

A Study on the Visual Image According to Changes in Number of Pleats and Skirt Length of Pleats Skirt⁺

Kim, Kyung-Hee* · Lee, Jung-Soon

M.A., Dept. of Fashion Design, Sangmyung University*

Professor, Dept. of Fashion Design, Sangmyung University

Abstract

This study has the purposes to search the most visually effective and appropriate number of pleats and skirt length, when it's worn, with the changes in the number of pleats and skirt length that could be influential in analyzing the visual evaluation of pleats skirt and to analyze the changes when those factors are applied in real pattern. The stimuli were 18 samples: 6 variations of the number of pleats and 3 variations of the length of skirt. The data were obtained from 54 fashion design majors. The data were analyzed by Factor Analysis, Anova, Scheffe's Test and the MCA method. The results of the study were as follows: The visual image by the number of pleats and the length of skirt were composed of 4 factors : activity, attraction, neatness and commonness. In these factors, activity factor was estimated by the most important factor. The visual image according to the changes in the number of pleats and skirt length had significant differences, and the pleats skirts with 12 and 16 number of pleats and 38cm of skirt length were evaluated to be the most effective. The activity factor had interaction influence effect according to the number of pleats and the skirt length. The skirt length had more influence than the number of pleats in attraction and neatness factors, and the other way around for commonness factor.

Key Words : activity, attraction, neatness, commonness

1. Introduction

People feel the urge to express themselves and clothes could act importantly as the medium. In the current society, personal looks form naturally through completed clothes from

putting them on. Especially women clothes have become the biggest means to express their individual characteristics and beauty. The visual evaluation of clothes which is completed from putting them on may help the wearer look better or not with causing optical illusion of body figure

⁺This Paper is an excerpt from the master's thesis.

through body figure, clothes shapes and way of wearing it. The pleats skirt has the active functionality to help body movement smoothly with folding the fabric to make pleated skirt and the formative feeling of pleats itself could be the expression that heightens the visual effect directly connected to the decoration's function. Also, the pleats skirt has unique formative characteristics like direction effect from repetition of line and rhythm. The skirt which is one of the clothes that formative characteristics of pleats could be applied generally is the representative of lower clothes. It is the important item to form the silhouette which could be variously shaped by length, width, location of waistline, amount of decoration, and material¹⁾. As length of the skirt and silhouette especially are the elements that imply the social aspect with trend and social economic conditions, they are symbols of new trend and, at the same time, means to express the trend.²⁾

As we look at the previous studies about pleats, there are studies about formative characteristics of pleats from Shon Young Mi, Yi Su Hyun (2004)³⁾, Leigh Youkyung(1994)⁴⁾, Park Hye sang(2004)⁵⁾, Ko Kyung Nam(2006)⁶⁾ and about materials from Song Sang Hee(2005)⁷⁾ and about history of costume from Lee Eun Kyung(1991)⁸⁾ and about Kansei engineering according to the components of pleats skirt from Jeon Sang Jin(1998)⁹⁾. The study about visual evaluation of the pleats skirt was dealt partly in Jeon Sang Jin(1998)'s study, however, more detail study about visual evaluation according to the changes in pleats skirt was hardly done.

Hence, this study has the purposes to search the most visually effective and appropriate number of pleats and skirt length, when it's worn, with the changes in the number of pleats

and skirt length that could be influential in analyzing the visual evaluation of pleats skirt and to analyze the changes when those factors are applied in real pattern.

Therefore, this study is to consider the visual image according to the changes in skirt length with 3 steps and changes in number of pleats with 6 steps.

More details about purposes are as follows.

(1) Analyze the factors of visual image according to the changes in number of pleats and skirt length.

(2) Examine the differences in visual image according to the changes in number of pleats.

(3) Examine the differences in visual image according to the changes in skirt length.

(4) Recognize the interaction effects of visual image according to the changes in number of pleats and skirt length.

II Methodology

1. Selection and Making Stimuli

In order to choose the number of pleats and skirt length of the pleats skirt, we carried out the market research and interviewed the pattern company. The number of pleats was divided into 10 steps : 6, 8, 12, 16, 20, 24, 28, 32, 36 and 40. In the interview about the length of the skirt, the shortest skirt length was usually started at 33cm excluding the mini-skirt. Therefore, 33cm was set as the base length and we gave 5cm changes into 7 steps; 33cm, 38cm, 43cm, 48cm, 53cm, 58cm and 63cm.

