Detailed Fit Evaluations of Plus-size Women's Formal Jackets Sold by Online Retailers
- With an Emphasis on Comparison of Age Groups 20-39 and 40-59 -

Hee-Jung Ha[†]

Dept. of Clothing and Textiles, Sangmyung University

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Abstract

This is a follow-up study to "An Analysis of the Fitting of Plus-sized Women's Formal Jackets in On-line Shopping Malls", in which we compiled basic sizes of formal jackets sold in online retailers for plus-sized women and compared specific measurements of the jackets from each retailer. Emphasizing a comparison of age groups 20-39 and 40-59, fit evaluations and analyses were conducted in order to provide data to help manufacturers develop formal jacket patterns that reflect physical characteristics of plus-sized consumers and offer better physical fit. The surveys and evaluations were conducted between October 2007 and May 2008, and the compiled data were analyzed using the SPSS 17.0 statistics program. The results were summarized as follows. The two age groups gave different evaluations of the fit problems in the women's formal jackets sold in online retailers. Whereas the age group 20-39 felt that the main problems were in the shoulder, armscye, upper arm, waist, abdomen and hip areas, the age group 40-59 said that they found more problems in the armscye, upper arms, sleeve length and jacket length. Modifying the shoulder area, armscye depth and jacket length severely compromises the jacket's balance, and attention to these areas must be given during pattern design.

Key words : online retailers, plus-sized women, formal jacket, fit evaluations.

I. Preface

Apparel merchandises are experiential goods requiring much investigation when making a purchase. Contrary to the initial assessment of not being suitable for internet media during early stages of online shopping, it is established as the most popular entrepreneurial online item due to low item costs and high added value. Focused merchandises in large shopping malls changed the direction from appliances and computers to apparel/fashion related merchandises.[1] Available merchandises are becoming more varied starting from casual wear and sportswear, including formal wear, maternity clothes, underwear, fashion accessories and jewelries to big size clothes, tailored clothes and specialty clothes that are difficult to find offline.[2]

However, plus-sized consumers corresponding

[†] Corresponding author E-mail : hjha@smu.ac.kr

1) Eun-Jung Choi and Moon-Sook Kim, "The Comparative Study of Purchasing Characteristics of the Apparel Products Consumer using Internet Shopping Mall and the Cable TV Home Shopping," *The Research Journal of the Costume Culture* Vol.11 No.6 (2003), pp.808-825.

to obese physique are limited in the range of apparel options as ready-made clothes targeting unspecified mass are manufactured with standard physique as the baseline and they possess physical demerits due to significant body fat accumulation in upper arms, shoulder, bust, abdomen, hip and thigh areas and the body fat accumulation areas vary by age groups even among plus-sized consumers.[3] Especially in the online market environment where consumers must make purchases in situations without personally fitting or testing, because product measurements are provided and not physical measurements and shoulder width, sleeve lengths and such are not standardized,[4] fit satisfaction of plus-sized consumers of ready-made apparel products will be low due to size discrepancies if purchases are made based on size information provided by the companies[5] and this will be a customer dissatisfaction factor. Much more efforts need to be put into customer support in online retailers than offline shopping malls as the propagating effects are enormous in online retailers compared to offline retailers if customer dissatisfaction occurs.[6]

Satisfaction of ready-made clothes occurs from differences between actual product performance and expected product performance after the purchase. Satisfaction increases when the product performance excels the expected product performance and it connects to positive review of the product by the consumer. According to a research result on purchase decision factors of Korean women in purchasing ready-made clothes, fit is shown to be most important and it is stated that fit is the biggest determining factor in purchasing clothes in the case of formal wear as it received significantly higher score than other purchase decision factors such as endurance, color or design.[7]

H. Ha[8] stated that online retailers must adhere strictly to labeling according to the apparel product size standardization of "bust-hip-height" which shows the basic physical areas and steer away from the conventional symbolic sizes like formal adult women's jacket size system in order to assist consumers in selecting proper sizes and purchase decisions and increase the satisfaction of the selected product. In addition, it is stated that consumer complaints on size discrepancies or fit of products will decrease if waist, back waist length, biacromion length and arm length were provided as reference physical measurements in addition to the basic physical measurements as consumers can use them as basis for selecting clothes that fit their physique. However for the size labeling method currently provided in internet, few companies were using formal jacket size labeling method of "bust-hip-height" regulated in KS K 0051 and all companies were using symbolic sizes such as 88, 99, 100 and 110 or L, XL and XXL. Provided sleeve lengths were about 5 to 10cm longer than the suggested ranges in KS adult women's clothes size reference physical measurements[9] and unnecessarily long lengths result in

2) Eun-jin Lee and Byung-Sook Hong, "The Effect of Service Quality Estimation and Perceived Risk on Purchase Intention and Satisfaction of the Fashion Merchandise to Internet Shopping Malls," *Journal of the Korea Home Economics Association* Vol.44 No.5 (2006), pp.79-87.

3) Hee-Jung Ha, "An Analysis of the Sizing System of Plus-sized Women's Formal Jackets in On-line Shopping Malls," *The Research Journal of the Costume Culture* Vol.17 No.2 (2009), pp.203-215.

4) Ibid., pp.203-215.

5) Ibid., pp.203-215.

6) Seung-Il Choi, "A Study on Effects of Characteristics of Internet Shopping Mall on Customer Loyalty," *The Journal of the Korea Contents Association* Vol.5 No.4 (2005), pp.45-53.

7) Hye-Jung Seok and In-Suk Kim, "A Study on the Fit Preference Tendency for Ready-to-Wear by the Age and Obesity Level of Adult Women," *Journal of the Korea Home Economics Association* Vol.41 No.9 (2003), pp.17-29.

8) Hee-Jung Ha, op. cit., (2009), pp.203-215.

9) Ibid., pp.203-215.

burdening the consumers with the financial cost of alteration. It is urgent to investigate details of ready-made clothes product sizes and identify specific dissatisfactions on fit in wearers'point of view to reflect on pattern development in order to fundamentally resolve plus-sized consumers' dissatisfactions on the fit of products from online retailers as seen above.

