RELATIONSHIP OF HIP AREA MEASUREMENTS, BODY SILHOUETTES, AND FIGURE TYPES

by

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TABLE OF CONTENTS

INTRODUCTION

"Bagginess" in straight skirts detracts from a well groomed appearance. Bagginess may be defined as the unsightly stretch in the sitting area of the skirt. This aspect of grooming is important to the career women, and is of growing concern since statistical figures for 1961 show that one out of every three women is employed in the civilian labor force (14, p. 203). Clothes worn by the business woman are often of a tailored type, usually with fitted skirts, which are more susceptible to bagging than are casual clothes.

Many of the occupations of these career women are sedentary in nature, thus increasing the possibility that the problem of "bagginess" would occur.

Little information is available in the literature related to this problem. Is bagginess the result of poor fit in the skirt? Does it occur because of fabric characteristics? Does the fabric stretch warpwise or filling-wise or both? Is the stretch present because of the absence of lining? Is it related to figure shape, and if so, to what part of the body, between the waist and the knee? Do some figure shapes tend to accentuate this problem?

This study was designed to determine relationships of body size and shape as possible causes of "bagginess" in fitted skirts.

REVIEW OF LITERATURE

A review of available literature revealed no previous investigation of the causes or prevention of "bagginess" in straight skirts. Most of the authors in the area of clothing construction and grooming concentrate their efforts on "fit".

Rivers (12) states that the fit of a skirt is determined by the way it hangs from the waist, the way it feels and looks. The same author lists four main figure faults which may detract from a good fit. Namely the swaybacked; the flat derriere; the high abdomen; and the large pelvic-bone. Could these figure faults be the cause of "bagginess" in straight skirts? Could the "fitting" solutions for the figure faults be used to overcome the problem of "bagginess"?

Although improper fit in skirts may contribute to the problem of "bagginess", this thesis was not concerned directly with that particular aspect. It is a preliminary investigation based on body measurements, silhouette shapes, and figure types, as possible clues to the problem of "bagginess".

Position and procedure for taking body measurements are discussed in various ways by the following authors:

Green (8), and Latzke (9) give clues for locating the hipline. The former suggests having the person stand, with feet spread far apart and toes turned in a pigeon-toed manner. The hollow at the ball and socket area, at the hips on both left and right sides is usually the natural hipline. The latter suggests placing the tips of the thumb at the natural waist line, and stretching the fingers down as far as possible on the

underarm lines, the second finger usually touches the hipline. When the arm hangs at the side, the wrist also touches this line, which varies from 7" to 10" below the waistline.

Other authors discuss the procedure for taking hip measurements. Fales (7), states that in taking hip measurements, two hip measurements are necessary. The first is taken over the fullest part of the hip, usually 6" below the waist; and the second one is taken at the fullest part of the thighs about 10" below the waist. The tape measure should always be held parallel to the floor.

Brown (2), and Erwin (4) both suggest taking the hip measurements 7" below the waistline, holding the tape measure parallel to the floor, and not too snugly.

In taking waist measurements Bishop (1), and Erwin (4) state that this measurement should be taken over a good foundation garment, with a tape measure held firmly at the smallest part of the body.

Mme. Mary Sykora,[1] considers each person unique, and while measuring subjects she accounts for individual differences. In taking waist measurements she states that the tape measure should be held parallel to the floor with two fingers inserted under the tape to allow for ease. The hip measurements are taken at the fullest part of the hips. This was determined by viewing the subject's side silhouette and marking the place where the hips bulge the most and then begins to curve in. This place was anywhere from 7" to 9".

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[1]Mme. Sykora, Mary, 1212 2nd Ave., Des Moines, Iowa. Method of taking measurements. Private communication. May 1962.

Mme. Sykora's method was followed for this thesis, because it provides for individual differences in body shapes and figure types.

Figure type references in literature are classified on the basis of body sizes, for example teens, sub-teens, misses, half-sizes. Others are classified as figure faults such as swaybacked, flat derriere, the high abdomen, and the large pelvic-bone. No classification based on the shape of the hip curve was stated.