In this study, stimuli were made by hand wrinkled form which could be manufactured by various width of pleats. With H-line skirt pattern¹⁰⁾, skirt patterns were made according to the number of pleats. The experiment clothes

were made by muslin. The basic experiments were compared by expert groups of 10, who currently give lectures to fashion design majoring college students about clothes construction, with a pair of adjectives of "same-different" in order to get the significant differences according to the changes in number of pleats and skirt length. As a result, 12, 16, 20, 28, 32 and 40 were chosen for the number of pleats and 6, 8, 24 and 36 were excluded. Also, 38cm, 48cm, and 58cm were selected for the skirt length. From the interview, 33cm of skirt was excluded because it is uncomfortable actively and visually on pleats skirt since it is too short. And 68cm of the longest skirt length was excluded because it is out of trend. Clothes stimuli used in the real experiment as the result from the basic experiment were 18 pleats skirt with 6 steps in number of pleats and 3 steps in skirt length.

2. Measurement Methods

This study selected 54 sophomore and junior Sangmyung University students who major in fashion design for May 1st to May 20th in 2008. Clothing stimuli were worn by upright posture manikin. In this study, stimuli were worn by manikin since manikin with upright posture conveys similar image to body figure. <Table 1> provides the measure of manikin we used. Clothing stimuli are shown in <Figure 1>. Upper garment of manikin was made by the same muslin with stimuli, using the basic bodice figure. 18 stimuli were worn by manikins and randomly provided to the evaluators. At this time, we used gray board on the background of stimuli to prevent the influence of color contrast between the color of stimuli and background. The distance between stimuli and evaluator was set to be 4m.

<Table 1> Size of manikin

unit : cm

Measurement Items	Size
Stature	163.2
Bust Circumference	83.3
Waist Circumference	65.0
Hip Circumference	90.0
Waist Back Length	38.5
Neck Point to Breast Point to Waistline	41.2
Waist to Hip Length	20.0

3. Standard of Evaluation

In order to select evaluation item to measure visual image according to the changes in number of pleats and skirt length, we provided stimuli to 30 fashion design experts and collected words that express the visual image with free thinking. Frequently used words were firstly collected and synonyms were excluded. We chose 19 pairs for visual image among the words collected from preparation experiment. As a result of testing suitability of chosen evaluation items, only 1 pair was thought to be inappropriate. Therefore, 18 pairs of adjectives were finally decided to be appropriate for this study. When provided to the evaluators, the stimuli were placed randomly and evaluated by 7-point likert type scale.

4. Data Analysis

Data we got from this study were analyzed statistically by using the SPSS 12.0. We analyzed the factors to figure out the factor formation of visual image according to the changes in number of pleats and skirt length. We operated ANOVA and Scheffé test to see

skirt length number of pleats	38Cm	48Cm	58Cm
12			
16			
20			

<Figure 1> Classification of clothing stimuli

skirt length number of pleats	38Cm	48Cm	58Cm
28			
32			
40			

<Figure 1> Classification of clothing stimuli (Continued)

differences of visual image based on the changes in number of pleats and skirt length. We operated two-way ANOVA and Multiple Comparison Analysis in order to check the influence of changes in number of pleats and skirt length about composition factor of visual image.

3. Standard of Evaluation

In order to select evaluation item to measure visual image according to the changes in number of pleats and skirt length, we provided stimuli to 30 fashion design experts and collected words that express the visual image with free thinking. Frequently used words were firstly collected and synonyms were excluded. We chose 19 pairs for visual image among the words collected from preparation experiment. As a result of testing suitability of chosen evaluation items, only 1 pair was thought to be inappropriate. Therefore, 18 pairs of adjectives were finally decided to be appropriate for this study. When provided to the evaluators, the stimuli were placed randomly and evaluated by 7-point likert type scale.

4. Data Analysis

Data we got from this study were analyzed statistically by using the SPSS 12.0. We analyzed the factors to figure out the factor formation of visual image according to the changes in number of pleats and skirt length. We operated ANOVA and Scheffé test to see differences of visual image based on the changes in number of pleats and skirt length. We operated two-way ANOVA and Multiple Comparison Analysis in order to check the influence of changes in number of pleats and skirt length about composition factor of visual image.

III. Result and Discussion

1. Components of Visual Image According to Changes in Number of Pleats and Skirt Length.

As a result of factor analysis to recognize the visual image according to the changes in number of pleats and skirt length, activity, attraction, neatness and commonness factors were chosen and the result is shown in <Table 2>.