Therefore as a follow-up research to "An Analysis of the Sizing System of Plus-sized Women's Formal Jackets in On-line Shopping Malls"[10], this study will compare detailed measurements of size 88 formal jacket products sold in online retailers targeting plus-sized women and conduct detailed fit evaluations by physical areas on products from each company in wearers' point of view by selecting as subjects age groups of 20's and 30's which show relatively higher internet purchase experience percentage and age groups of 40's and 50's which can be lured into becoming new internet customers by guaranteeing safe transactions and services after purchase as they have strong buying power but are very cautious.[11] In addition, the goal is to provide data to assist in development of formal jacket patterns with excellent physical fitness that reflect physical characteristics of plus-sized female consumers by analyzing and investigating the detailed fit by physical areas and functional evaluation by motions focused on the comparison between the age groups.

II. Research Method and Procedure

1. Subject Selection

In order to compare and evaluate detailed fit of formal jacket products sold in online retailers, following criteria were required for the subjects. Rohrer index is 1.5 or higher and the bust sizes are 90cm or above and below 100cm as size 88 formal jacket products provide the bust size of 100cm[12]. Female subjects in 20's and 30's age group have drop (difference between hip and bust) distribution of 3cm to 21cm corresponding to N physique and A physique according to the KS K 0051 physique categorization table and female subjects in 40's and 50's age group have drop distribution of −14cm to 3cm corresponding to H physique according to the KS K 0051 physique categorization table in order to represent plus-sized consumers by age and physique. Twelve females in 20's and 30's and twelve females in 40's and 50's, total twenty four subjects that satisfy all of the criteria were convenience sampled. ⟨Table 1⟩ shows the mean physical measurements of the subjects.

2. Selection of Formal Jacket Products for Experiment

For formal jacket products for investigation of detailed contents of ready-made clothes sizes and to identify specific issues on detailed fit in wearers' point of view,[13-15] general brand one-button formal jackets under 100 thousand KRW price range[16], with princess line, tailored collar and jacket length of 20-30cm below waist line in a same design category[17] in black wool-blend material[18] were selected. Size 88 which is the basic size products from seven companies analyzed

10) Ibid., pp.203-215.

11) Kyung-a Choi and Yangjin Jeon, "Consumer Satisfaction and Intention to Revisit Internet Shopping Sites-Total Shopping Site vs. Fashion Specialty Site-," *Journal of the Korean Society of Clothing and Textiles* Vol.31 No.2 (2007), pp.300-307.

12) Hee-Jung Ha, op. cit., (2009), pp.203-215.

13) Seon-Sook Kim, "The Research about Successful Apparel Products in Internet Shopping-mall: Focusing on F/W Products," *Journal of the Korean Society of Clothing and Textiles* Vol.29 No.9/10 (2005), pp.1349-1358.

14) Dong-Lim Chung and Aea-Rin Kim, "Jacket Pattern for Plus-sized Women and Visual Effects of Area Division," *Proceedings of the Korea Society of Costume Conference* (2003), p.34.

15) Myung-Ok Kim and Mi-A Suh, "A Survey on the Ease of Jacket and Lining Fabrics that made of Stretchable Fabrics," *The Research Journal of the Costume Culture* Vol.15 No.2 (2007), pp.265-275.

16) Seon-Sook Kim, op. cit., (2005), pp.1349-1358.

⟨**Table 1**⟩ Mean Physical Measurements of the Subjects   (Unit: cm)

Category	Detailed Category	20's and 30's (n=12)		40's and 50's (n=12)		Total (n=24)	
		Mean	S.D.	Mean	S.D.	Mean	S.D.
Height	Stature	160.467	4.848	156.658	3.255	158.563	4.482
Width	Bust Breadth	29.001	1.449	28.717	0.741	28.862	1.135
	Waist Breadth	27.175	1.950	27.925	1.288	27.550	1.661
	Hip Width	35.625	1.513	33.775	0.645	34.700	1.479
	Thigh Breadth	16.433	0.866	15.803	0.755	16.121	0.856
	Front Interscye Length	32.917	1.026	33.017	0.634	32.967	0.835
	Back Interscye Length	35.592	0.834	34.992	0.897	35.292	0.901
	Bust Point-bust Point	19.925	1.430	18.425	0.533	19.175	1.304
Thickness	Bust Depth	25.192	1.488	24.925	1.050	25.058	1.267
	Waist Depth	19.808	1.726	21.292	1.373	20.550	1.703
	Abdomen Depth	23.783	1.380	25.342	1.257	24.563	1.517
	Hip Depth	24.842	2.109	23.175	1.278	24.008	1.906
	Thigh Depth	20.125	1.059	17.067	1.407	18.596	1.981
Circumference	Bust Circumference	98.625	2.861	97.125	1.530	97.875	2.371
	Waist Circumference	81.250	2.291	82.333	1.203	81.791	1.873
	Abdomen Circumference	93.908	3.837	97.383	1.981	95.645	3.474
	Hip Circumference	103.325	2.974	97.725	1.925	100.525	3.766
	Thigh Circumference	64.625	1.823	57.342	2.301	60.983	4.238
	Upper Arm Circumference	31.942	0.765	30.442	0.815	31.192	1.088
	Sleeve Circumference	16.842	0.438	17.108	0.281	16.975	0.385
Length	Biacromion Length	40.225	0.554	39.433	0.854	39.829	0.812
	Waist Back Length	39.708	0.448	39.083	2.269	39.396	1.631
	Cervical To Breast Point Length	53.842	0.533	53.242	0.955	53.542	0.816
	Cervical To Breast Point Length	37.375	0.496	37.258	1.166	37.317	0.878
	Arm Length	54.483	1.897	52.883	1.383	53.683	1.817
Others	Weight(Kg)	68.958	4.585	62.125	2.090	65.541	4.932
	Rohrer Index	1.669	0.154	1.603	0.083	1.636	0.126

in the research by H. Ha[19] which satisfied all of the criteria were selected, evaluated and analyzed.

3. Fit Evaluation Method and Data Analysis
Fit evaluation was conducted by dressing the subjects with products from seven companies in a random order. Each subject was asked to evaluate twenty-two categories related to detailed fit such as neck, shoulder, bust, waist, hip and arm areas and eight categories related to motion fitness within

17) Dong-Lim Chung and Aca-Rin Kim, op. cit., (2003), p.34.
18) Myung-Ok Kim and Mi-A Suh, op. cit., (2007), pp.265-275.
19) Hee-Jung Ha, op. cit., (2009), pp.203-215.

the recognizable range of the subjects corresponding to consumers, after showing them their dressed condition in a full-body mirror. After referring to prior researches[20-25], the categories were selected after pre-experiment discussions and three preliminary experiments to achieve objective evaluation. The detailed contents are shown In ⟨Table 2⟩ and ⟨Table 3⟩.

