

A Basic Research on the Blouse Pattern of Middle-School Girls' Uniform⁺

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Abstract

This research attempts to analyze the physical characteristics of middle school girls and compare the product sizes and patterns of school uniform blouses by brand. And wearing tests were performed regarding the appearance of blouse by brand. The results are follows.

The standard deviation for bust circumference and waist circumference of middle school girls measured in 2004 were showed extremely large difference among individuals compared to the previous results. While waist back length reached adult size by 2nd grade high school, bishoulder length reached adult size by 2nd grade middle school. And girls after 2nd grade middle school had their depth and breadth of bust, underbust circumference and bust circumference growing proportionally. These results need to be reflected in producing a pattern drafting for middle schoolers.

By comparing wearing test results on appearance, it was shown that in terms of ease of bust circumference, the expert group evaluated brand with less ease as not having adequate ease compared to brand, while the middle schooler group evaluated as having sufficient ease. The front silhouette also showed same results. This reflects the preference for appearance by the middle schooler group, which is a factor to be considered during pattern drafting of school uniform blouse.

Key Words : middle school girls, physical characteristics, school uniform, blouse pattern, wearing test

II. Purpose of Study

Interests on clothing and appearance differ greatly from every individual as well as depending on age. Particularly, as adolescence is a period

where teenagers get increasingly inquisitive and place importance on their clothing and appearance, their outer look wearing school uniforms is becoming an essential factor in choosing uniform brands for middle and high schoolers¹⁾.

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According to preceding research on wearing school uniforms, middle and high schoolers place importance on the appearance of their school uniforms such as silhouette and fit. This trend may also be observed in TV advertisements on school uniforms that emphasize physical appearances such as long legs, small face and adequate body proportions²⁾.

Unlike other ready-to-wear clothing, school uniforms are worn continuously for 3 years. Therefore, not only design but also size fit is important in determining school uniform wearing appearance.

In order to improve the size fit of school uniforms, there is need for a reasonable manufacture of school uniforms that effectively cover the growth figures of middle and high schoolers. Especially, the growth pattern of middle school girls show unbalanced and rapid growths unlike elementary schoolers that show relatively balanced growth or high schoolers that nearly resemble adult's physical characteristics. For this reason, physical sizes of middle school girls show noticeable differences from every individual³⁾. Hence, to manufacture school uniforms for middle school girls with improved size fit, it is desirable to precisely identify the changes in physical size of each body part according to age, and based on these, set the size system required for manufacture of school uniforms⁴⁾.

However, as school uniform manufacturers are using size systems based upon each of their respective experience and knowhow, there is not only difference in size systems but even same size system have difference product measurements between manufacturers. Thus students are confused from choosing sizes that fit⁵⁾. Moreover, with the current school uniform size system being applied to middle and high

schoolers alike⁶⁾, the physical characteristics of middle schoolers are not being reflected.

Hence, this research attempts to analyze the physical characteristics of middle school girls and compare the product sizes and patterns of school uniform blouses by brand for application as basic data in designing patterns of school uniform blouses that reflect physical characteristics of middle school girls.

II. Methodology

1. Analysis on the Physical Characteristics of Middle School Girls

In order to analyze the physical characteristics of middle school girls, comparison were made on 6 measurements of height, weight, waist back length, bishoulder length, bust circumference, waist circumference and 2 index of bust flatness ratio (bust breadth/bust depth) and cup size (bust circumference - underbust circumference) targeting at girls from 1st grade elementary school (6 yrs) to 3rd grade high school (17 yrs). For research data, results of the National Physical Size Standard(2nd in 1986, 3rd in 1992, 4th in 1997, 5th in 2004) were used.

2. Comparison of School Uniform Blouse by Brand

In order to compare the product sizes and patterns of middle school girls' uniform blouse, the most common design being sold was selected, with the patterns of three brands of higher market share being compared. And comparative analysis was made on the uniform blouse(Size 85-155).

In this study, in order to compare blouse patterns of high school girls' uniform, the most

common design of high school girls' uniforms being sold was selected, with the patterns of three brands of higher market share being compared.

For product size comparison, 15 items were measured and for pattern comparison, one blouse from every brand was used in flattening patterns. Also, wearing tests were performed to analyze products with superior appearance, where the subjects were 2 middle schoolers with height of 155cm and bust circumference of 82cm. The testers were 8 majors of clothing & textiles and 6 middle schoolers who made evaluations on a 5 rating scale (5=being very good and 1=being very bad). As 2 brands of blouse had bust circumference product sizes smaller than that of 85cm, they were worn by subjects with bust circumference of 82cm.

By comparing product sizes and appearance wearing tests by brand, ANOVA and Duncan tests were performed.

The school uniform blouse used in research had hip line length that has 4-panel bodice basic pattern with armhole princess line inside with shirts collar and shirts sleeve design as in Fig. 1.