METHOD OF PROCEDURE

This is an investigation of certain factors related to body size and shape as possible causes of "bagginess" in straight skirts. Intercorrelations were calculated among certain sitting and standing hip-area-measurements to determine the reliability of these measurements as indicators of the amount of "spread" (change in shape of body volume) from standing to sitting positions. Body silhouettes, from waist to mid-thigh, were classified into figure types. A survey was made of student opinion of bagginess in basic muslin skirts worn by these same students for four consecutive 4-hour class periods. The results of this survey were related to the figure type groupings.

Selection of Subjects

Thirty women from the Home Economics student body and faculty of Iowa State University, served as subjects. Seventeen were under-graduates enrolled in the beginning Clothing Construction and Pattern making course. The remainder were volunteer graduate students and staff members. The choice of subjects was determined by availability rather than figure characteristics.

Circumference Measurements Standing

The subjects were measured over their slips without girdles. Circumference measurements for each subject were taken around the waist and hips at these four locations: the waist; 3" below the waist; the largest part of the hips; and a distance of 7" to 9" below the waist. This 7" to 9" distance was determined on an individual basis, by viewing the

subject at a side angle to determine where the back curvature bulged out the most and then started to curve in. The fourth measurement was taken at a mid-point between the 3" and the 7" to 9" circumference measurements, which was 5" to 6" below the waist.

In order to aid in the taking of these measurements, the exact locations of the four measurements were marked by short strips of colored tape placed on the individual's slip at intervals around the body (see Figure 1).

The four circumference measurements were then taken with a plastic tape measure with the amount of ease indicated below:

(a) The waist measurement was taken with 1-1½" ease.

(b) The 3" and 5-6" levels below the waist were taken with two fingers inserted under the tape measure at the front and one finger inserted under the tape measure at the back.

(c) The 7-9" hip measurement was taken leaving enough ease to provide for the stomach protrusion. This amount of ease was usually between 1½" to 2".

All measurements were recorded on a chart.

Silhouette Drawings Standing

In order to draw the silhouettes of the subjects, beam-calipers were used. Carpenter pencils, which were flat, were attached to wooden rulers, which in turn were fastened to the beams of the calipers with masking tape.

Each silhouette drawing was made on a sheet of paper large enough to include the outline of the body from the waist to the knees. A