Likert type 7 point scale was used for the evaluation method for the fit evaluation categories. Except for the "overall appearance" category, each category was evaluated from 1 point for "very small (very short, very narrow, very low, very inside, etc)" to 7 points for "very large (very long, very wide, very high, very outside, etc)" according to the degree of detailed fit with 4 point for "proper"as the standard for all categories in order to identify sources of dissatisfaction on detailed fit and their degrees. The overall appearance category was evaluated from 1 point for "very bad" to 7 points for "very good" with 4 points for "average" as the standard.

Evaluation method for motion fitness categories was Likert type 7 point scale for each category with 4 points for "average" as the standard according the degree of discomfort and comfort and 1 point for "very uncomfortable", 2 points for "uncomfortable", 3 points for "slightly uncomfortable", 4 point for "average", 5 points for "slightly comfortable", 6 points for "comfortable" and 7 points for "very comfortable."

Research and fit evaluation were conducted from October 2007 to May 2009 and the collected data were analyzed with SPSS 17.0 statistical program. Group mean analyses were conducted for analyses of specific evaluations of detailed fit and motion fitness evaluation of the collected data. Independent sample T-test was

⟨Table 2⟩ Evaluation Categories for Detailed Fit Condition of Formal Jacket Products

Category	No.	Sub-Category
Neck	1	Side Neck Cut Amount
	2	Back Neck Pull
Shoulder	3	Shoulder Width
	4	Shoulder Slope
Armhole	5	Armhole Depth
Bust	6	Bust Circumference Ease (Front)
	7	Bust Circumference Ease (Back)
Waist	8	Waist Circumference Ease (Front)
	9	Waist Circumference Ease (Back)
Abdomen	10	Abdominal Circumference Ease
Hip	11	Hip Circumference Ease (Front)
	12	Hip Circumference Ease (Back)
Sleeve	13	Upper Arm Ease
	14	Sleeve Length
Jacket Length	15	Jacket Length (Front)
	16	Jacket Length (Back)
Line in Detail	17	Fastening Button Placement
	18	Collar Width
	19	Lapel Width
	20	Lapel Length
	21	Princess Line Placement (Front)
Overall	22	Overall Appearance

20) In-Mi Kim and So-Ra Kim, "A Study of Ready-Made Clothes (RMC) of Women in their Early Twenties: their Body Posture and RMC Fitting," *Korean Journal of Human Ecology* Vol.18 No.2 (2009), pp.451-463.

21) Hye-Jung Seok and In-Suk Kim, op. cit., (2003), pp.17-29.

22) Boo-Hyun Sohn, Kyung-Hi Hong, and Se-Jin Park, "The Analysis of Manufactured Jacket Pattern for Obese Women in Their Middle Age," *Korean Journal of Human Ecology* Vol.14 No.3 (2005), pp.475-483.

23) Jeong-Yim Lee and So-Young Joo, "Size Analysis of Ready-made Clothing for Elderly Women and Fit Evaluation according to Their Body Type," *Journal of the Korean Society of Clothing and Textiles* Vol.29 No.8 (2005), pp.1092-1101.

24) Mee-Sung Choi, "A Study on the Sensory Evaluation of Appearance and Fit for Basic Apparel Patterns," *Journal of the Korean Society of Clothing and Textiles* Vol.26 No.11 (2002), pp.1627-1637.

25) Hwa-Yeon Jeong and Mi-A Suh, "A Study on the Fit of Ready-to-Wear Garment for Girls at the Age of Puberty," *The International Journal of Costume Culture* Vol.9 No.1 (2006), pp.39-51.

〈Table 3〉 Motion Fitness Evaluation Categories for Formal Jacket Products

No.	Contents of Evaluation Categories
1	Upright standing posture
2	Posture with upper limbs moving back and forth while walking
3	Both arms 90° up frontward posture
4	Both arms 90° up sideways posture
5	Posture with right arm raised as much as possible
6	Both arms crossed in front posture
7	Bent forward 90° standing up posture
8	Sitting on chair 90° posture

conducted to compare and analyze differences between the age groups of 20's to 30's and 40's to 50's.

Ⅲ. Research Results

1. Detailed Measurement Comparisons by Retailers of Size 88 Women's Formal Jacket Products from Online Retailers

Detailed measurements by areas were conducted on the products by retailers in order to identify sources of plus-sized consumers' dissatisfactions on formal jackets and to design patterns reflecting physiques of plus-sized consumers. The results are shown in 〈Table 4〉.

Detailed measurements of size 88 formal jacket products show that for back neckline, only companies I and Q were below 10cm and the other five companies showed 10cm or above. For shoulder width, only company N was 42cm and the other six companies were 38cm to 39cm. For shoulder length, two companies of I and N were in 12cm to 12.5cm range, company G 10.2 cm and the other four companies were in 11cm to 11.7cm range. For armhole depth (front), only

companies I and Q were below 19cm to 19.5cm and the other five companies were 20cm to 21 cm. For armhole depth (back), only companies G and Q were 23cm and the other five companies showed 22cm to 22.5cm. This coincides with the results of Sohn et al.[26] which states that conventional patterns that determine armhole depths by ratios to bust cause problems in obese physique with large bust when lifting arms as well as in appearance due to excessively large armhole circumference and require correction in 18.2cm to 20.9cm range.

For bust, only company Q had identical measurements for bust circumference (front) and bust circumference (back) and the other six companies showed 1cm to 5cm larger bust circumference (front) than bust circumference (back). All companies showed 1cm to 6cm larger waist circumference (front) than waist circumference (back). For hem line, only company Q had identical measurements for hem line (front) and hem line (back) and the other six companies showed 3.5cm to 10cm larger hem line (front) than hem line (back). The reason for larger measurements in front than back as such in most companies is thought to be that protruding areas due to frontal body fat deposit are considered and applied to the patterns. This coincides with Ha[27] whose research states that body fat deposits are concentrated on waist and abdomen area in plus-sized women as they age. It also coincides with Sohn[28] whose research states that problems occur in covering waist and abdomen area obesity when the hip circumference is selected as the width of the jacket lower end during drawing jacket pattern as increase in hip circumference is small compared to increases in waist and abdomen circumference in obese middle-aged women.

