

## Analysis of Body Characteristics of the US Women Aged from 26 to 45 Using 3D Body Scan Data

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### Abstract

This study investigated the anthropometric characteristics of US women 26 to 45 years of age to classify their body shapes into different categories. Research data was obtained from 2950 women 26 to 45 years of age who participated in the SizeUSA study. A 26 to 35 years of age group and a 36 to 45 years of age group were selected from the data pool. A total of 26 measurements important for body shape classification and for apparel product development was used for the data analysis. Five factors accounted for the US women's body measurements. The body shapes of women were categorized into 4 types: Obese A-Shape, Overweight Y-Shape, Obese H-Shape, and Normal S-Shape. Normal S-Shape was the most common body shape type. More women in the 26 to 35 years of age group had Normal S-Shape type than women in the 36 to 45 years of age group. More women in the 36 to 45 years of age group had Obese A-Shape, Overweight Y-Shape, and Obese H-Shape than women in the 26 to 35 years of age group. Younger US women, 26 to 35 years of age had slimmer body sizes with more balanced body shapes; however, older US women, 36 to 45 years of age had larger body sizes with more various body shapes.

### Keywords

Body size, body shape, US women, and 3D body scanning

## Introduction

The US is a major importer and exporter of clothing and textiles goods (Seyoum, 2010). Women in their mid-twenties start careers and establish a financial foundation as they enter their 30s and 40s. American women in these age ranges are the major consumers of apparel products and many apparel brands develop products that cater to these age groups. Macy's, a large department store chain in the US, has targeted the Millennial customer group as an important age group for increased spending powers in the US fashion industry (Gennette, 2012). Impulse women's brand consumers are the post college group among Millennial customers who are 20 to 30 years of age starting careers and family with 26 years old being the key age. Neiman Marcus considered 20 to 30 year olds as an important age group for the store (Clark & Edelson, 2006; Edelson, 2007). Among contemporary and misses' brands, women 30 plus to 40 plus are an important customer group; they are fashion conscious consumers who dress to look younger and trendier (Thurman, 2007). Talbot's acquisition of J. Jill was to expand

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the company to target mid-30s to mid-40s women with a relaxed life style (Moin, 2007). Finish Line launched a new shoe brand chain Pavina that targeted a new demographic of 25 to 40 year-old women older than their typical target market of 18 to 19 year-old women (Moin, 2005). Understanding body size and shape characteristics of US women 26 to 45 years of age represents an important marketing strategy for foreign apparel companies who wish to be successful in the US clothing and textiles industry.

Several researchers examined the anthropometric characteristic of Korean young and middle-aged women. Certain body size and shape characteristics of young and middle-aged women are shared across the countries regardless of their ethnicity; consequently, previous studies using Korean anthropometric data are examined to better design the current research study. Shim and Hahm (2001) examined the body types of Korean middle-aged women 35 to 59 years of age. The researchers categorized women's body shapes into 6 types. The characteristics of Type 1 body were short height and heaviest weight with a H-shape front view and leaned-back shape profile view. The characteristics of Type 2 body were regular height and weight. The characteristics of Type 3 body were short height, heavy weight, and long upper body length with posture bent forward and protruded hip shape. The characteristics of Type 4 body were a thin and tall body, short upper body length, protruded back and hip shape, and leaned-back shape from profile view. The characteristics of Type 5 body were thin and regular height with X-shape from front view and I-shape from the profile view. The characteristics of Type 6 body were thin and tall height with B-shape from profile view. Type 1, 2, and 3 were common body types of 45 to 49, 50 to 54, and 55 to 59 year old groups. Type 4, 5, and 6 were common body types of 35 to 39 and 40 to 44 year old groups. They concluded that middle-aged women 35 to 59 years of age had distinctive shape differences between 35 to 44 years of age and 45 to 59 years of age group. Nam, Choi, and Lee (2013) studied the body characteristics of 35 to 64 year old women. They compared the body measurements of the 35 to 64 age group from the 5<sup>th</sup> Size Korea data and the same age group from the 6<sup>th</sup> Size Korea data and investigated the body measurement changes. They found that women in the 6<sup>th</sup> Size Korea study had taller height, lighter weight, and smaller width and depth related measurements than women in the 5<sup>th</sup> Size Korea study. Lee (2011) investigated the

body characteristic of short Korean women 18 to 59 years of age. More percentages of short women existed in the older age groups than younger age groups. When compared to women of normal height, short women in the younger age groups had a tendency to look heavier due to the larger body proportion of width, depth, girth, and length to height. However, short women in the older age group did not look different from women of normal height.