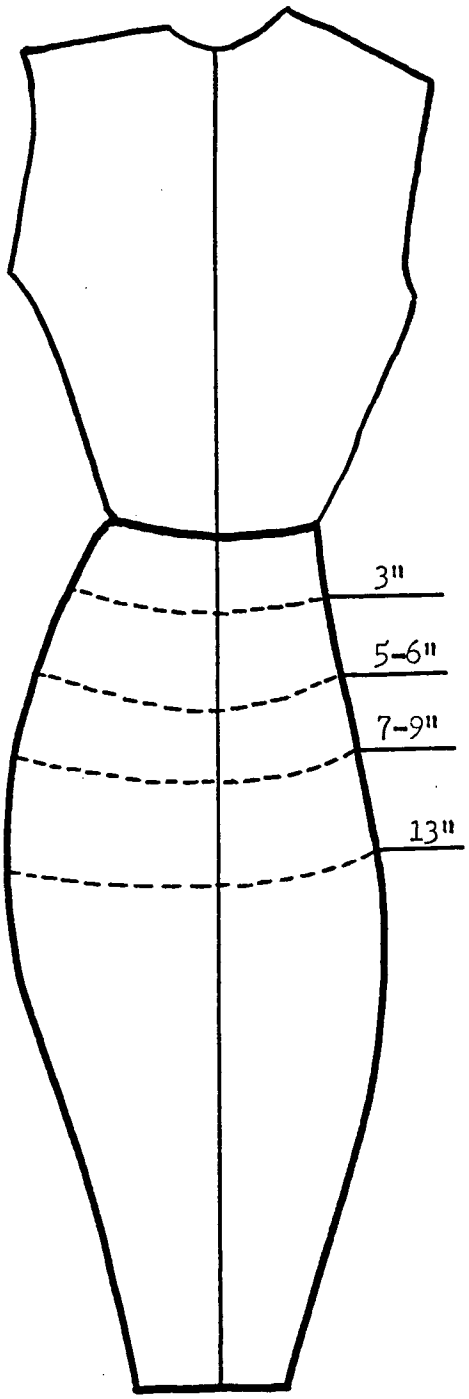

Figure 1. Position of measurements

horizontal line, to indicate the level of the waistline was first drawn on the paper. As the subject stood with her back to a wall covered by corkboard, the paper was adjusted so that the horizontal line on the paper coincided with the waistline of the subject. The paper was then fastened to the corkboard with thumb tacks. The beam-calipers, held parallel to the floor were adjusted to fit the subject's waist and slowly expanded with the increase in hip curvature as lines were drawn around and down each side of the figure to a 13" mark below the waist.

After the front-view silhouette was drawn, the subject turned so that her left side was against the wall. The same procedure of adjusting the paper so that the horizontal line coincided with the subjects' waistline, and adjusting the beam calipers to fit her contour was followed, and a side-view silhouette was drawn for each subject.

Silhouette Drawings Sitting

Two outline drawings of the sitting area of each subject were made on graph paper marked off in $\frac{1}{4}$" squares. The graph paper was taped to a hem-marking stand, and the subjects were made to sit on the paper in a straight position. One outline for each subject was drawn around that portion of the body, between the waist to a line 13" below the waist, which came in actual contact with the hem-marking stand.

A second and larger outline which would take in the "hip-spread" was drawn around the sitting figure by a pencil held perpendicular to the hem-marking stand and just touching the largest curvature of the hip area.

In this thesis the area enclosed in the first outline is referred

to as the inner-sitting-curvature-area and that enclosed by the second line, as the outer-sitting-curvature-area. The area between the first and second outlines is referred to as the width of the sitting-curvature-area.

These areas were calculated and recorded on individual charts.

Sitting Circumference Measurements

While each subject was sitting, a circumference measurement at the 7" to 9" distance below the waist was taken with a plastic tape measure and recorded. The difference between the sitting and standing measurements for the 7" to 9" level was used in computing intercorrelations according to the Pearson product-moment method.[1]

Measurements of Silhouettes

The front-view and side-view silhouettes were divided horizontally by drawing lines parallel to the waistline, at the 3", the 5-6", the 7"-9", and the 13" levels. The width of the silhouette at each level was measured with a plastic ruler and recorded.

From the front-view silhouette the space enclosed between the 7" to 9" and the 13" line was traced on $\frac{1}{4}$" square graph paper and the area was calculated. No area was calculated for the side-view silhouettes.

The front-view silhouette was then sectioned vertically. This was done by drawing a rectangle using the waistline as one side of the rectangle, and the 13" distance as the other side of it. Two portions of

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[1] $$r = \frac{N\Sigma XY - \Sigma X \Sigma Y}{\sqrt{\left[N\Sigma X^2 - (\Sigma X)^2\right]\left[N\Sigma Y^2 - (\Sigma Y)^2\right]}}$$

the front-view silhouette remained outside the center rectangle. These two portions are referred to in this thesis as the right- and left-hip-curvature-areas.

The side-view silhouette was treated in the same manner, and the two portions that remained outside the center rectangle are referred to in this thesis as the back-hip-curvature-area, and the front-curvature-area.

The distances, from the center rectangle, out to the silhouette outline at the 3", 5"-6", 7"-9" and the 13" levels were measured for the right- and left-curvature-areas; front- and back-curvature-areas. These measurements were taken with a plastic ruler and recorded.

The right- and left-hip-curvature-areas of each front-view silhouette were examined and differences were observed. Not one single front-view hip-curvature-area was alike on both sides. Because the left-hip-curvature showed greater difference in respect to shape, it was used for the purpose of grouping the silhouettes into figure types.