<Fig. 1> Blouse Design

III. Results and Discussion

1. Analysis on the Physical Characteristics of Middle School Girls

1) Changing Trend in Measured Height and Weight

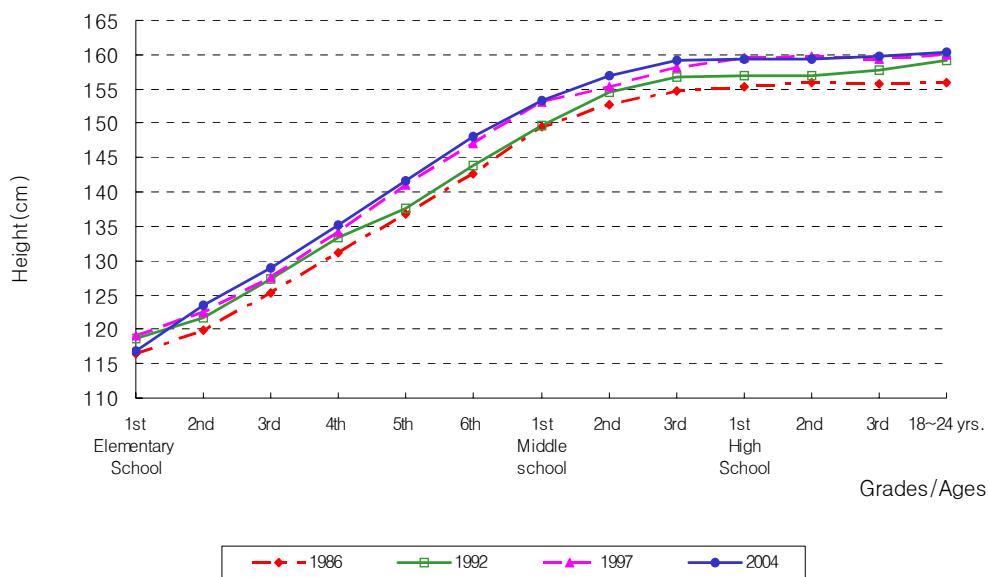
According to the average height measured in 2004, it grew the most during grades 3~6 of elementary school and nearly completed growth between 3rd grade of middle school and 1st grade of high school. Although growth trend was similar compared to previous data, the 2004 measured average height increased about 4cm compared to that in 1986 <Fig. 2>.

According to the average weight measured in 2004, it grew the most between 4th grade of elementary school and 1st grade of middle school and nearly completed growth between grades 1~2 of high school. Compared to previous data, it was shown to grow about 1 year faster as to 1986 and 1992, with the average weight measured in 2004 increasing 2kg compared to that in 1986 <Fig. 3>.

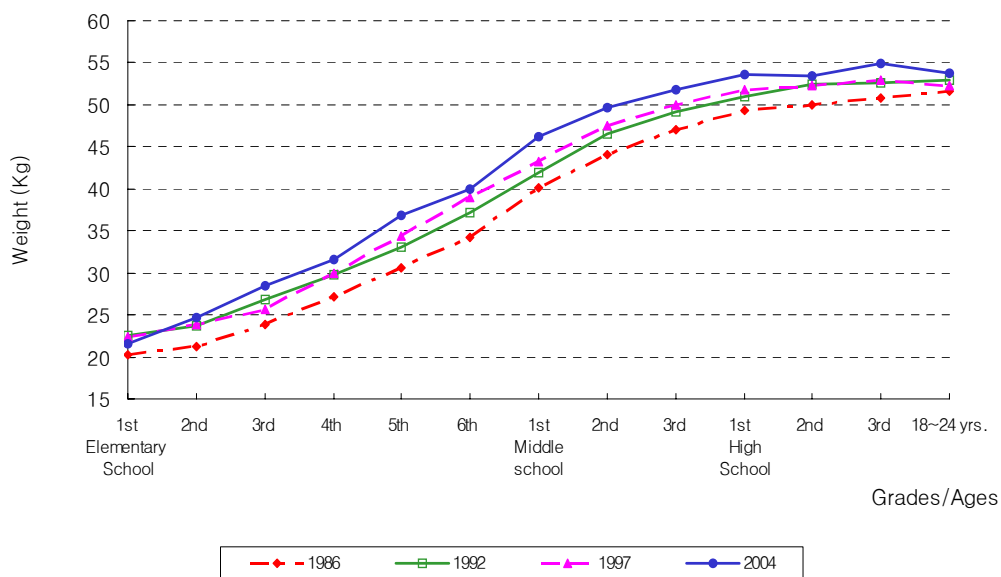
As such, unlike high school girls whose growth of height and weight are nearly completed, it can be learned that middle school girls are undergoing rapid growths.

2) Changes in Major Body Sizes for Pattern Drafting

Observation was made on the change in size of bust circumference, waist circumference, waist back length, bishoulder length that are the criteria for pattern drafting, and the change in sizes was also observed by calculating bust flatness ratio and cup size that becomes the criteria for setting bust dart. Their results are as follows.



<Fig. 2> Changing of Height by grades and ages



<Fig. 3> Changing of Weight by grades and ages

According to bust circumference average measured in 2004, it increased the most between 4th grade elementary school and 1st grade middle school with nearly completing growth by grades 1~2 of high school. Compared to previous data, it was shown to grow about a year faster than in 1986 and 1992, and the bust circumference average was reduced about 1.5cm in 1997, increasing again about 1.5cm in 2004 <Fig. 4>.

Waist circumference showed similar trend with bust circumference, increasing about 1.5cm in 2004 compared to previous measured data <Fig. 5>.