In order to search the component factor of visual image according to the changes in number of pleats and skirt length, we carried out the factor analysis. For verify the reliability, we calculated Crombach's alpha value. Coefficient of reliability of factor 1 was 0.96, factor 2 was 0.88, factor 3 was 0.65, and factor 4 was 0.47. In <Table 2>, 4 factors were extracted by having more than 1 eigen value as a result of Varimax crossing rotation with main component analysis. Factor 1 was composed of heavy-light, mature-cute, looks older-looks younger, gentle-vivid, heavy-cool, formal-casual, classic-modern, inactive-active and was named as activity factor. Factor 2 was formed by not-wanting to buy-wanting to buy, not pretty-pretty, untrendy-trendy and was named as attraction factor.

Factor 3 was made up by not high class-high class, cheap-elegant, rustic-sophisticated, not neat-neat, sexy-pure and was named as neatness factor. Factor 4 was composed of complicated-simple, unusual-ordinary and was named as commonness factor. These 4 factors took 74% of whole variables and especially, activity factor had 35.5% of all and then 17.2% of attraction factor, 13.8% of neatness factor, and 7.6% of commonness factor.

<Table 2> Factor analysis of visual image according to changes in number of pleats and skirt length

Items	factor loading	factor loading	factor loading	factor loading
factor1 : activity				
heavy-light	<u>.892</u>	.207	-.133	-.034
mature-cute	<u>.875</u>	.280	-.136	-.014
looking older-looking younger	<u>.870</u>	.291	-.134	.028
gentle-vivid	<u>.852</u>	.174	-.234	-.074
stifling-cool	<u>.765</u>	.436	-.016	-.009
formal-casual	<u>.756</u>	.197	-.285	.100
classic-modern	<u>.739</u>	.371	-.069	-.073
inactive-active	<u>.732</u>	.238	-.069	.076
factor2 : attraction				
unwanting-to-buy – wanting-to-buy	.289	<u>.844</u>	.159	.024
not pretty – pretty	.308	<u>.839</u>	.181	.019
untrendy-trendy	.348	<u>.778</u>	-.058	-.145
factor3 : neatness				
non high classed – high classed	-.141	.032	<u>.842</u>	-.058
cheap – elegant	-.252	.062	<u>.806</u>	.055
unfashionable-sharp	.432	.423	<u>.560</u>	-.071
loose-neat	-.490	-.004	<u>.513</u>	.284
sexy-pure	-.475	.034	<u>.508</u>	.270
factor4: commonness				
complicated-simple	.154	.055	-.024	<u>.872</u>
extraordinary-ordinary	.200	.477	-.201	<u>.621</u>
explained variance	6.384	3.099	2.495	1.362
percent of explained variance	35.467	17.219	13.864	7.567

2. Visual Image According to Changes in Number of Pleats

<Table 3> shows the result from ANOVA and Scheffé tested for each factor to analyze visual image based on the number of pleats.

<Table 3> compares the visual image according to the changes in number of pleats in 6 steps and shows great differences in all factors except commonness factor in 16, 28, 32, and 40 number of pleats. And when the number

of pleats was 12 and 16, and 38cm of skirt length, the pleats skirt was the most active and attractive. As the skirt got longer, it seemed older and less attractive. However, it had more significant image effect in neatness factor and commonness factor. When the number of pleats was 20 and 38cm of skirt length, it was evaluated as more active and trendy visual image effect in attraction factor and activity factor. As the skirt got longer, the visual image was worsely evaluated. As a result of Scheffé

test, the neatness factor was evaluated to have similar visual image with 48cm and 58cm skirt length, and commonness factor was evaluated to have similar image with 38cm and 48cm of skirt length. When the number of pleats was 28 and skirt length was 38cm, the pleats skirt was highly evaluated in visual image in attraction factor and activity factor. And when the skirt length was 58cm, it looked older and untrendy. As a result of Scheffé test, 48cm and 58cm of skirt length had similar visual image. When the number of pleats was 32 and 40, the pleats skirt was shown to be more active and attractive as the skirt gets shorter in activity factor and attraction factor, and was evaluated to be the neatest in 58cm of skirt length. The visual image according to the changes in the number of pleats had 8.202 of F value, and it was evaluated well when the number of pleats was 12 and 16.