These previous studies used Korean women's measurement data to categorize women's body types and compared the age differences in body shapes and sizes. In order to understand the US female consumers, anthropometric studies on the US women needs to be conducted. SizeUSA is a large scale anthropometric study conducted between 2002 and 2003 using 3D body scanners led by [TC]<sup>2</sup> with industry partnerships in the US (Devarajan & Istook, 2004). Study participants consisted of 12,000 white, black, Asian and Hispanic people aged 18 to over 66 years of age who resided in different US states. Research studies using the data from the SizeUSA study have been conducted with different aims and analysis methods. Alexander, Pisut, and Ivanescu (2012) examined the body shape of plus-size women using SizeUSA data and analyzed their hip shape characteristics. The results showed that plus size women had different hip shapes that included high hip shape, mid hip shape, low hip shape and straight hip shape. As plus-size women got heavier, high hip shapes and straight hip shapes existed more than the other hip shapes. Devarajan and Istook, (2004) randomly selected 531 women's measurement data from SizeUSA study and used six body measurements for shape classification analysis. The analysis resulted in nine different body shapes: hourglass, bottom hourglass, top hourglass, spoon, rectangle, diamond, oval, triangle, and inverted triangle. Some studies used US measurement data from the SizeUSA study and Korean measurement data from the Size Korea study to compare size and shape differences between American and Korean women (Lee, Istook, Nam, & Park, 2007; Yi, & Istook, 2008). The studies that used the SizeUSA dataset did not examine age groups of 20s to 40s specifically; consequently, further investigations are needed to understand the US women 26 to 45 years of age.

The current study investigated the anthropometric characteristics of the US women 26 to 45 years of age in order to classify their body shapes into different categories. The following five research

questions were developed:

- 1) Research question 1: What are the factors that affect body shapes of the US women 26 to 45 years of age?
- 2) Research question 2: How are the body shapes of the US women 26 to 45 years of age classified? What are the characteristics of the US women body shape classifications?
- 3) Research question 3: What are the relationships of age groups and body shape classifications?
- 4) Research question 4: What are the differences in anthropometric data between the 26 to 35 years of age group and the 36 to 45 years of age group?

## Method

### Sample and Procedures

The anthropometric data for the research was from a secondary dataset of the SizeUSA study. This study used 2950 participants between the ages of 26 to 45 after eliminating 47 participants due to missing data. Two age groups were selected from the data pool: the 26 to 35 years of age group ( $n=1523$ , 51.63%) and the 36 to 45 years of age group ( $n=1427$ , 48.27%). A total of 26 measurements important for body shape classification and apparel product development was used for the data analysis: 7 measurements in the girth category (neck base girth, bust girth, waist girth, hip girth, upper arm girth, thigh girth, and knee girth), 4 measurements in the width category (back shoulder width - contoured, back shoulder width, across back width, and across front width), 7 measurements in the height/length category (height, bust height, waist height, hip height, crotch height, knee height, and arm length), 3 drop values (hip girth minus waist girth, hip girth minus bust girth, and bust girth minus waist girth), 2 values in the indice measurement category (waist/height and hip/height), and 3 measurements in the other category (weight, side neck to bust point distance, and bust point distance).