Figure Types

The subjects were placed in figure type groups according to the shape of the left-hip-curvature-area. This was done by first tracing the left-hip-curvature-areas on transparent paper and then superimposing the drawings on one another and examining them to ascertain the number and kind of possible groupings. A composite diagram for each of the figure types was made.

The back-hip-curvature-areas were also studied, by tracing this section off on transparent paper, superimposing the drawings one over

the other, and grouping them into certain figure types. Then diagrams were made.

Experiment with Muslin Skirts

The 17 under-graduate students, had made basic muslin skirts as part of their regular class work. These skirts were made from a basic commercial pattern. The skirts had no flare at the side seam. Each student wore her skirt, without a girdle, for four consecutive 4-hour class periods. At the end of this time the skirts were judged by these same students, for "bagginess". A rating scale was drawn up for the purpose (see Appendix).

The results of this survey were compared to the figure type groupings.

FINDINGS AND DISCUSSION

Analysis of Measurement Data

In order to investigate the relationships of body size and shape as a possible cause of "bagginess" in straight skirts, intercorrelations were calculated among certain sitting and standing hip-area measurements for thirty subjects.

1. Area sitting and area standing.
2. Spread in width (circumference sitting-circumference standing), and spread in area (area sitting - area standing).
3. Front-view 7"-9" - waist, and side-view width at the 7"-9" - waist.
4. Area sitting and side-view width at the 7"-9".
5. Area sitting and front-view width at the 7"-9".
6. Area standing and hip circumference at the 7"-9".
7. Front-view 7"-9" and side-view 7"-9".
8. Area sitting - area standing and outer - inner measurements at the 13" mark sitting.
9. Area sitting and hip circumference at the 7"-9" standing.

Simple coefficients of correlation and t-values were computed with the above hip-area measurements (Table 1).

The coefficient of correlation for the area sitting with the hip circumference at the 7"-9" standing was significant at the 5% level when compared with the t-value (.05) = 2.048. The computed t-value being = 2.116.

Table 1. Results of the coefficient of correlation and t-values

Measurements	Computed r[a]	Computed t-value[b]
1	0.0743	0.395
2	0.0576	0.305
3	0.1865	1.003
4	-0.0353	-0.187
5	-0.2268	-1.232
6	-0.0822	-0.436
7	-0.0203	0.107
8	0.0424	0.214
9	0.3896	2.116*

*Significant at the 5% level when compared with the table t-value (.05) = 2.048.

The coefficient of correlation 1 through 8 in this study showed no significance. Because there was little significant correlation among the measurements, no intercorrelations were drawn among body and/or silhouette measurements, figure types, and amount of "bagginess".

[a]Pearson product-moment method:

$$r = \frac{N\Sigma XY - \Sigma X \Sigma Y}{\sqrt{\left[N\Sigma X^2 - (\Sigma X)^2\right]\left[N\Sigma Y^2 - (\Sigma Y)^2\right]}} \qquad b_t = r\sqrt{\frac{(n-2)}{(1-r^2)}}$$

Figure Types in Relation to Skirt Stretch

The front-view silhouettes were sectioned vertically and a detailed comparison was made of the right- and left-hip-curvature-areas of each subject. It was observed that, not one single person was alike on both sides, and that the left-hip-curvature was usually the more pronounced of the two. Therefore, the left side of the silhouette was chosen for the figure type analysis.

The side-view silhouette of each subject was also sectioned

vertically and analyzed for figure-type classification. The back-hip-curvature line showed greater deviation from the vertical sectioning line than did the front-curvature, so was used for this study.

Three main figure types were discerned for the left-side-hip-curvature types (Figure 2) and for the back-hip-curvature types (Figure 3).

1. Type A, called the 'flattened' type, because the curvature area began rather straight and continued with little or no curve.

2. Type B, called the 'pear-shaped' type, because the curvature area began with a slight slope and gradually increased to the 7"-9" level. Then it began to curve in giving a 'pear-shaped' contour.