To sum up, according to the number of pleats, the activity factors for each skirt length had great differences in visual image. For all number of pleats, the shorter the skirt got, the more active and more attractive the skirt was looked. And as the skirt length got longer, it was thought to be less active and attractive. When the skirt was 58cm long, the pleats skirt couldn't make the average in the activity factor. The attraction factor had similar image for each skirt length according to the number of pleats, but 48cm and 58cm pleat skirt sometimes had similar image in attraction factor. Pleats skirt that had long length and large number of pleats was considered as a non-attractive skirt. when the number of pleats was 12, 16, 20 and the length was 58cm, the skirt looked neat and common. The total visual image of changes in the number of pleats was better when the number was small.

3. Visual Image According to Changes in Skirt Length

The result from ANOVA and Scheffé test for each factor in order to analyze visual image according to the changes in skirt length is shown in <Table 4>.

From comparing the visual image factors according to the changes in number of pleats for each 38cm, 48cm, and 58cm skirt length in <Table 4>, only 38cm of skirt length showed significant difference in commonness factor. 48cm skirt length showed great differences in all factors. 58cm skirt length had significant differences in activity factor and commonness factor. In all skirt length, as the number of pleats got smaller, the skirt was evaluated to be common and as the number of pleats got larger, it was thought to be not common. When the skirt length was 38cm, the pleats skirt showed great differences according to the changes in number of pleats only in commonness factor. When the number of pleats was 12, it was seemed to be most common and simple, and when the number was 40, it was evaluated to be unique and complicated. When the skirt length was 48cm and the number of pleats was 16, it had the most active image in activity factor, and when the number of pleats was 40, it had the most untidy image in neatness factor. Like 38cm of skirt length, 48cm of skirt length had ordinary and common image as the number of pleats got smaller. When the skirt length was 58cm, the pleats skirt looked gentle and older than other ones and had ordinary and common image. In commonness factor, it had the more common image as the number of pleats got smaller. The visual image according to the changes in skirt length had 8.858 of F value and 38cm of skirt length was highly evaluated.

<Table 3> Visual image according to changes in number of pleats

number of pleats	factor	skirt length			F-value	mean
		38cm	48cm	58cm		
12	activity	5.55 a	3.72 b	2.96 c	96.927***	4.37
	attraction	4.36 a	3.59 b	3.09 b	13.056***	
	neatness	3.81 b	4.65 a	4.90 a	33.440***	
	commonness	5.03 b	5.32 b/a	5.47 a	3.925*	
16	activity	5.63 a	4.65 b	3.29 c	72.843***	4.37
	attraction	4.09 a	3.98 b/a	3.31 c	4.503*	
	neatness	3.82 b	4.44 a	4.74 a	21.171***	
	commonness	4.64	5.02	4.78	2.159	
20	activity	5.53 a	4.13 b	2.74 c	150.831***	4.24
	attraction	4.42 a	3.60 b	2.94 c	30.443***	
	neatness	3.72 b	4.41 a	4.71 a	14.230***	
	commonness	4.57 b	4.19 b/a	5.17 a	4.969**	
28	activity	5.41 a	4.08 b	2.88 c	108.566***	4.10
	attraction	4.50 a	3.40 b	3.03 b	22.403***	
	neatness	3.91 b	4.44 a	4.66 a	15.370***	
	commonness	4.16	4.30	4.46	1.379	
32	activity	5.46 a	3.70 b	2.92 c	118.079***	4.01
	attraction	4.50 a	3.27 b	3.06 b	14.746***	
	neatness	3.89 b	4.39 a	4.61 a	12.439***	
	commonness	4.09	4.13	4.28	.457	
40	activity	5.65 a	4.22 b	2.72 c	157.473***	3.93
	attraction	4.23 a	3.18 b	2.88 b	15.737***	
	neatness	3.67 c	4.13 b	4.64 a	22.317***	
	commonness	3.75	3.89	4.22	2.391	
F value of visual image according to changes in number of pleats						8.202***

*p<.05, **p<.01, ***p<.001

abc: result of scheffé test

To sum up, as the skirt length was short, more vivid, active and casual image was shown, and as the skirt got longer, more gentle and formal look was expressed. When the skirt was short, there was no differences in activity image by number of pleats, but when the skirt was longer, differences in activity image was shown by number of pleats. And in all skirt lengths, the skirt looked more neat and common when the number of pleats was small. When the skirt length was middle, it had some different degree of neatness and sophistications according to the different number of pleats. Overall, the total visual image was better in shorter skirt.