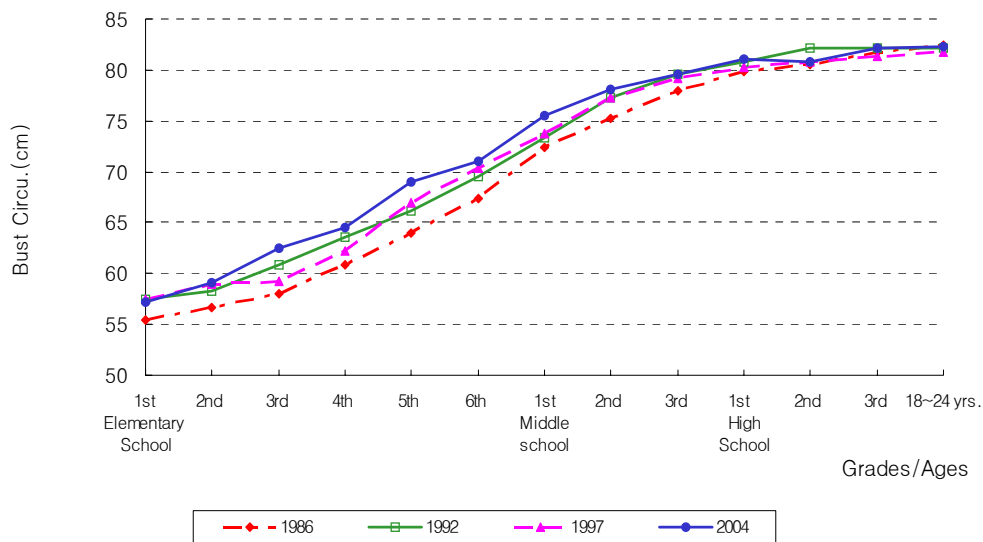
Also, the standard deviation for bust circumference and waist circumference of middle school girls measured in 2004 were 5.7~8.9cm, showing extremely large difference among individuals compared to the previous results <Tab. 1>. Therefore, these need to be reflected

in pattern making and size system during production of school uniform.

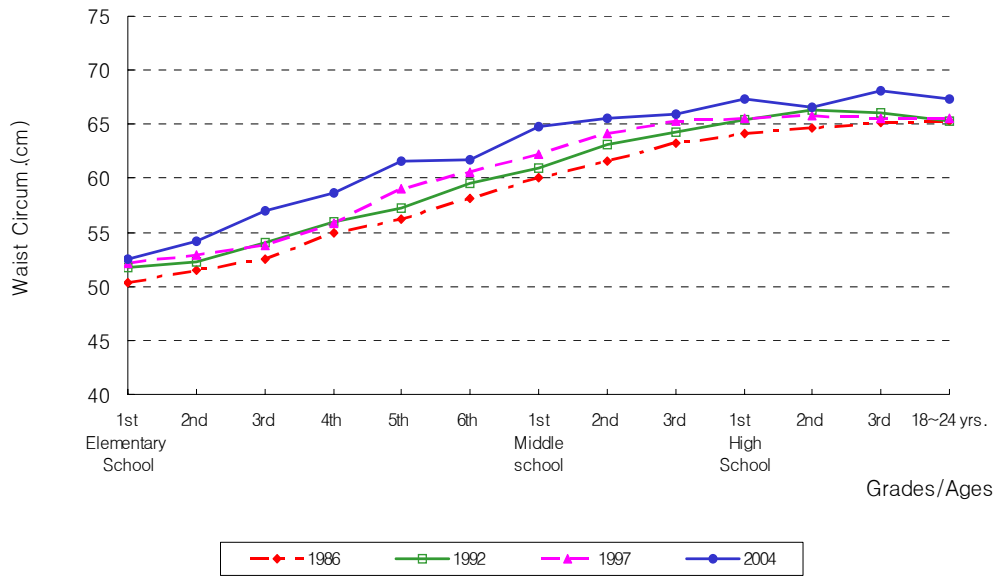
According to waist back length average measured in 2004, it increased the most between 3rd grade elementary school and 1st grade middle school, and nearly completed growth by grades 2~3 of high school. Compared to previous data, waist back length average was reduced in 1997 and increased again to 38.1cm in 2004.

According to bishoulder length average measured in 2004, growth continued starting from 1st grade elementary school and nearly completed growth by 3rd grade middle school. Although the trend was similar compared to 1997 data measuring bishoulder length, it increased 0.5cm to 39.6cm in 2004.

According to index (grade average/18~24 yrs average) by each grade level for waist back length and bishoulder length, the data measured