3. Type C, called the 'rounded type', because the curvature area began at the waist and curved out to the 5"-7" level. Then it began to curve in at the 7"-9" giving a more nearly round contour.

The three main figure types and number of subjects are classified in Table 2.

Table 2. Number of subjects classified in the three types for both left-hip and back-hip-curvature areas

Figure types	Left-hip-curvature-area No. of subjects	Back-hip-curvature-area No. of subjects
A	12	10
B	7	11
C	11	9

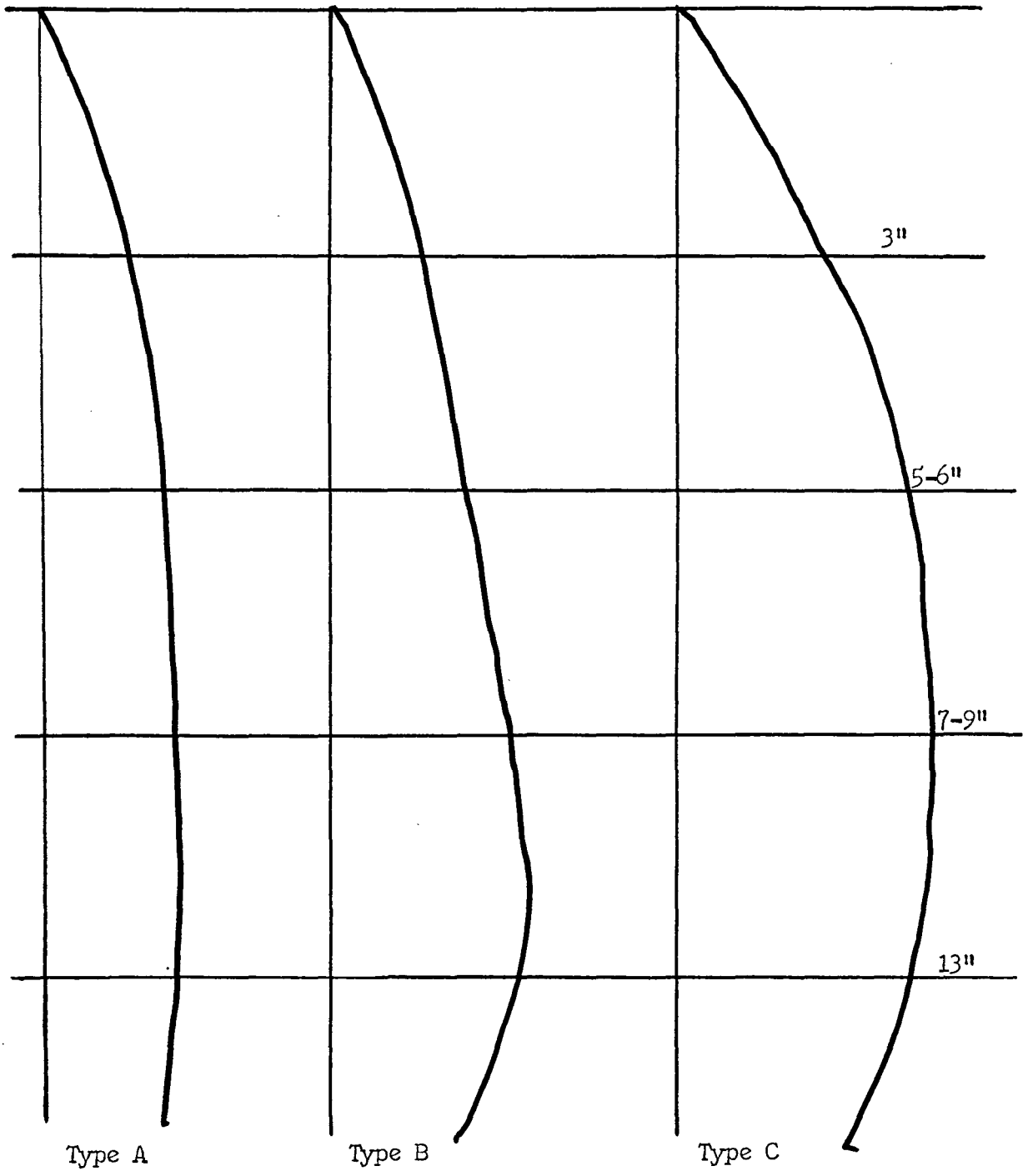

Figure 2. Left-hip-curvature-area

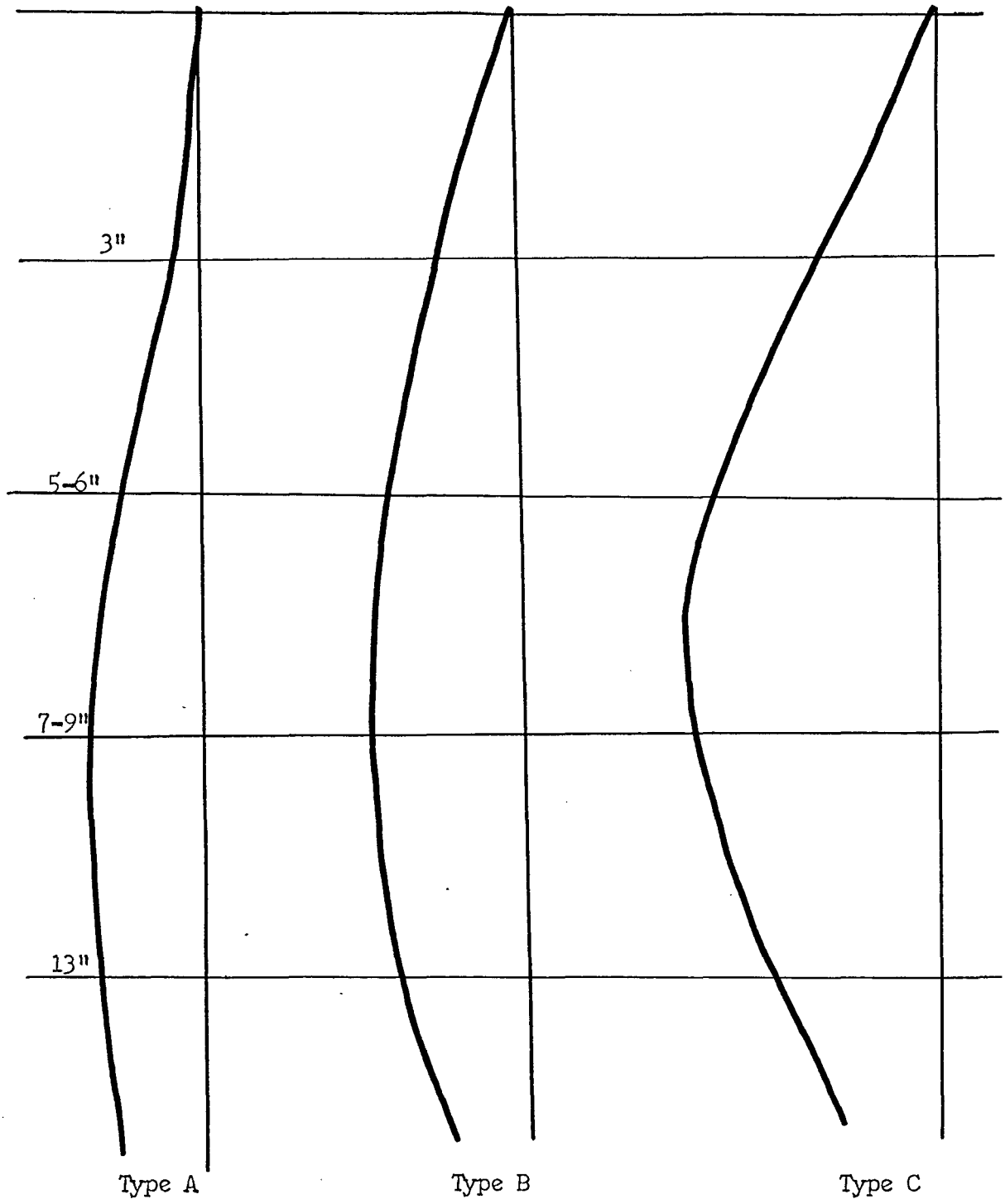

Figure 3. Back-hip-curvature-areas

Very few of the subjects fell into the same type for both the left-hip and back-hip-curvature areas. On further analysis it was observed that the subjects with left-hip-curvature-area type A, were also found in the back-hip-curvature areas in types A, B, and C (Table 3). These same observations were made for left-hip-curvature areas of types B and C.

Table 3. Figure types common to left-hip and back-hip curvature areas

Left-hip-curvature-area Figure types	Back-hip-curvature-area No. of subjects in each type
A	A = 4 B = 4 C = 2
B	A = 4 B = 4 C = 3
C	A = 2 B = 4 C = 3

A survey was made of student opinions of "bagginess" in basic muslin skirts worn by these same students for four consecutive 4-hour class period. Seventeen of the thirty subjects participated in this section of the study (Table 4). At the end of the given time, the skirts were evaluated by the students according to a rating scale (see Appendix).