### Data Analysis

Descriptive statistics, factor analysis, cluster analysis, chi-square test, one-way ANOVA, Duncan’s post-hoc test, and *t*-test were conducted using the SPSS program. A factor analysis was conducted to investigate the factors accounting for the US women’s

body measurements. Cluster analysis classified body shapes using factor scores. One-way ANOVA and Duncan’s post-hoc test were conducted to compare the mean of each measurement between the clusters. Chi-square statistics were conducted to examine

**Table 1.** Factors Analysis for the Body Measurements

Factor 1. Girth Factor	Factor Loading
Bust Girth	.955
Weight	.943
Waist Girth	.936
Hip Girth	.925
Back Shoulder Width (Contoured)	.892
Upper Arm Girth	.886
Back Shoulder Width	.885
Thigh Girth	.858
Side Neck to Bust Point Distance	.839
Bust Point Distance	.825
Knee Girth	.807
Neck Base Girth	.803
Across Back Width	.772
Across Front Width	.602
Eigenvalue=10.65 % of Variance=40.95% Cumulative%=40.95% $\alpha=.672$	
Factor 2. Height Factor	Factor Loading
Bust Height	.946
Crotch Height	.942
Height	.920
Hip Height	.894
Waist Height	.881
Knee Height	.872
Arm Length	.810
Eigenvalue=6.06 % of Variance=23.29% Cumulative%=64.24% $\alpha=.955$	
Factor 3. Hip Drop Factor	Factor Loading
Hip Girth – Waist Girth	.912
Hip Girth – Bust Girth	.831
Eigenvalue=2.12 % of Variance=8.15% Cumulative%=72.39% $\alpha=.810$	
Factor 4. Lower Body Proportion Factor	Factor Loading
Waist Height/Height	.861
Hip Height/Height	.834
Eigenvalue=1.97 % of Variance=7.59% Cumulative%=79.98% $\alpha=.887$	
Factor 5. Bust Drop Factor	Factor Loading
Bust Girth – Waist Girth	.938
Eigenvalue=1.61 % of Variance=6.20% Cumulative%=86.18% $\alpha=-$	

the relationships between age groups and clusters. A *t*-test was conducted to further investigate the differences between the two age groups in each measurement.

## Results

### Factors Affecting US Women's Body Shapes

The factor analysis results revealed five factors that accounted for the US women's body measurements (reliability from .672 to .955) (Table 1). Factor 1 Girth Factor accounted for 40.95% of the total variance (Eigenvalue=10.65). Factor 1 Girth Factor included 14 measurements mostly related to girth and width measurements: weight, bust girth, waist girth, hip girth, upper arm girth, back shoulder width - contoured, back shoulder width, across back width, across front width, neck base girth, side neck to bust point distance, bust point distance, thigh girth, and knee girth. Factor 2 Height Factor accounted for 23.29% of the total variance (Eigenvalue=6.06). Factor 2 included 7 measurements related to height measurements: height, bust height, waist height, hip height, crotch height, knee height, and arm length. Factor 3 Hip Drop Factor accounted for 8.15% of the total variance (Eigenvalue =2.12). Factor 3 included 2 measurements related to hip drop values: hip girth minus waist girth and hip girth minus bust girth. Factor 4 Lower Body Proportion Factor accounted for 7.59% of the total variance (Eigenvalue=1.97). Factor 4 included 2 indice measurements related to measurements calculated for the lower body proportion: waist/height and hip/height. Factor 5 Bust Drop Factor accounted for 6.20% of the total variance (Eigenvalue =1.61). Factor 5 included 1 measurement related to bust drop

value: bust girth minus waist girth.

### Body Shape Classifications and Characteristics

A cluster analysis classified body shapes using factor scores based on the factor analysis results. Four clusters were optimal to classify US women's body shapes and explain shape differences. Cluster 4 had the largest number of women (n=1271, 43.08%), and Cluster 1 (n=633, 21.46%) and Cluster 2 (n=646, 21.90%) represented similar numbers of women, and Cluster 3 represented the smallest number of women (n=400, 13.56%). In order to analyze the characteristics of each cluster, one-way ANOVA and Duncan's post-hoc test were conducted to compare the mean factor scores between the clusters (Table 2).