4. Interaction of the Visual Image According to Changes in Number of Pleats and Skirt Length.

To check the mutual influence according to the changes in number of pleats and skirt length, we analyzed each factor by two-way ANOVA and Multiple Comparison Analysis. The main effect is shown in <Table 5>, and <Table 6>. As a result, the interaction effect showed significant differences in activity factor. The main effect showed significant differences in all factors excluding number of pleats in attraction factor. Activity, attraction, neatness and commonness

<Table 4> Visual image according to changes in skirt length

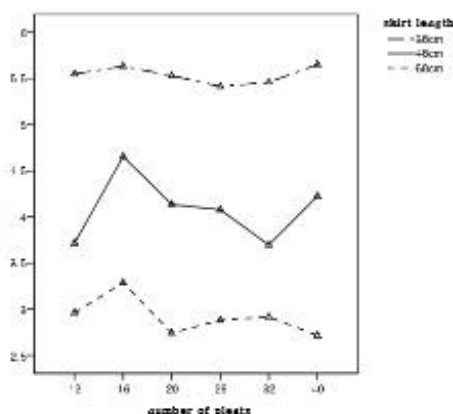
skirt length	factor	number of pleats						F-value	mean
		12	16	20	28	32	40		
38cm	activity	5.55	5.63	5.53	5.41	5.46	5.65	.582	4.51
	attraction	4.36	4.09	4.42	4.50	4.30	4.23	.558	
	neatness	3.81	3.82	3.72	3.91	3.89	3.67	.827	
	commonness	5.03 a	4.64 b/a	4.57 b/a	4.16 c/b	4.09 c/b	3.75 c	10.635***	
48cm	activity	3.72 b	4.65 a	4.13 b/a	4.08 b/a	3.70 b	4.22 b/a	7.957***	4.15
	attraction	3.59 b/a	3.98 a	3.60 b/a	3.40 b/a	3.27 b/a	3.18 b	3.133**	
	neatness	4.65 a	4.44 b/a	4.41 b/a	4.44 b/a	4.39 b/a	4.13 b	3.101**	
	commonness	5.32 a	5.02 a	4.91 b/a	4.30 c/b	4.13 c	3.80 c	19.024***	
58cm	activity	2.96 a	3.29 a	2.74 a	2.88 a	2.92 a	2.72 a	2.736*	3.85
	attraction	3.09	3.31	2.94	3.03	3.06	2.88	.752	
	neatness	4.09	4.70	4.71	4.66	4.61	4.64	.968	
	commonness	5.47 a	4.78 c/b	5.17 b/a	4.46 c	4.28 c	4.22 c	13.275***	
F value of visual image according to changes in skirt length									8.858* **

*p<0.5 **p<.01, ***p<.001
abc: result of scheffé test

<Table 5> Interaction effect of visual image according to changes in number of pleats and skirt length

variance	activity		attraction		neatness		commonness	
	sum of mean squares	F-value	sum of mean squares	F-value	sum of mean squares	F-value	sum of mean squares	F-value
number of pleats (A)	5.365	6.207***	2.632	1.492	1.646	2.874*	42.333	40.560***
skirt length (B)	576.304	666.824***	137.438	77.905***	71.364	124.648***	10.940	10.482***
Interaction (A×B)	2.293	2.653***	2.266	1.285	.495	.864	.838	.803

*p<.05, **p<.01, ***p<.001



<Figure 2> Interaction effect of number of pleats and skirt length on activity factor

factors showed significant differences in skirt length, and all the factors except attraction factor also showed significant differences in number of pleats as well. The interaction effect of number of pleats and skirt length change in activity factor is shown in <Figure 2>.

From <Figure 2>, the activity factor showed great differences according to the changes in skirt length. When the skirt length was 38cm, the pleats skirt didn't have any differences according to the number of pleats in activity image, but when the skirt length was 48cm, the

activity image was influenced a lot by number of pleats. When the skirt length was 48cm, the pleats skirt was mostly vivid and casual and active in 16 number of pleats and 40 number of pleats followed. 20 and 28 number of pleats, and 12 and 32 number of pleats had similar activity image. When the skirt length was 58cm, the activity images were different greatly as the number of pleats was small. However, when the number of pleats was large, image of activity factor was similar.

Because the interaction effect was not so significant in attraction, neatness, and commonness factors, the result from Multiple Comparison Analysis about the main effect is shown in <Table 6>. As a result of Multiple Comparison Analysis, when we looked at the sum of square of eta², skirt length had more influence on the visual image than the number of pleats in the neatness and attraction factor, and the other way around in the commonness factor.