When the figure types were compared with the results of the "bagginess" survey of the muslin skirts, no relationship was evident. There

Table 4. Results of the rating

Amount of "bagginess"	No. of subjects
None	0
Little	3
Some	9
Much	5
Badly	0

could be several reasons for this, owing to the limitations of this study.

1. Considering the left-hip-curvature and back-hip-curvature areas.
2. The small sample.
3. The classification of figure types.

SUMMARY

This investigation was designed to determine relationship of hip-area measurements, body silhouettes, and figure types, as possible causes of "bagginess" in straight skirts.

Thirty women from the Home Economics student body and faculty of Iowa State University, served as subjects. The choice was determined by availability rather than figure characteristics.

While the subjects were standing circumference measurements were taken at the waist, the 3", 5"-6", and 7"-9" levels below the waist.

Front and side-view silhouette outlines of the body, between the waist and knees, were drawn with beam-calipers.

The subjects were seated on a hem-marking stand and two outlines of the sitting area were made on $\frac{1}{4}$" square graph paper. One outline was drawn around that portion of the body, which came in actual contact with the hem-marking stand. The other outline was drawn around the largest curvature of the hip area. Also, circumference measurements at the 7"-9" distance below the waist was taken while the subjects were seated.

All the above mentioned measurements were taken over the subjects slip without girdles, and recorded on individual charts.

From the front-view silhouettes the areas between the 7"-9" and 13" lines were calculated, areas were also calculated for the sitting outlines. These areas were recorded on individual charts.

The front-view and side-view silhouettes were divided horizontally and vertically. This was done for purposes of using the widths and curvature areas for computing correlations and classifing figure types.

Nine intercorrelations were computed among areas sitting, areas standing, circumference measurements, and silhouette width measurements for both front-view and back-view.

The Pearson product moment-method and t-values were used. Eight of these correlations proved to be non-significant at the 5% level in this study. Only one was significant, it was the correlation between the area sitting and the circumference measurements at the 7-9" level standing. The computed t-value was 2.116, and the table t-value at the 5% level was 2.048, thus making the correlation significant at the 5% level.

Three figure types were discerned for both the left-side-hip-curvatures and the back-hip-curvatures.

1. Type A, called the 'flattened' type.
2. Type B, called the 'pear-shaped' type.
3. Type C, called the 'rounded' type.

Very few of the subjects fell into the same types for both the left-hip and back-hip-curvature types.

Basic muslin skirts were made and worn by seventeen undergraduate students for four consecutive 4-hour class periods. They were then judged by these same subjects for "bagginess". The results of this survey were compared with the figure type groupings. No relationship was evident.