Based on the formula from the Center for Disease Control and Prevention (n. a.) website, the mean body mass index (BMI) was calculated for each cluster to compare the body fat of women in different clusters. BMI is calculated based on individual weight and height as an indicator of body fat. BMI is categorized as: less than 18.5 underweight, between 18.5 to 24.9 normal weight, between 25 and 29.9 overweight, and 30 and over obese. Additionally, in order to further investigate the specific measurement differences between the clusters, one-way ANOVA and Duncan's post-hoc test compared the mean of each 26 measurements between 4 clusters (Table 3).

Women in Cluster 1 had the highest factor score for the Hip Drop Factor. The mean of hip girth minus waist girth and the mean of hip girth minus bust girth showed the largest mean score among four clusters. The results indicate that they have a lower body larger than their upper body. Additionally, these women had

Table 2. Body Shape Classification based on Cluster Analysis (N =2950)

Factor	Cluster Group	Cluster 1 (n=633)	Cluster 2 (n=646)	Cluster 3 (n=400)	Cluster 4 (n=1271)	F-Value
Girth Factor		.604 (b)	.340 (c)	.911 (a)	-.760 (d)	854.90**
Height Factor		-.213 (c)	.042 (b)	.319 (a)	-.015 (b)	24.20**
Hip Drop Factor		1.17 (a)	-.708 (c)	-.672 (c)	-.013 (b)	857.53**
Lower Body Proportion Factor		.084 (b)	-.675 (d)	.997 (a)	-.013 (c)	303.39**
Bust Drop Factor		.218 (b)	.793 (a)	-.659 (d)	-.305 (c)	321.75**

\**p*<.05, \*\**p*<.01, a-d: Duncan's multiple range test (a>b>c>d)

- Cluster 1: Obese A-Shape
- Cluster 2: Overweight Y-Shape
- Cluster 3: Obese H-Shape
- Cluster 4: Normal S-Shape

**Table 3.** Measurement Differences between Body Shape Classifications (Measurement Unit: cm/kg)

Anthropometric Measurement		Cluster Group	C.1: Obese A-Shape (n=633)	C.2: Overweight Y-Shape (n=646)	C.3: Obese H-Shape (n=400)	C.4: Normal S-Shape (n=1271)	F-Value
Girth Factor	Bust Girth		109.957b	109.804b	119.253a	94.310c	913.64**
	Weight		84.305b	73.940c	92.193a	59.647d	746.62**
	Waist Girth		94.590b	91.567c	107.975a	80.162d	698.62**
	Hip Girth		119.659b	107.467c	121.564a	99.695d	814.06**
	Back Shoulder Width (Contoured)		40.691c	41.478b	42.418a	37.262d	618.98**
	Upper Arm Girth		34.874b	31.521c	36.805a	27.686d	727.85**
	Back Shoulder Width		39.522c	40.335b	41.072a	36.170d	610.55**
	Thigh Girth		70.536a	62.357c	69.952b	58.268d	827.19**
	Side Neck to Bust Point Distance		29.413b	29.058c	30.886a	26.137d	527.10**
	Bust Point Distance		22.098b	22.098b	23.393a	19.482c	590.02**
	Knee Girth		42.418a	38.735c	41.986b	36.906d	560.41**
	Neck Base Girth		39.268b	39.116b	41.859a	36.525c	439.71**
	Across Back Width		37.744c	38.430b	40.310a	34.849d	379.77**
	Across Front Width		39.421c	40.869a	40.132b	35.331d	315.32**
Height Factor	Bust Height		115.976c	116.789b	118.008a	116.205bc	11.57**
	Crotch Height		71.552c	71.831c	74.270a	72.822b	33.90**
	Height		162.255b	164.109a	163.627a	161.696b	19.07**
	Hip Height		82.702b	82.169bc	87.198a	81.890c	125.99**
	Waist Height		99.720b	98.146c	102.921a	97.587c	103.56**
	Knee Height		43.663c	43.993bc	45.542a	44.094b	33.75**
	Arm Length		53.772b	53.696b	56.134a	53.264c	65.36**
Hip Drop Factor	Hip Girth – Waist Girth		25.070a	15.875c	13.589d	19.533b	604.43**
	Hip Girth – Bust Girth		9.728a	-2.362d	2.311c	5.385b	615.05**
Lower Body Proportion Factor	Waist Height/Height		0.615b	0.598d	0.629a	0.603c	274.23**
	Hip Height/Height		0.510b	0.501d	0.533a	0.506c	346.66**
Bust Drop Factor	Bust Girth – Waist Girth		15.367b	18.237a	11.252d	14.148c	208.12**