For sleeve circumference, only company G was 35cm and the other six companies were in 36cm

26) Boo-Hyun Sohn, Kyung-Hi Hong and Se-Jin Park, op. cit., (2005), pp.475-483.

27) Hee-Jung Ha and A-Rin Kim, "A Study on the Physical Characteristics of Plus-sized Women, by Age," *The Research Journal of the Costume Culture* Vol.11 No.1 (2003), pp.153-164.

28) Boo-Hyun Sohn and Kyung-Hi Hong, "Development of Clothing Size and Grading Increments Chart for Women in Middle Age," *Korean Journal of Human Ecology* Vol.14 No.1 (2005), pp.107-117.

⟨Table 4⟩ Comparison of Detailed Measurements of Products by Companies   (Unit: cm)

Detailed Measurement	Company	A	G	I	N	Q	R	S
Back Neckline		10.0	10.0	9.8	10.3	9.6	10.0	10.0
Shoulder Width/2 (Back neck point-Shoulder point)		19.5	19.0	19.0	21.0	19.0	19.0	19.0
Shoulder Length (Side neck point-Shoulder point)		11.7	10.2	12.0	12.5	11.3	11.5	11.0
Armhole Depth	Front	20.0	21.0	19.5	20.5	19.0	20.5	20.0
	Back	22.5	23.0	22.0	22.5	23.0	23.5	22.0
Armhole Circumference	Front	25.5	26.0	25.5	24.5	24.5	25.0	24.0
	Back	27.0	27.5	25.5	26.0	26.2	26.5	27.0
Chest Circumference	Front	49.5	51.5	50.0	52.0	49.0	50.5	51.0
		48.5	46.5	48.5	50.0	49.0	47.5	49.0
Waist Circumference	Front	45.0	49.0	46.0	47.5	47.0	46.5	48.0
	Back	44.0	43.0	44.0	44.0	44.5	43.0	44.5
Hip Circumference	Front	58.0	61.0	54.5	57.5	56.0	57.0	56.0
	Back	54.0	52.0	47.8	54.0	54.0	54.0	54.0
Hem Line	Front	58.0	62.0	56.0	62.0	55.0	57.5	57.5
	Back	54.0	52.0	49.0	56.0	55.0	54.0	54.0
Sleeve Circumference		37.2	35.0	37.0	36.0	37.0	36.0	36.4
Wrist Level		14.5	13.5	14.5	13.5	14.0	14.0	14.0
Sleeve Length	Outside	61.0	60.0	61.0	60.5	60.5	61.5	60.5
	Inside	45.0	42.0	44.5	45.0	43.5	45.0	44.0
Jacket Length	Front	63.0	67.0	66.0	67.0	69.5	63.5	64.0
	Back	59.0	60.5	62.5	63.0	65.0	59.5	59.0
Button Placement		39.5	35.0	40.0	39.0	39.5	39.3	40.8
Back Collar Width (Including Stand Portion)		8.0	6.5	7.5	8.0	8.0	8.0	8.0
Front Collar Width		7.0	7.5	8.5	7.0	7.5	8.5	7.0
Lapel Width		8.0	9.0	9.0	7.5	7.8	9.5	7.5
Lapel Length	fold line	34.0	31.5	34.0	35.5	34.0	33.0	34.0
	edge	32.0	29.5	31.5	33.0	31.5	31.5	31.5
Shoulder Point-Princess Line Distance	Front	12.0	17.2	12.5	10.8	11.0	12.5	12.0
	Back	12.0	11.7	11.0	11.2	13.2	12.5	12.0
Center Waist Point-Princess Line Distance	Front	13.5	15.5	13.2	14.0	13.5	13.5	14.0
	Back	13.5	12.0	11.7	13.3	13.2	13.2	13.5

Note 1. Bust size is measured at an arbitrary horizontal line under the armpit point of products.
    2. Waist size is measured at an arbitrary horizontal line 39cm below back neck point.
    3. Hip size is measured at an arbitrary horizontal line 59cm below back neck point.

to 37.2cm range. For wrist level/2, two companies of G and N were 13.5cm and the other five companies were in 14.0cm to 14.5cm range. For sleeve length, only company R was 61.5cm and the other six companies were 60cm to 61cm. For jacket length (front), only company Q was 69.5cm, company G, I and N 66cm to 67cm and the other three companies were 63cm to 64cm. Jacket length (front) was longer than jacket length (back) by 4cm to 6.5cm for all companies. It is thought to be due to each company reflecting front added hem with bust and abdomen protrusion in consideration differently in the pattern. For shoulder point-princess line distance (front), only company G was 17.7cm and the other companies were in 10.8cm to 12.5cm range. For center waist point-princess line distance (front), only company G was 15.5cm and the other six companies were in 13.2cm to 14cm range.

2. Comparison of Detailed Fit Evaluations of Plus-size Women's Formal Jackets by Age Group

Detailed fit evaluations of formal jackets by companies were conducted. It was analyzed with *T*-test whether differences appear between 20's to 30's age group and 40's to 50's age group and the result is shown in ⟨Table 5⟩. All categories except shoulder slope showed significant differences between the age groups in $p<0.05$ level and above.

Detailed view of the categories with significant differences show that 40's to 50's age group evaluated company N as 4.33 to 4.50, appropriate in side neck cut amount category and back neck pull category while 20's to 30's age group evaluated them as 5.25 to 5.33, slightly loose. In shoulder width category, 20's to 30's age group evaluated all companies except company N as 2.91 to 3.25, slightly narrow and 40's to 50's age group evaluated them as 4.16 to 4.91, appropriate to slightly wide. Plus-sized women in their 20's and 30's have obese but balanced

physique, showing larger shoulder width and hip width and the smallest waist width compared to other age groups[29] and this is thought to be the result of such physical characteristics of 20's and 30's not being reflected. In armhole depth category, 20's to 30's age group evaluated all companies except company G and S as 3.25 to 3.91, slightly tight and 40's to 50's age group evaluated all companies as 4.58 to 5.75, slightly sagging with slack. This coincides with the research result[30] stating that determining armhole depths by ratios to bust causes problems when lifting arms in middle-age obese physique with large bust as armhole circumference or armhole depth becomes excessively large.

