasper, C., 1993, "Garment-sizing Systems: An International Comparison", *International Journal of Clothing Science and Technology*, 5, 28-37.

7. Bulgun, E.Y., 1994, "Türkiye'de 12-17 Yaş Grubu Genç Kızların Beden Ölçüleri Standardizasyonu", İzmir: Ege Üniversitesi, Yayımlanmamış Doktora Tezi.

8. Gönen, E., 1991, "Hazır Giyim Üretiminde Antropometri", 3. Ergonomi Kongresi, Ankara.

9. Cho, Y., Okada, N., Park, H., Takatera, M., Inui, S., Shimizu, Y., 2005, "An Interactive Body Model for Individual Pattern Making", *International Journal of Clothing Science and Technology*, 17(2), 91-99.

10. Connell, L.J., Ulrich, P., Knox, A., Hutton, G., Woronka, D., Ashdown, S., 2002, "Body Scan Analysis for Fit Models Based on Body Shape and Posture Analysis", National Textile Center Annual Report: November, 1-9.

11. Petrova, A., Ashdown, S.P., 2008, "Three-Dimensional Body Scan Data Analysis: Body Size and Shape Dependence of Ease Values for Pants' Fit", *Clothing and Textile Research Journal,* 26(3), 227-252.

12. Simmons, K., 2002, "Body Measurement Techniques: A Comparison of Three-Dimensional Body Scanning and Physical Anthropometric Methods", *Doctoral Dissertation*, North Carolina State University, Raleigh, NC.

13. www.tüik.gov.tr

14. International Standard ISO 8559. Garment Construction and Anthropometric Surveys - Body Dimensions. First Edition- 1989- 07-01.

15. ASTM – Standard Table of Body Measurements for Adult Female Misses Figure Type, Sizes 2-20 (Designation: D 5585-95).

16. ASTM – Standard Terminology Relating to Body Dimensions for Apparel Sizing (Designation: D 5219-99).

17. International Standard ISO 3635. Size Designation of Clothes- Definitions and Body Measurement Procedure. Third Edition- 1981- 08-01.

18. Mete, F., 1990, "Giysi Tasarımı Açısından İnsan Vücudunun Mekaniği", *Tekstil ve Makine Dergisi*, 4(21), 150-154.

19. System M. Müller&Sohn, Gradieren, Deutsche Bekleidungs-Akademie, München, Franz Xaver Müller GmbH.

20. Gupta, D., Gangadhar, B.R., 2004, "A Statistical Model for Developing Body Size Chart for Garments", *International Journal of Clothing Science and Technology*, 16(5), 458-469.

21. Lee, J.Y., Istook, C.L., Nam, Y.J., Park, S.M., 2007, "Comparison of Body Shape USA and Korean Women", *International Journal of Clothing Science and Technology*, 19(5), 374-391.

22. Ujevic, D., Rogale, D., Drenovac, M., Pezelj, D., Hrastinski, M., Narancic, N.S., Mimica, Z., Hrzenjak, R., 2006, "Croatian Anthropometric System Meeting The European Union", *International Journal of Clothing Science and Technology*, 18(3), 200-218.

23. Devarajan, P., Istook, C.L., 2004, "Validation of "Female Figure Identification Technique (FFIT) for Apparel" Software", *Journal of Textile and Apparel Technology and Management*, 4(1), 1-23.

24. Protopsaltou, D., Luible, C., Arevalo, M., Magnenat-Thalmann, N., 2001, "A Body and Garment Creation Method for An Internet Based Virtual Fitting Room", available at: http://miralabwww.unige.ch/newMIRA/MIRALabHtml.htm (accessed 8 April 2002).

25. Connell, L.J., Ulrich, P.V., Brannon, E.L., Alexander, M., Presley, A.B., 2006, "Body Shape Assessment Scale: Instrument Development for Analyzing Female Figures", *Clothing and Textile Research Journal*, 24(2), 81-95.