\* $p < .05$ , \*\* $p < .01$ , a–d: Duncan's multiple range test ( $a > b > c > d$ )

a mean BMI of 31.97 in the obese range and the second highest factor score for the Girth Factor. Therefore, the body shape type of Cluster 1 was named as Obese A-Shape. The mean measurement of bust girth, waist girth, hip girth, weight, and height of women in Cluster 1 were 109.957 cm, 94.590 cm, 119.659 cm, 84.305 kg, and 162.255 cm respectively.

Women in Cluster 2 had the highest factor score for the Bust Drop Factor and the lowest factor score for the Hip Drop Factor. The mean of bust girth minus waist girth showed the largest mean score among four clusters. The mean of the hip girth minus bust girth showed the smallest mean score among four clusters. The results indicate that women in this cluster have a larger upper body

than lower body. Additionally, these women had a mean BMI of 27.50 for the overweight range and the second lowest factor score for the Girth Factor. Therefore, the body shape type of Cluster 2 was named as Overweight Y-Shape. The mean measurement of bust girth, waist girth, hip girth, weight, and height of women in Cluster 2 were 109.804 cm, 91.567 cm, 107.467 cm, 73.940 kg, and 164.109 cm respectively.

Women in Cluster 3 had the lowest factor scores for the Bust Drop Factor and lowest factor scores for the Hip Drop Factor. This cluster also indicated the highest factor score in Height Factor and the highest factor score in the Lower Body Proportion Factor. The mean of hip girth minus waist girth showed the smallest mean

score among the four clusters. The results indicate that bust and hip size are similar to each other and their waist is least defined, which made the body look H-Shape. Additionally, these women had a mean BMI of 34.41 in the obese range and the highest factor score for the Girth Factor. More specifically, a one-way ANOVA and Duncan's post-hoc test showed that most mean measurements for the Girth Factor, such as bust girth, weight, waist girth, hip girth, back shoulder width (contoured), upper arm girth, back shoulder width, side neck to bust point distance, bust point distance, neck base girth, and across back width, were the largest in Cluster 3, which indicated that these women have large body sizes. Therefore, the body shape type of Cluster 3 was named Obese H-Shape. The mean measurement of bust girth, waist girth, hip girth, weight, and height of women in Cluster 3 were 119.253 cm, 107.975 cm, 121.564 cm, 92.193 kg, and 163.627 cm respectively.

Women in Cluster 4 had the moderate factor scores in Bust Drop Factor and Hip Drop Factor. The mean of hip girth minus waist girth showed the second largest mean score among four clusters. The results indicate that their bust and hip size are similar to each other and their waist is defined, which makes the body looking like S-Shape. Additionally, these women had a mean BMI of 22.83 in the normal range and had the lowest factor score in Girth Factor. More specifically, one-way ANOVA and Duncan's post-hoc test showed that all of the mean measurements in Girth Factor were the smallest in Cluster 4, which indicate that these women have small body sizes. Therefore, the body shape type of Cluster 3 was named as Normal S-Shape. This cluster was the largest cluster among all 4 clusters, which indicate that Normal S-Shape is the most common body shape type among the US women 26 to 45 years of age. The mean measurement of bust girth, waist girth, hip girth, weight, and height of women in Cluster 4 were 94.310 cm, 80.162 cm, 99.695 cm, 59.647 kg, and 161.696 cm respectively.