In bust circumference ease (front) category, 20's to 30's age group evaluated three companies, G, N and S as 5.16 to 5.33, evaluating as having more ease than 40's to 50's age group which evaluated them as 4.16 to 4.50, appropriate. In waist circumference ease (front) category, 40's to 50's age group evaluated companies G and N as 4.08 to 4.16, appropriate while 20's to 30's age group evaluated them as 5.08 to 5.33, slightly large ease. In abdominal circumference ease category, 40's to 50's age group evaluated company R as 3.83, while 20's to 30's age group evaluated it as 4.91, evaluating as having more ease than 40's to 50's age group. In hip circumference ease (front) category, 20's to 30's age group evaluated company G as 5.41, having slightly large ease, while 40's to 50's age group evaluated it as 4.25, appropriate. It is thought that products are designed with only middle aged obese women in consideration whose waist and abdomen girth increase and body fat concentrates in frontal areas with aging[31] even though plus-sized women in their 20's and 30's have the lowest flattening quotient in waist, abdomen and hip area compare to other age groups.[32] In upper arm ease category, 20's to 30's age group evaluated all companies except company R as 2.83 to 3.75, evaluating

29) Hee-Jung Ha and A-Rin Kim, op. cit., (2003), pp.153-164.

30) Boo-Hyun Sohn, Kyung-Hi Hong and Se-Jin Park, op. cit., (2005), pp.475-483.

31) Boo-Hyun Sohn and Kyung-Hi Hong, op. cit., (2005), pp.107-117.

⟨Table 5⟩ Comparison of Detailed Fit Evaluations of Women's Formal Jacket Products by Age Group

Category	Company	20's and 30's	40's and 50's	t-value
Side Neck Cut Amount	A	4.41(0.66)	4.25(0.86)	0.528
	G	4.33(0.88)	4.16(0.57)	0.545
	I	3.75(0.86)	3.66(0.49)	0.290
	N	5.33(0.77)	4.50(0.79)	2.590*
	Q	3.83(0.57)	3.50(0.79)	1.173
	R	4.58(0.99)	4.00(0.73)	1.444
	S	4.16(0.71)	3.91(0.66)	0.883
Back Neck Pull	A	4.33(0.49)	3.91(0.90)	1.407
	G	4.25(0.75)	4.16(0.57)	0.304
	I	3.91(0.51)	3.58(0.51)	1.586
	N	5.25(0.62)	4.33(0.98)	2.727*
	Q	3.41(0.66)	3.25(0.75)	0.573
	R	4.50(0.67)	4.08(0.51)	1.915
	S	4.08(0.66)	4.00(0.60)	0.321
Shoulder Width	A	3.08(0.66)	4.50(0.52)	− 5.785***
	G	2.66(0.65)	4.16(0.57)	− 5.970***
	I	3.25(0.75)	4.91(0.90)	− 4.917***
	N	4.91(1.08)	5.16(0.71)	− 0.666
	Q	3.16(0.57)	4.33(0.49)	− 5.326***
	R	2.91(0.66)	4.75(1.05)	− 5.093***
	S	3.00(0.73)	4.66(0.88)	− 5.000***
Shoulder Slope	A	3.91(0.90)	4.08(0.66)	− 0.515
	G	4.41(0.99)	4.00(0.73)	1.164
	I	3.83(0.57)	3.83(0.93)	0.000
	N	4.00(0.60)	4.25(0.62)	− 1.000
	Q	4.25(0.62)	4.08(0.51)	− 0.980
	R	3.83(0.71)	4.33(0.49)	− 0.364
	S	4.08(0.66)	3.75(0.62)	1.265
Armhole Depth	A	3.66(0.49)	5.16(0.57)	− 6.848***
	G	4.25(0.75)	5.75(0.86)	− 4.526***
	I	3.25(0.62)	4.58(0.79)	− 4.584***
	N	3.41(0.66)	5.41(0.51)	− 8.210***
	Q	3.50(0.79)	5.08(0.99)	− 4.298***
	R	3.91(0.79)	5.66(0.65)	− 5.805***
	S	4.16(0.83)	5.25(0.85)	0.732**

32) Hee-Jung Ha and A-Rin Kim, op. cit., (2003), pp.153-164.

⟨**Table 5**⟩ Continued

Category	Company	20's and 30's	40's and 50's	*t*-value
Bust Circumference Ease (Front)	A	3.08(0.90)	4.33(0.65)	− 3.897**
	G	5.25(0.75)	4.16(0.83)	3.336**
	I	3.91(0.79)	4.00(0.85)	− 0.248
	N	5.33(0.65)	4.50(0.52)	3.458**
	Q	3.50(0.79)	4.25(0.75)	− 2.367*
	R	3.91(0.66)	4.16(0.57)	− 1.265
	S	5.16(0.71)	4.41(0.51)	2.941**
Bust Circumference Ease(Back)	A	3.91(0.66)	4.25(0.86)	− 1.055
	G	3.66(0.88)	3.91(0.90)	− 0.685
	I	3.41(0.66)	4.00(0.73)	− 2.028
	N	4.91(0.99)	4.66(1.07)	0.591
	Q	3.66(0.65)	4.16(0.71)	− 1.787
	R	3.58(0.90)	3.83(1.02)	− 1.477
	S	4.16(0.57)	4.75(0.75)	− 2.128*
Waist Circumference Ease (Front)	A	3.91(0.66)	4.00(0.60)	− 0.321
	G	5.33(1.07)	4.08(0.51)	3.638**
	I	3.75(0.62)	3.66(0.77)	0.290
	N	5.08(0.66)	4.16(0.57)	3.595**
	Q	3.91(0.51)	4.41(0.66)	− 2.053
	R	3.66(0.65)	3.83(0.71)	− 0.928
	S	5.16(0.83)	4.58(0.66)	1.889
Waist Circumference Ease (Back)	A	3.66(0.88)	3.91(0.66)	− 0.779
	G	3.41(0.79)	3.58(0.79)	− 0.515
	I	4.16(0.57)	4.08(0.66)	0.327
	N	4.33(0.77)	3.91(0.51)	1.546
	Q	4.16(0.57)	4.00(0.73)	0.616
	R	4.91(0.79)	3.83(0.71)	2.783*
	S	3.75(0.62)	4.50(0.52)	− 3.200**
Abdominal Circumference Ease	A	3.66(0.88)	3.91(0.66)	− 0.364
	G	3.41(0.79)	3.58(0.79)	3.997
	I	4.16(0.57)	4.08(0.66)	0.000
	N	4.33(0.77)	3.91(0.51)	0.883
	Q	4.16(0.57)	4.00(0.73)	− 0.983
	R	4.91(0.79)	3.83(0.71)	2.275*
	S	3.75(0.62)	4.50(0.52)	0.528