<Fig. 4> Changing of bust circum. by grades and ages



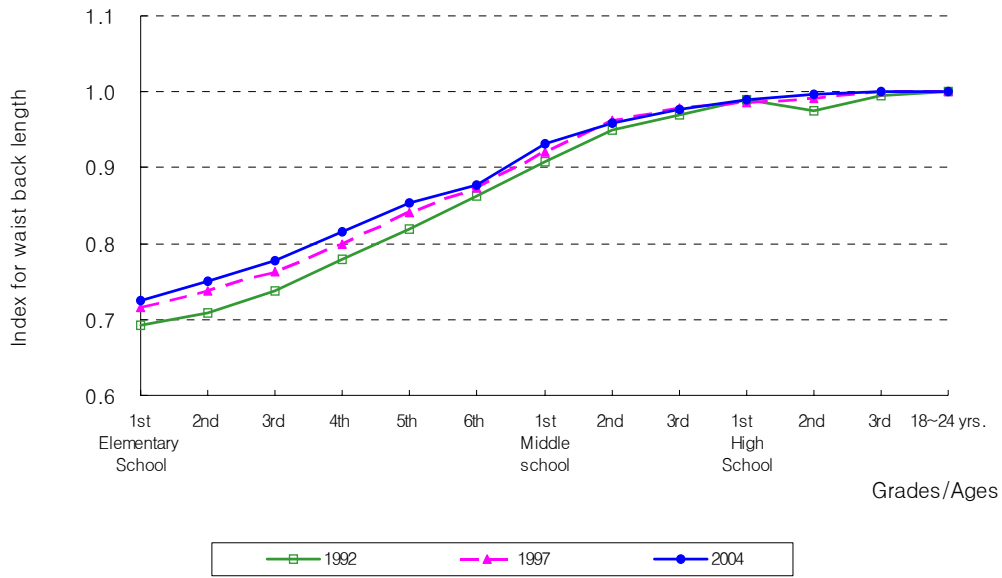
<Fig. 5> Changing of waist circum. by grades and ages

<Tab. 1> Measurements of bust and waist circum. by grades and ages

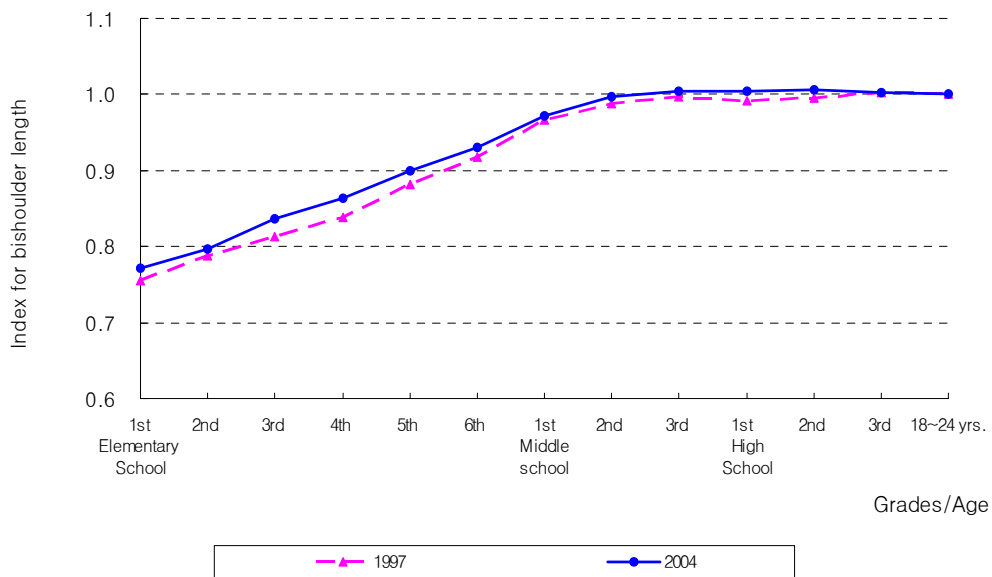
Item	Grades	1986		1992		1997		2004		
		Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	
Bust circumference	Middle School	1st	72.4	6.2	73.4	6.9	73.7	6.4	75.5	8.0
		2nd	75.3	5.9	77.2	6.2	77.2	6.5	78.1	7.5
		3rd	78.0	5.6	79.6	6.0	79.2	6.9	79.5	7.0
	High School	1st	79.8	6.0	80.8	5.6	80.2	5.4	81.1	6.5
		2nd	80.5	5.0	82.2	5.1	80.8	5.5	80.8	6.2
		3rd	81.7	5.0	82.2	5.1	81.3	6.0	82.1	6.6
Waist circumference	Middle School	1st	60.1	5.0	61.0	5.8	62.2	6.0	64.7	7.3
		2nd	61.6	5.2	63.1	5.7	64.1	5.9	65.6	7.0
		3rd	63.3	5.1	64.3	5.7	65.3	5.5	65.9	6.4
	High School	1st	64.1	4.7	65.4	5.6	65.5	5.0	67.3	6.3
		2nd	64.6	4.6	66.3	5.2	65.8	4.8	66.6	5.7
		3rd	65.2	4.7	66.0	4.9	65.5	4.7	68.1	6.9

in 2004 showed larger index value in the same grade level compared to previously measured data<Fig.6, 7>. Especially, while waist back length reached adult size by 2nd grade high

school, bishoulder length reached adult size by 2nd grade middle school thus showing that it's a factor to be considered during pattern drafting for middle and high schoolers.