### Relationships between Age Groups and Body Shape Classification

Chi-square statistics examined the relationships between two age groups and four clusters (Table 4). Significant differences existed between the age groups ( $\chi^2=30.54^{**}$ ,  $p<.01$ ). In Obese A-Shape cluster, Overweight Y-Shape cluster, and Obese H-Shape cluster, the percentages of the 36 to 45 years of age group were 51.82% ( $n=328$ ), 53.25% ( $n=344$ ), and 53.50% ( $n=214$ ) respectively and the percentages of the 26 to 35 years of age group were 48.18% ( $n=305$ ), 46.75% ( $n=302$ ), and 46.50% ( $n=186$ ) respectively. In the Normal S-Shape cluster, the percentage of the 26 to 35 years of age group was 57.44% ( $n=730$ ) and the percentage of the 36 to 45 years of age group was 42.56% ( $n=541$ ). In summary, in Obese A-Shape cluster, Overweight Y-Shape cluster, and Obese H-Shape cluster, the percentage of the 36 to 45 years of age group was higher than the 26 to 35 years of age group. In the Normal S-Shape cluster, the percentage of the 26 to 35 years of age group was higher than the 36 to 45 years of age group.

### Differences in Anthropometric Data between the Age Groups

To investigate the body measurement differences between the two age groups, a *t*-test compared the means of each measurement (Table 5). Significant differences existed in the mean values of 17 of 26 measurements between the two age groups. The mean values of all of the measurements were significantly larger for the 36 to 45 years of age group than the 26 to 35 years of age group, except for thigh girth in Girth Factor including bust girth, weight, waist girth, hip girth, back shoulder width (contoured), upper arm girth, back shoulder width, side neck to bust point distance, bust point distance, knee girth, neck base girth, across back width, and across front width.

**Table 4.** Relationship between Age Groups and Body Shape Classification (N=2950) ( )=col.%

Age Group \ Cluster Group	C.1: Obese A-Shape n (%)	C.2: Overweight Y-Shape n (%)	C.3: Obese H-Shape n (%)	C.4: Normal S-Shape n (%)	Total
26-35	305 (48.18)	302 (46.75)	186 (46.50)	730 (57.44)	1523 (51.63)
36-45	328 (51.82)	344 (53.25)	214 (53.50)	541 (42.56)	1427 (48.37)
Total	633 (100.00)	646 (100.00)	400 (100.00)	1271 (100.00)	2950 (100.00)

$\chi^2=30.54^{**}$ ,  $df=3$

\*\* $p<.01$

**Table 5.** Measurement Differences between Age Groups (Measurement Unit: cm/kg)

Anthropometric Measurement		Age Group	26-35 (n=1523)	36-45 (n=1427)	t-Value
Girth Factor	Bust Girth		103.200	105.791	-5.26**
	Weight		71.218	73.831	-3.76**
	Waist Girth		88.240	90.907	-4.89**
	Hip Girth		107.696	109.677	-3.96**
	Back Shoulder Width (Contoured)		39.319	39.954	-5.10**
	Upper Arm Girth		30.785	31.852	-5.25**
	Back Shoulder Width		39.319	39.954	-5.104**
	Thigh Girth		63.221	63.551	-1.20
	Side Neck to Bust Point Distance		27.889	28.372	-4.37**
	Bust Point Distance		21.031	21.285	-2.94**
	Knee Girth		38.989	39.345	-2.49*
	Neck Base Girth		38.024	38.811	-6.29**
	Across Back Width		36.652	37.363	-5.23**
	Across Front Width		37.846	38.303	-2.48*
Height Factor	Bust Height		116.738	116.281	2.11*
	Crotch Height		72.796	72.238	3.21**
	Height		162.789	162.408	1.43
	Hip Height		82.906	82.779	0.76
	Waist Height		98.958	98.806	0.73
	Knee Height		44.272	44.069	1.75
	Arm Length		53.873	53.823	0.41
Hip Drop Factor	Hip Girth - Waist Girth		19.431	18.771	3.00**
	Hip Girth - Bust Girth		4.496	3.886	2.51*
Lower Body Proportion Factor	Waist Height/Height		.608	.608	-0.57
	Hip Height/Height		.509	.510	-0.44
Bust Drop Factor	Bust Girth - Waist Girth		14.935	14.884	0.31

\* $p < .05$ , \*\* $p < .01$ 

The mean values of bust height and crotch height in Height Factor were significantly larger for the 26 to 35 years of age group than the 36 to 45 years of age group. Mean drop values of hip girth minus waist girth and hip girth minus bust girth in Hip Drop Factor were significantly larger for the 26 to 35 years of age group than the 36 to 45 years of age group.