⟨Table 5⟩ Continued

Category	Company	20's and 30's	40's and 50's	t-value
Hip Circumference Ease (Front)	A	4.41(0.90)	3.83(0.83)	1.646
	G	5.41(0.99)	4.25(0.62)	3.694**
	1	3.66(0.65)	4.16(0.38)	−2.283*
	N	4.33(0.75)	4.41(0.51)	−0.348
	Q	3.83(0.71)	3.50(0.67)	1.173
	R	4.16(0.57)	4.25(0.45)	−0.394
	S	3.75(0.62)	3.58(0.51)	0.715
Hip Circumference Ease (Back)	A	3.58(0.66)	3.91(0.66)	−1.221
	G	4.00(0.60)	3.33(0.65)	2.602*
	1	2.91(0.79)	4.08(0.51)	−4.274***
	N	3.75(0.62)	4.16(0.83)	−1.387
	Q	3.91(0.66)	4.33(0.65)	−1.546
	R	4.00(0.60)	4.08(0.66)	−0.616
	S	3.83(0.71)	4.41(0.66)	−2.060
Upper Arm Ease	A	3.50(0.79)	5.25(0.62)	−5.994***
	G	2.83(0.71)	4.41(0.51)	−6.209***
	1	3.58(0.79)	5.16(0.71)	−5.128***
	N	3.08(0.66)	4.91(0.66)	−6.717***
	Q	3.58(0.90)	5.25(0.75)	−4.917***
	R	4.08(0.79)	4.75(0.45)	−2.649*
	S	3.75(0.86)	5.58(0.79)	0.942***
Sleeve Length	A	4.33(0.77)	5.00(0.60)	−2.345*
	G	4.41(0.49)	5.08(0.66)	−2.443*
	1	4.66(0.49)	5.25(0.75)	−2.244*
	N	4.25(0.62)	5.41(0.51)	−5.007***
	Q	4.50(0.52)	5.08(0.79)	−2.128*
	R	4.25(0.45)	5.25(0.75)	−4.926***
	S	4.41(0.51)	5.16(0.83)	−2.649*
Jacket Length (Front)	A	3.16(0.83)	4.66(0.77)	−4.552***
	G	4.58(0.79)	5.33(0.77)	−2.338*
	1	4.00(0.60)	4.83(1.02)	−2.419*
	N	4.33(1.23)	5.75(0.45)	−3.742**
	Q	4.41(0.66)	5.33(0.65)	−3.402**
	R	3.58(1.37)	4.58(0.51)	−2.353*
	S	3.66(1.07)	4.33(0.65)	−1.840

⟨Table 5⟩ Continued

Category	Company	20's and 30's	40's and 50's	t-value
Jacket Length (Back)	A	3.25(0.86)	4.33(0.49)	−3.767**
	G	3.50(1.24)	4.41(0.51)	−2.360*
	I	3.00(0.85)	5.00(0.95)	−5.416***
	N	3.41(0.90)	5.16(0.71)	−5.265***
	Q	4.08(0.79)	5.66(0.49)	−5.876***
	R	3.16(0.93)	4.75(0.62)	−4.876***
	S	3.00(0.73)	4.83(0.71)	−6.167***
Fastening Button Placement	A	3.83(1.11)	4.00(0.73)	−0.432
	G	5.50(0.79)	5.08(0.66)	1.387
	I	5.41(0.51)	4.25(0.62)	5.007***
	N	5.08(0.66)	4.08(0.28)	4.757***
	Q	5.16(0.71)	4.41(0.79)	2.429*
	R	3.58(0.66)	4.50(0.52)	−3.743**
	S	3.91(0.90)	4.66(0.65)	−2.338*
Collar Width	A	3.58(0.90)	3.91(0.66)	−1.030
	G	3.41(0.90)	3.33(0.65)	0.260
	I	5.66(0.77)	4.25(0.62)	4.926***
	N	3.75(0.75)	4.41(0.51)	−2.530*
	Q	3.50(0.67)	4.25(0.62)	−2.833*
	R	4.91(0.79)	4.16(0.93)	2.580*
	S	3.83(0.71)	3.91(0.51)	−0.327
Lapel Width	A	4.16(0.57)	4.16(0.71)	0.000
	G	5.08(0.90)	3.66(0.77)	4.123***
	I	4.66(0.88)	4.00(0.60)	2.152*
	N	4.58(0.66)	3.91(0.66)	2.443*
	Q	4.25(0.75)	4.08(0.66)	0.573
	R	4.50(0.67)	4.66(0.77)	−0.856
	S	4.08(0.79)	3.91(0.66)	0.557
Lapel Length	A	4.58(0.79)	4.33(0.65)	0.844
	G	2.91(1.08)	3.91(0.99)	−2.353*
	I	3.50(0.52)	4.33(0.65)	3.458**
	N	3.58(0.66)	4.25(0.62)	−2.530*
	Q	3.25(0.62)	4.33(0.88)	−3.463**
	R	4.25(0.45)	4.58(0.79)	−0.290
	S	4.08(0.79)	4.41(0.66)	−1.113

⟨Table 5⟩ Continued

Category	Company	20's and 30's	40's and 50's	t-value
Princess Line Placement	A	5.16(0.57)	5.83(0.71)	−2.507*
	G	5.66(0.49)	6.08(0.66)	−1.738
	I	4.58(0.51)	4.91(0.79)	−1.221
	N	5.33(0.65)	5.08(0.79)	0.844
	Q	4.91(0.90)	5.75(0.75)	−2.458*
	R	5.08(0.90)	5.66(0.49)	−1.670
	S	5.25(0.62)	4.58(0.66)	2.530*
Overall Appearance	A	2.91(0.79)	3.16(0.83)	−0.752
	G	2.50(0.67)	4.75(0.62)	−8.500***
	I	3.16(0.83)	4.16(0.83)	−2.934**
	N	3.25(0.75)	3.16(0.83)	0.257
	Q	5.16(0.57)	4.58(1.08)	1.646
	R	3.58(0.79)	3.25(0.62)	0.844
	S	4.16(0.57)	3.41(0.90)	2.429*

*$p<0.05$, **$p<0.01$, ***$p<0.001$.

as having small ease while 40's to 50's age group evaluated them as 4.41 to 5.58, evaluating as having slightly large ease.