<Fig. 6> Changing of index for back length by grades and ages



<Fig. 7> Changing of index for bishoulder length by grades and ages

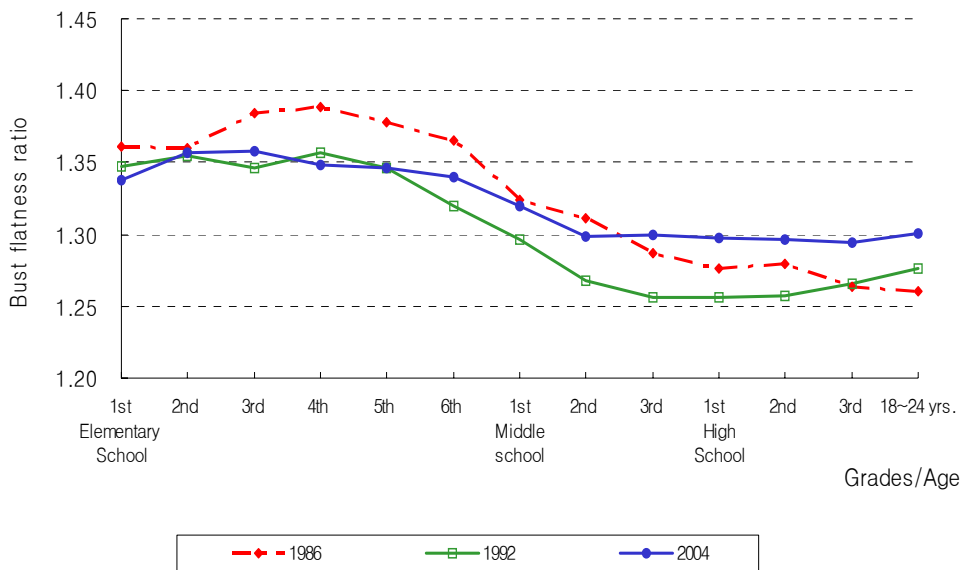
As bust flatness ratio was calculated with bust breadth/bust depth, the larger this value means physical characteristics with flatter bust, and the smaller this value means physical characteristics with rounder bust. After 3rd grade middle school, the bust flatness ratio of data measured in 2004 showed larger value than previous data thus meaning physical characteristics with flatter bust<Fig. 8>.

According to index(grade average/18~24 yrs average) by each grade level for bust circumference of data measured in 2004 reached adult size by 3rd grade high school, bust flatness ratio reached adult size by 2nd grade middle school, thus showing that breadth and depth of bust are increasing proportionally after 3rd grade middle school<Fig. 9>. As only bust breadth was measured in 1997, it was excluded from analysis.

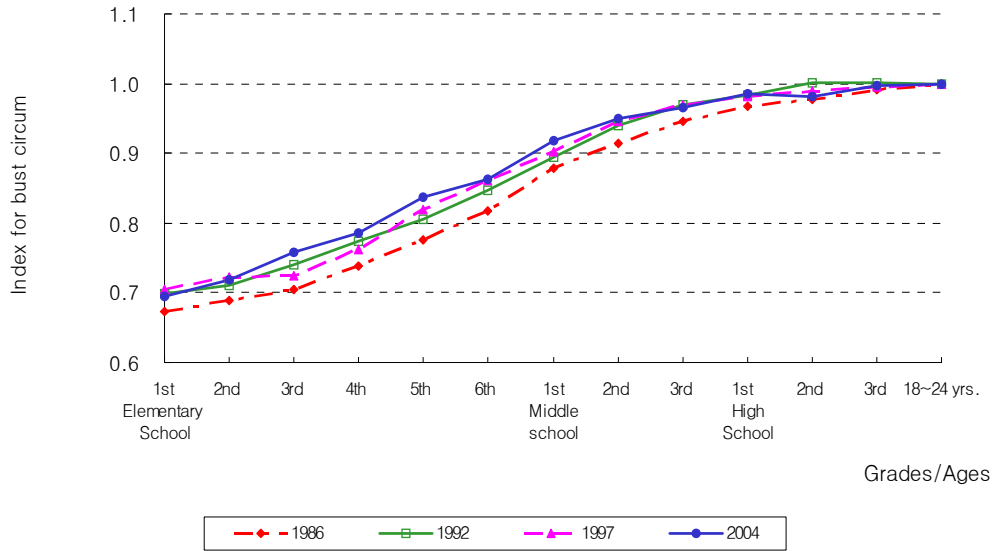
The cup size (difference between bust circumference and underbust circumference) of data measured

in 1986, 1992 and 1997 showed large increases during 6th grade elementary school and 2nd grade middle school. On the other hand, the cup size of data measured in 2004 showed gradual increase without periods of steep rise where the amount changed got closer to 0 after 2nd grade middle school, earlier than previous <Fig. 10, 11>. The data in 1992 had measured underbust circumference starting from 6th grade elementary school thus making it unable to calculate cup size of previous grade levels.

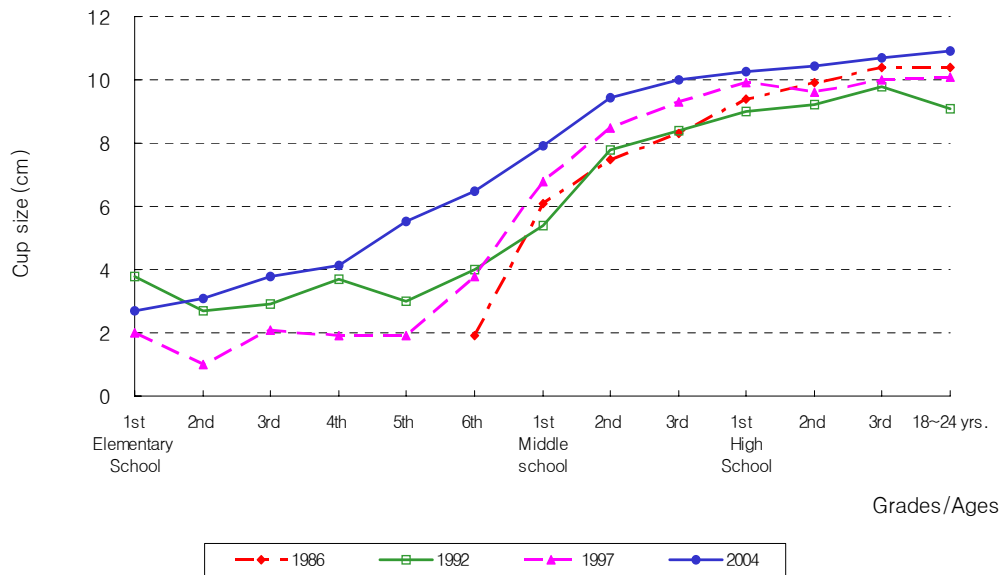
Based upon these results, it can be learned that girls after 2nd grade middle school had their depth and breadth of bust, underbust circumference and bust circumference growing proportionally thus not showing much change in bust flatness ratio and cup size. As the shape of bust in an important factor in designing women's clothing, these need to be reflected in producing a pattern drafting for middle schoolers.