The attraction factor was evaluated to be more attractive as the skirt got shorter, and evaluated to be less attractive as the skirt got longer. 12 to 28 number of pleats seemed to be more attractive than 32 or 40 number of pleats, in other words, too many number of pleats. The

<Table 6> Multiple Comparison Analysis of visual image according to changes in number of pleats and skirt length

variance	factor	attraction		neatness		commonness	
		mean	eta ²	mean	eta ²	mean	eta ²
number of pleats	12	3.697	.008	4.454	.014	5.275	.170
	16	3.797		4.333		4.812	
	20	3.654		4.281		4.884	
	28	3.643		4.335		4.306	
	32	3.546		4.299		4.168	
	40	3.430		4.148		3.952	
skirt length	38cm	4.319	.136	3.803	.202	4.373	.021
	48cm	3.503		4.411		4.594	
	58cm	3.053		4.710		4.731	
multiple R ²		.136		.119		.174	
multiple R		.369		.446		.417	

effectiveness seemed greatly different according to the skirt length and number of pleats in neatness factor, and longer skirt had more neat image than shorter one. As the number of pleats was smaller and skirt was longer, it had more common and ordinary image in commonness factor.

IV. Conclusion

This study analyzed the component factor and differences of visual image through 3 steps of changes in skirt length and 6 steps of changes in number of pleats in pleats skirt. As a result of factor analysis of visual image according to the changes in number of pleats and skirt length,

among 4 factors which were activity, attraction, neatness, and commonness factors, the activity factor was the most important of all. The activity factor had interaction influence effect according to the number of pleats and the skirt length. The skirt length had more influence than the number of pleats in attraction and neatness factors, and the other way around for commonness factor. When the skirt was 38cm, the number of pleats did not affect the activity image, however, when the skirt was 48cm, the number of pleats affected the image a lot. When the skirt was 58cm, the activity image had great differences according to the number of pleats when the number was small. However, when the number was large, the image of activity factor was similar. In attraction factor, the skirt got

shorter and smaller number of pleats, it looked more attractive and trendy and had the wanting-to-buy image. But when the skirt got longer and larger number of pleats, it was not attractive and people didn't want to buy it. In neatness and commonness factors, as the skirt got longer and smaller number of pleats, it looked more neat, formal, and ordinary. When the skirt got shorter and larger number of pleats, it didn't look decent, high-classed and common.

From the above result, the visual image was evaluated differently according to the number of pleats and skirt length of the pleats skirt and most people would like to wear clothes in more efficient way to cover the weakness and emphasize the strength of their body figure. The visual image of pleats skirt had big differences in efficiency of skirt length and number of pleats in each factor. Therefore, if we changed the component factor of the pleats skirt differently by the image that we would like to emphasize, we would get the appropriate visual evaluation.

There could be some limitations to apply this result because the visual evaluation could be changed by the body figure factor since stimuli were worn by the manikin and the evaluators were restricted by 20s who majored in fashion design.

Reference

- 1) Lee, Young-Ju (2007), " The Visual Evaluation by the Variation in the Location of the Belt of Skirt and Slacks Behavior", *Korean Journal of Human Ecology*, 16(5), p.1021
- 2) Lee, Kyung-Hee · Lee, Eun-Rung (2008), Fashion design plus idea, Kyomunsa, p.96
- 3) Shon, Young-Mi · Yi, Su-Hyun (2004), "A Study on the Fashion Design Applying Pleats Method -Focusing on the Deconstruction Fashion-", *Journal of the Korean Society of Costume*, 54(6), pp.153-168
- 4) Leigh, Youkyung (1994), "A Study on the Fashion Design Applied by the Formativeness of the Pleats", Ewha Womans University, Master's Thesis.
- 5) Park, Hyesang (2004), "A Study on the Pleats Design with the technique of Paper-Folding", Ewha Womans University, Master's Thesis.
- 6) Ko, Kyung Nam (2006), "A Design Study Applied by the Formativeness of the Pleats", Kook Min University, Master's Thesis.
- 7) Song, Sang-Hee (2005), "A Study on the Pleats Fabrics in Modern Costume-Mainly after 1960's- ", Hanyang University, Master's Thesis.
- 8) Lee, Eun-Kyung(1991), "Pleats Design Expressed in Costume", Sookmyung Women's University, Master's Thesis.
- 9) Jeon, Sang- Jin (1998), "A Virtual Engineering Study of the Factors Involved in Pleated Skirt Design ", Yeungnam University, Master's Thesis.
- 10) Na Mi Hyang, et al (2003), *Industrial Pattern Making -women's clothing-*, kyohakyongusa, p.20

Received September 22, 2009

Revised October 15, 2009

Accepted October 19, 2009