## Discussion and Conclusion

The current study investigated the anthropometric characteristics of US women 26 to 45 years of age and classified their body

shapes into different categories. Five factors accounted for US women body measurements: Factor 1 Girth Factor, Factor 2 Height Factor, Factor 3 Hip Drop Factor, Factor 4 Lower Body Proportion Factor, and Factor 5 Bust Drop Factor.

Cluster analysis revealed that the body shape of US women 26 to 45 years of age can be categorized into 4 types: Obese A-Shape, Overweight Y-Shape, Obese H-Shape, and Normal S-Shape. Normal S-Shape was the most common body shape type among US women 26 to 45 years of age. A similar number of women had Obese A-Shape and Overweight Y-Shape. The smallest number of women had Obese H-Shape. Each body shape type showed unique characteristics. Women in the Obese A-Shape had a larger lower

body than a upper body with BMI in the obese range. Women in the Overweight Y-Shape had a larger upper body than a lower body with a BMI in the overweight range. Women in the Obese H-Shape had a bust and hip size similar to each other with a less defined waist and a BMI in the obese range. Women in the Normal S-Shape had a bust and hip size similar to each other with a defined waist and a BMI in the normal range.

More women in the 26 to 35 years of age group than women in the 36 to 45 years of age group had a Normal S-Shape type. This suggests that younger US women 26 to 35 years of age had slimmer body sizes with more balanced body shapes than women 10 years older on average. More women in the 36 to 45 years of age group than women in the 26 to 35 years of age group were Obese A-Shape, Overweight Y-Shape, and Obese H-Shape; consequently, older US women 36 to 45 years of age had larger body sizes with more various body shapes than women 10 years younger on average.

Two groups were in the obese BMI range: Obese A-Shape and Obese H-Shape. Two obese groups represented 35.02% of all women and the result indicate that approximately one-third of US women 26 to 45 years of age are obese. Another cluster group with a heavy body weight was Overweight Y-Shape; these women had a mean BMI in the overweight range. This suggests that fat may be distributed in different body parts as women get older and gain weight, which results in a heavier upper body, heavier waist or heavier lower body. Therefore, younger US women 26 to 35 years of age had slimmer and more balanced body shapes; in addition, older US women 36 to 45 years of age had heavier and more varied body shapes.

A *t*-test indicated differences in anthropometric data between the 26 to 35 years of age group and the 36 to 45 years of age group. The findings showed that bust girth, waist girth, and hip girth which are the most critical girth measurements in sizing charts showed large measurement differences (1.981 cm to 2.667 cm differences) between the 26 to 35 years of age group and the 36 to 45 years of age group, and the weight difference between the two age groups was approximately 2.613 kg. The bust height was lower and the side neck to bust point distance was longer for the 36 to 45 years of age group than the 26 to 35 years of age group; consequently, it can be interpreted that the women's breasts begin

to droop due to age.

The findings of studies can serve as baseline information for foreign companies to develop apparel products that target the US apparel market. The study results suggest that developing products for S-Shape type in the normal weight range will provide an optimal garment fit for US female consumers of apparel brands 26-45 years of age. However, a recommendation is to provide several fit options for different body types such as A-Shape, Y-Shape, and H-Shape to better serve this market, especially for the 36 to 45 years of age group. Approximately one-third of the US women aged 26 to 45 years of age were obese in this study; therefore, developing garments with good fit for plus-size women has the potential to be successful in the US apparel industry. More anthropometric studies on plus-size women are recommended to understand this unique target market segment. The body classifications of this study were limited to front views only; therefore, adding classifications on profile views are recommended for a future study that provides a better understanding of the anthropometric characteristics of US women 26 to 45 years of age.

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