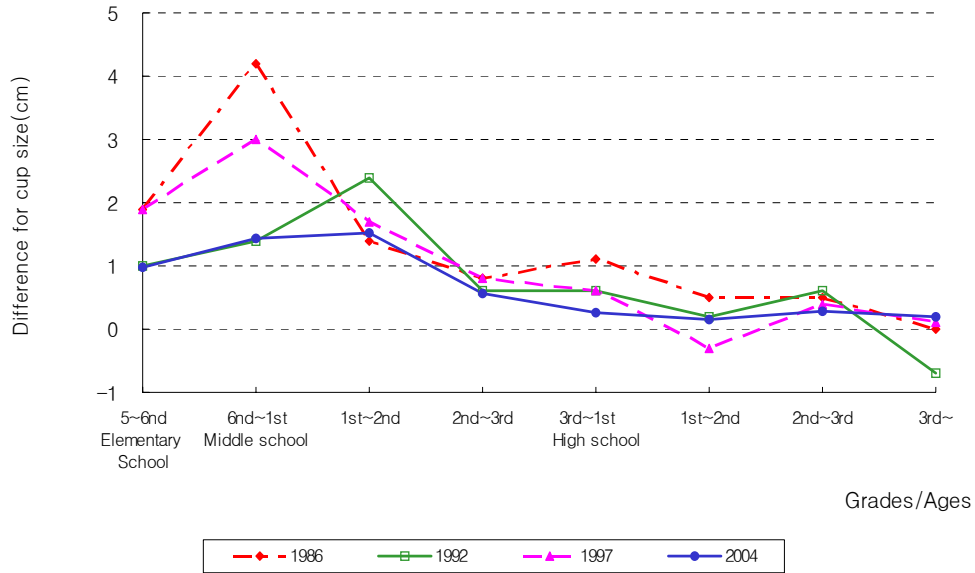
<Fig. 8> Changing of bust flatness ratio by grades and ages



<Fig. 9> Changing of index for bust circum. by grades and ages



<Fig. 10> Changing of cup size by grades and ages



<Fig. 11> Changing of difference for cup size by grades and ages

2. Comparison of School Uniform Blouse by Brand

1) Comparison of Blouse Product Sizes by Brand

Comparison results for blouse product sizes by brand are shown in Tab. 2.

For bust circumference for blouse of brands A, B and C, brand A was 84.2cm, brand B 83.4cm and brand C 88.8cm. Brands A and B had smaller product sizes compared to size 85. Brand B had the shortest front length and shirts length, and brands A and C showed statistically insignificant difference. Waist and hemline circumference showed statistically significant difference between the 3 brands, and brand B was the smallest in the order of C, A, B. For front interscye, brand A was the largest with brand C having the smallest, and for back interscye, brands B and C were larger with brand

A the smaller. Although shoulder length showed statistically insignificant difference between the 3 brands, for bishoulder length, brand C was shown to be larger than other brands.

For sleeve length, brand B was the smallest with brand C the largest. As to neck base circumference, brand B was shown to be smaller than other brands.

2) Comparison of Patterns by Brand

Patterns were made through flattening of blouse by brand, and their degree of polymerization is shown in Fig. 12.

The front length of brand A and C were similar in terms of product size, where regarding patterns, brand A had longer lower part and shorter upper part on the basis of waist line, while brand C was higher above the waist. Therefore, the shoulder neck point of brand C

was higher than brand A. Considering together with the shape of dart, it can be said that brand A is a pattern containing bust dart, while brand C is a pattern that has proceeded bust dart with armhole ease.

For collar band, the curvature of brands A and C were larger than brand B. As to the width of sleeve, brand A was narrower than other brands, For cap heights, brand C was taller than other brands.

3) Wearing Tests Regarding Appearance of Blouse by Brand

Wearing tests regarding the appearance of blouse by brand were proceeded by dividing into

expert group and middle schooler group, with evaluation results of expert group shown in Tab. 3, and those by middle schoolers shown in Tab. 4.