In sleeve length category, 40's to 50's age group evaluated all companies as 5.00 to 5.41, evaluating as being long compared to 20's to 30's age group which evaluated them as 4.25 to 4.66. In jacket length (front) category, 40's to 50's age group evaluated all companies except company S as 4.58 to 5.75, evaluating as being long compared to 20's to 30's age group which evaluated them as 3.16 to 4.58. This coincides with the study result[33] stating that more alterations of sleeve length are shown with older age and larger size and the study result[34] stating that middle aged obese women prefer short length jackets with 55cm length from back neck point to hem line area and 16cm below back waist line.

In fastening button placement category, 20's

to 30's age group evaluated companies I, N and Q as 5.08 to 5.41, evaluating as being higher than 40's to 50's age group which evaluated them as 4.08 to 4.41, appropriate. In collar width category, 20's to 30's age group evaluated companies I and R as 5.66 and 4.91, evaluating as being wider than 40's to 50's age group which evaluated them as 4.25 and 4.16, appropriate while evaluating companies N and Q as 3.75 and 3.50, as being narrower than 40's to 50's age group which evaluated them as 4.41 and 4.25, appropriate. In lapel width category, 20's to 30's age group evaluated companies G, I and N as 4.58 to 5.08, evaluating as being wider than 40's to 50's age group which evaluated them as 3.66 to 4.00. In lapel length category, 20's to 30's age group evaluated companies G, I, N and Q as 2.91 to 3.58, evaluating as being longer than 40's to 50's age group which evaluated them as 3.91 to 4.33, appropriate. In princess line place-

33) Hee-Chun Lee and Won-Ja Lee, "Ready-mades Size System and Consumer Satisfaction on Women's Jackets: For Women Aged between 20's and 30's," *Journal of the Korea Fashion and Costume Design Association* Vol.7 No.3 (2005), pp.27-38.

34) Boo-Hyun Sohn, Kyung-Hi Hong and Se-Jin Park, op. cit., (2005), pp.475-483.

ment category, 40's to 50's age group evaluated companies A and Q as 5.83 and 5.75, evaluating as being outside compared to 20's to 30's age group which evaluated them as 5.16 and 4.91. It is thought to be an issue to be considered in developing jacket patterns.

In overall appearance category, 20's to 30's age group evaluated companies G and I as 2.50 and 3.16, evaluating as having not as good appearance compared to 40's to 50's age group which evaluated them as 4.75 and 4.16. It is thought that the products from company G and I received low evaluations from 20's to 30's age group with low flattening quotientcompared to other age groups and relatively high evaluations from 40's to 50's age group which is abdominal obesity type with high flattening quotient as larger margins

are set up for waist circumference (front), hip circumference (front) and hem line (front) in their products compared to other companies to cover waist and abdominal area obesity.

3. Comparison of Motion Fitness Evaluations of Plus-size Women's Formal Jackets by Age Group

Motion fitness evaluations of formal jackets by companies were conducted. It was analyzed with T-test whether differences appear between 20's to 30's age group and 40's to 50's age group and the result is shown in ⟨Table 6⟩. All categories except upright standing posture showed significant differences between the age groups in $p<0.05$ level and above.

Detailed view of the categories with significant differences show that 20's to 30's age

⟨**Table 6**⟩ Motion Fitness Evaluations of Formal Jacket Products (by Age Group)

	Ages / Companies	20's and 30's	40's and 50's	t-value
Upright Standing Posture	A	5.25(0.62)	5.58(0.79)	-1.146
	G	6.25(0.75)	6.41(0.66)	-0.573
	I	6.08(0.79)	6.00(0.60)	0.290
	N	5.91(0.66)	6.25(0.62)	-1.265
	Q	5.83(0.83)	6.08(0.66)	-0.810
	R	5.66(0.88)	6.16(0.57)	-1.636
	S	5.75(0.75)	5.75(0.62)	0.00
Posture With Upper Limbs Moving Back and Forth	A	5.75(0.62)	5.91(0.51)	-0.715
	G	6.58(0.51)	6.00(0.60)	0.301*
	I	6.08(0.66)	5.58(0.90)	1.545
	N	6.25(0.75)	6.08(0.66)	0.573
	Q	6.16(0.71)	5.75(0.75)	1.387
	R	6.33(0.65)	6.25(0.45)	0.364
	S	6.25(0.62)	5.66(0.65)	2.244*
Both Arms 90° Up Frontward Posture	A	4.41(1.24)	4.25(0.62)	0.416
	G	5.50(0.79)	5.83(0.83)	-1.00
	I	4.66(0.98)	5.00(0.95)	-0.842
	N	4.91(0.67)	4.41(0.66)	1.832
	Q	4.75(1.05)	5.91(0.66)	-3.235**
	R	5.16(0.71)	5.25(1.21)	-0.205
	S	5.00(0.95)	4.91(0.66)	0.248