According to wearing test evaluation results on appearance by expert group in Tab. 3, brand C received highest evaluation regarding the ease of bust circumference as it included adequate ease compared to other brands. For bishoulder length, although statistically significant difference was shown between brands in terms of product size, it was not so regarding evaluation on appearance. From here, we may learn the similar bishoulder lengths between brands did not affect evaluation on appearance. As to ease of front and back interscye and silhouette in front, brand

<Tab. 2> Comparison results for blouse product sizes by brand

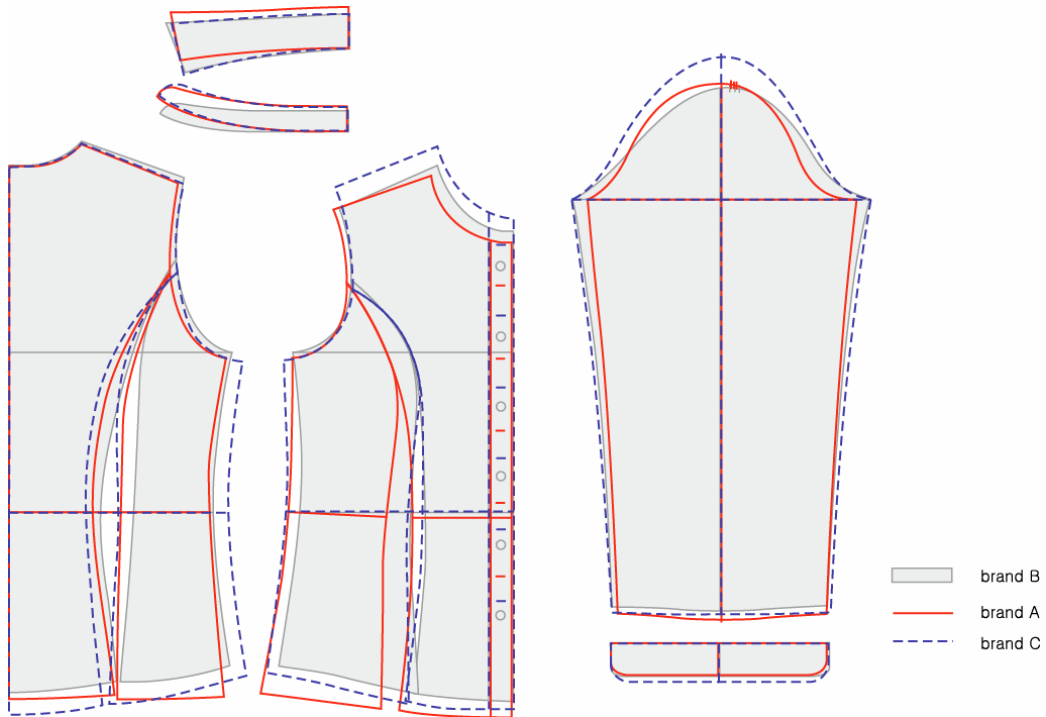
Item	Brand A (n=4)		Brand B (n=4)		Brand C (n=4)		F value
Front length	57.4	A	55.8	B	57.7	A	6.1*
Shirts length	56.4	A	55.2	B	56.7	A	20.4***
Bust circum.	84.2	B	83.4	C	88.8	A	191.1***
Waist circum.	76.1	B	73.4	C	79.2	A	329.6***
Hemline circum.	90.8	B	89.3	C	92.5	A	20.9***
Front interscye	31.9	A	31.5	B	31.3	C	23.3***
Back interscye	33.3	B	33.8	A	34.2	A	11.7**
Shoulder length	11.1		11.0		11.2		1.9
Bishoulder length	36.0	B	36.1	B	36.3	A	11.4**
Sideseam length	36.5	A	33.3	B	33.0	B	105.5***
Sleeve length (included cuffs)	59.4	B	57.9	C	61.4	A	119.8***
Sleeve hem	19.5		19.6		19.8		0.8
collar band breadth	2.4		2.3		2.5		3.5
Collar breadth	4.1	A	3.7	B	3.6	B	16.7***
Neck base circum.	38.8	A	37.3	B	38.4	A	19.4***

* p < 0.05 ** p < 0.01 *** p < 0.001, A>B>C

C received highest evaluations, while brand A topped in terms of silhouette to the back. For sleeve, sleeve length of brand C was too long with high cap height in receiving low evaluations in appearance. As to collar, brand C with the largest neck base circumference of product received highest evaluations.

According to middle schooler group's wearing test results on appearance in Tab. 4, in terms of ease of bust circumference, brand C with the most ease received the lowest evaluation, with the same results for ease of front and back interscye and front and back silhouette. For sleeve, sleeve length of Brand C was too long with high cap height in receiving low evaluations in appearance. As to collar, brand C with the largest neck base circumference of product received the lowest evaluation.

By comparing wearing test results on appearance between expert group in Tab. 3 and middle schooler group in Tab. 4, it was shown that in terms of ease of bust circumference, the expert group evaluated brands A and B with less ease as not having adequate ease compared to brand C, while the middle schooler group evaluated as having sufficient ease. The overall appearance in front also showed same results. This reflects the preference for appearance by the middle schooler group, which is a factor to be considered during pattern drafting of school uniform blouse.