⟨**Table 6**⟩ Continued

Companies / Ages		20's and 30's	40's and 50's	*t*-value
Both Arms 90° Up Sideways Posture	A	6.00(0.60)	4.58(0.90)	4.529***
	G	6.33(0.65)	6.25(0.62)	0.321
	I	5.66(0.88)	6.08(0.66)	−1.299
	N	5.75(0.62)	5.33(0.88)	1.332
	Q	5.41(0.79)	5.50(0.67)	−0.277
	R	5.83(0.71)	5.83(0.71)	0.000
	S	5.91(0.90)	5.58(0.79)	0.962
Posture with Right Arm Raised	A	5.66(0.49)	4.58(1.37)	2.563*
	G	6.08(0.90)	5.25(1.28)	1.837
	I	5.41(1.08)	5.33(1.07)	0.189
	N	5.25(0.75)	4.91(1.44)	0.709
	Q	5.00(1.16)	5.66(0.65)	−2.345*
	R	5.08(0.66)	4.50(0.79)	1.941
	S	5.50(0.67)	5.58(0.51)	−0.340
Both Arms Crossed in Front Posture	A	4.00(0.60)	3.91(0.66)	0.321
	G	4.75(0.75)	5.75(0.62)	−3.546**
	I	4.58(0.99)	4.91(0.90)	−0.860
	N	3.91(0.66)	4.66(1.23)	−1.855
	Q	5.66(0.49)	5.83(0.71)	−0.663
	R	4.08(0.51)	5.41(0.90)	−4.453***
	S	4.83(1.26)	5.08(0.90)	−0.557
Bent Forward 90° Standing Up Posture	A	5.00(0.73)	4.66(1.15)	0.842
	G	5.33(0.65)	5.50(0.79)	0.440
	I	4.75(0.86)	5.16(0.93)	−1.131
	N	5.16(0.57)	4.58(1.16)	1.555
	Q	5.08(0.66)	5.75(0.45)	−2.861**
	R	4.83(0.57)	5.58(0.51)	−3.358**
	S	5.25(0.75)	5.41(0.79)	−0.528
Sitting On Chair 90° Posture	A	6.08(0.66)	4.91(0.90)	3.604**
	G	6.41(0.66)	6.83(0.57)	0.231*
	I	5.66(0.88)	5.33(0.88)	0.920
	N	5.83(1.02)	5.58(0.66)	0.705
	Q	6.00(0.73)	5.75(0.45)	1.00
	R	5.91(1.08)	5.00(0.95)	2.200*
	S	5.33(1.30)	5.08(0.79)	0.568

*$p<0.05$, **$p<0.01$, ***$p<0.001$.

group evaluated companies G and S as 6.58 and 6.25 in posture with upper limbs moving back and forth category, evaluating them as being more comfortable than 40's to 50's age group which evaluated them as 6.00 and 5.66. In both arms 90° up sideways posture category and posture with right arm raised category, 40's to 50's age group evaluated company A as 4.58, evaluating lower than 20's to 30's age group which evaluated them as 6.00 and 5.66. In detailed fit evaluation, 40's to 50's age group evaluated all companies as 4.58 to 5.75, slightly sagging with slack and this coincides with the study result[35] stating that issues may rise when lifting arms when armhole circumference or armhole depth is large.

In both arms 90° up frontward posture category, 20's to 30's age group evaluated company Q as 4.75, evaluating it lower than 40's to 50's age group which evaluated it as 5.91. In both arms crossed in front posture category, 20's to 30's age group evaluated companies G and R as 4.75 and 4.08, evaluating them lower than 40's to 50's age group which evaluated them as 5.75 and 5.41. It is thought to be the result from small armhole circumference or armhole depth as 20's to 30's age group evaluated all companies except G and S as 3.25 to 3.91, slightly tight in detailed fit evaluation.

In bent forward 90° standing up posture category, 20's to 30's age group evaluated companies Q and R as 5.08 and 4.83, evaluating them a little lower than 40's to 50's age group which evaluated them as 5.75 and 5.58. In sitting on chair 90° posture category, 40's to 50's age group evaluated companies A and R as 4.91 and 5.00, evaluating them lower than 20's to 30's age group which evaluated them as 6.08 and 5.91. It is thought to be the result of the pressure in abdomen area when abdominal obesity type with high flattening quotient sits down.

Ⅳ. Conclusion

The purpose of this study is to provide basic

data to assist in development of formal jacket patterns with excellent physical fitness that reflect physical characteristics of plus-sized consumers by comparing detailedmeasurements of size 88 formal jacket products sold by online retailers and analyzing and investigating the differences between the age groups in the wearers' point of view by conducting fit evaluations of the detailed fit of products from each company by physical areasusing as subjects age groups of 20's and 30's which show relatively higher internet purchase experience percentage and age groups of 40's and 50's which can be lured into becoming new internet customers by guaranteeing safe transactions and services after purchase as they have strong buying power but are very cautious.

Conclusions derived from the study results are as follows.

First, the results of detailed measurements of size 88 formal jackets showed that protruding areas in frontal body were considered as most companies configured larger sizes in front than back in bust, waist and hip areas and longer front added hem.

Second, all categories except shoulder slope showed significant differences between the age groups in comparisons by age groups of detailed fit evaluations of plus-sized women's formal jackets. By companies, 20's to 30's age group evaluated shoulder width, armhole depth and hip to be small and waist and abdomen circumference to be big while 40's to 50's age group evaluated shoulder width and armhole depth to be big and sleeve length and jacket length to be long. 20's to 30's age group with relatively low body flattening quotient than other age groups gave low evaluations and 40's to 50's age group which is abdominal obesity type with high flattening quotient gave relatively high evaluation to products with more margins configured in waist (front), hip (front) and hem line than other companies, including overall appearance category.

Third, motion fitness evaluations of formal jacket

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35) Ibid., pp.475-483.

products by companies were conducted and all categories except upright standing posture showed significant differences between the age groups. 20's to 30's age group gave lower evaluations than 40's to 50's age group in both arms 90° up frontward posture category and both arms crossed in front posture category. It is identified that this is related to the result of the detailed fit evaluations which states that arm hole depth is small.

As seen above, shoulder, armhole, bust, waist, hip, sleeve length and jacket length are areas where problems occur in fit in women's formal jackets sold in online retailers. These are areas where physique must be reflected when designing patterns. Especially, it is considered that pattern developments must be performed by differentiating the two plus-sized physiques as dissatisfaction categories are different between consumers in their 20's and 30's whose majority is lower body obesity and triangular obesity with developed hip area and thigh area and consumers in their 40's and 50's whose majority is abdominal obesity with protruding upper abdomen and lower abdomen and flat characteristic curve from waist to hip. It is expected that fit satisfaction of formal jacket products for plus-sized female consumers can be increased as differentiated pattern developments enable more physical characteristics to be reflected to the production.

The limitation of this study is that discretion needs to be taken in generalizing the study results as the jackets selected for the study were collected with size 88 as the standard and the subjects were convenience sampled, limited to women from their 20's to 50's who can wear size 88.

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