<Fig. 12> Comparison for blouse pattern by brand

<Tab. 3> Results of the wearing test for appearance by expert group (n=8)

Item		Brand A		Brand B		Brand C		F value
Overall	Ease of Bust Circumference	1.75	B	2.00	B	4.00	A	34.06***
	Ease of Waist Circumference	3.50	A	2.50	B	2.75	B	8.27**
	Position of Waist Circumference	4.25		4.00		4.00		0.16
	Position of Lateral Shoulder point	2.75		3.00		3.25		1.50
Torso	Ease of Interscye, front	2.75	B	3.25	B	4.00	A	9.50**
	Front silhouette	1.50	C	2.50	B	4.00	A	66.50***
	Ease of Interscye, back	2.25	B	2.25	B	3.25	A	4.48*
	Back silhouette	3.75	A	1.50	C	2.00	B	42.63***
Sleeve	Sleeve Length	3.25	B	4.00	A	1.00	C	273.00***
	Ease of Sleeve	3.25	B	4.00	A	1.75	C	31.50***
Collar	Ease of Neck Base Circumference	3.25	AB	3.00	B	4.00	A	3.37*
	Breadth of Back Collar	2.75	B	3.25	B	4.00	A	9.50***
	Appearance of Front Collar	3.00		2.75		3.75		3.03

* p < 0.05, ** p < 0.01, *** p < 0.001, Duncan test A>B>C
5 rating scale : 5 = being very good and 1 = being very bad

<Tab. 4> Results of the wearing test for appearance by middle schooler group (n=6)

Item		Brand A		Brand B		Brand C		F value
Overall	Ease of Bust Circumference	4.33	A	4.00	A	2.67	B	10.50***
	Ease of Waist Circumference	3.67	B	4.67	A	3.00	C	23.75***
	Position of Waist Circumference	4.00		4.33		4.00		0.25
	Position of Lateral Shoulder point	3.67		3.33		2.67		2.92
Torso	Ease of Interscye, front	4.33	A	4.00	AB	3.33	B	3.50*
	Front silhouette	4.33	A	4.33	A	3.00	B	8.00*
	Ease of Interscye, back	4.00	A	4.33	A	2.67	B	6.56**
	Back silhouette	4.67	A	4.00	A	3.00	B	11.88***
Sleeve	Sleeve Length	3.00	B	4.33	A	2.33	B	8.75**
	Ease of Sleeve	3.67	A	3.67	A	2.33	B	4.45*
Collar	Ease of Neck Base Circumference	4.00	AB	4.33	A	3.33	B	3.50*
	Breadth of Back Collar	4.00	A	4.00	A	3.00	B	3.75*
	Appearance of Front Collar	3.33	B	4.33	A	3.00	B	6.50*

* p < 0.05, ** p < 0.01, *** p < 0.001, Duncan test A>B>C
5 rating scale : 5 = being very good and 1 = being very bad

IV. Conclusion

This research attempts to analyze the physical characteristics of middle school girls and compare the product sizes and patterns of school uniform blouses by brand for application as basic data in designing patterns of school uniform blouses that reflect physical characteristics of middle school girls.

In order to analyze the physical characteristics of middle school girls, comparison were made on 6 measurements of height, weight, waist back length, bishoulder length, bust circumference, waist circumference and 2 index of bust flatness ratio (bust breadth/bust depth) and cup size (bust circumference - underbust circumference) targeting at girls from 1st grade elementary school (6 yrs) to 3rd grade high school (17 yrs). The results are follows.

According to the average height and weight measured in 2004, unlike high school girls whose growth of height and weight are nearly completed, middle school girls are undergoing rapid growths. And bust and waist circumference average measured in 2004 increased the most between 4th grade elementary school and 1st grade middle school with nearly completing growth by grades 1~2 of high school. Also, the standard deviation for bust circumference and waist circumference of middle school girls measured in 2004 were showed extremely large difference among individuals compared to the previous results. Therefore, these need to be reflected in pattern making and size system during production of school uniform. Waist back length average measured in 2004 increased the most between 3rd grade elementary school and 1st grade middle school, and nearly completed growth by grades 2~3 of high school. Bishoulder length average measured in 2004

grow continually starting from 1st grade elementary school and nearly completed growth by 3rd grade middle school.

According to index (grade average/18~24 yrs average) of data measured in 2004, while waist back length reached adult size by 2nd grade high school, bishoulder length reached adult size by 2nd grade middle school. And while bust circumference reached adult size by 3rd grade high school, the difference of bust flatness ratio between grades and those of cup size got closer go 0 after 2nd grade middle school. Based upon these results, it can be learned that girls after 2nd grade middle school had their depth and breadth of bust, underbust circumference and bust circumference growing proportionally thus not showing much change in bust flatness ratio and cup size.

As the lateral shoulder point and the shape of bust in an important factor in designing women's clothing, these need to be reflected in producing a pattern drafting for middle schoolers.

Also, in order to compare the product sizes and patterns of middle school girls' uniform blouse by brand, comparative analysis was made on the uniform blouse currently being sold. And wearing tests were performed to analyze products with superior appearance. The results are follows.

For bust circumference for blouse of brands A, B and C, brand A was 84.2cm, brand B 83.4cm and brand C 88.8cm. Brands A and B had smaller product sizes compared to size 85. So, there is a necessity to reset size system for middle schools. For bishoulder length, although statistically significant difference was shown between brands in terms of product size, it was not so regarding evaluation on appearance.

By comparing wearing test results on appearance between expert group and middle

schooler group, it was shown that in terms of ease of bust circumference, the expert group evaluated brands A and B with less ease as not having adequate ease compared to brand C, while the middle schooler group evaluated as having sufficient ease. The front silhouette also showed same results. This reflects the preference for appearance by the middle schooler group, which is a factor to be considered during pattern drafting of school uniform blouse.

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