RECOMMENDATIONS

As a result of this preliminary study, the following recommendations are made for further investigations in this area:

1. Another investigation of the same type involving a larger sample, randomly selected.
2. A more comprehensive study of figure types using left- and right-hip-curvature-areas.
3. Followed by a study relating these figure types to "bagginess" in straight skirts.
4. A further investigation of change in body volume with and without foundation garments.
5. Further research on the relationship of fabrics and the grain line of skirt linings to "bagginess" in straight skirts.
6. In an investigation such as this, other hip-area measurements.

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APPENDIX

Circumference Measurements

No. of subjects	Waist	3" below waist	5-6" hip	Standing 7-9" hip	Sitting 7-9" hip
1	27	37	39.5	43.5	46
2	25.5	32.5	37	40	41
3	26.75	33	36	39.5	40.5
4	24.5	31	36.5	39	40.5
5	26	34	36.75	38.5	39.5
6	27	35.5	38	40.5	42
7	28	37.5	39.25	39.5	41
8	25.5	34	36.5	38.5	40
9	40.25	38	40.25	41.5	43
10	23.75	30	35	37.5	39
11	25	35	37	40	42
12	25	33	37.5	39	40
13	25.5	34	36.5	39	40
14	25	32	36	38.5	40
15	27.5	34.5	38.5	40	41.5
16	27.5	35.25	38.5	40.5	42
17	24.5	30.5	35	38.5	39.5
18	28	34.375	38.375	40.5	41.5
19	27	34	38.5	40	41
20	29	37	40	43	44
21	29	35	39	40	42
22	25	30	35	38	40
23	29.5	35	42	43.5	44.5
24	32	38	40	40.5	42
25	30	36	42	43.5	46
26	26	32.5	37.5	38.5	40
27	27.5	36	38.5	41	42
28	25	32	36	38	40
29	35.5	36.5	43	46	48
30	25	30	36	38.5	40

Front-view Silhouette Measurements

No. of subjects	Waist	3" below waist	5-6" hip	7-9" hip	13" hip
1	10	12.75	15	16.125	16.75
2	9.5	11.625	13	14	14.375
3	10	13	14	14.5	14.5
4	9.625	12	13.5	15.625	14.625
5	10.25	12.625	13.625	14.125	14
6	10.75	12.375	13.125	12.5	13.75
7	11	13.5	14	14	13.75
8	10	12.75	13.75	14.375	14.375
9	11	13.5	14.625	15.625	14.625
10	8.625	11.5	13	14	14
11	9	11.5	13	13.875	14.25
12	9.5	11.625	12.625	13.625	13.5
13	10	11.625	13	13.125	13
14	9.25	11	12.5	12.25	13.625
15	9.75	11.75	13	14	14
16	9.5	12.375	14.375	15	14.75
17	8.5	11.5	12.75	13.75	13.75
18	10.25	13.375	14.5	15.125	14.75
19	12	13.25	14.25	14.75	16.75
20	10.5	13.5	14.75	15	15.5
21	10.5	13.25	14.25	14.5	14
22	7.5	10.625	11.625	11.625	11.625
23	9.125	12.5	13.25	13.5	13.75
24	10.25	13	13.75	10.625	13
25	9.5	11.375	13	14	13.625
26	8.875	11.25	12.875	13.25	13.875
27	9.25	12.25	13.75	14	13.375
28	9	11	12.75	13.5	13
29	11.5	12.75	13.125	12.75	12.25
30	9.125	11.625	13.5	13.75	13

Side-view Silhouette Measurements

No. of subjects	Waist	3" below waist	5-6" hip	7-9" hip	13" hip
1	5.375	7.125	8	8.75	8.25
2	6.625	7.75	8.125	9	8.75
3	7.625	8	8.5	9.125	8.25
4	6.625	7.5	8.875	9.5	9.125
5	6.25	8	9	9.625	9
6	6.5	8	8.75	9.25	8.125
7	6.75	9.375	10	9.625	7.5
8	6.125	8.25	8.75	8.75	8
9	8.25	10	10.5	10.625	8.75
10	6.125	6.625	8.125	9.125	9.25
11	6	8	9.25	9.5	8.5
12	5.5	8	9	9.25	8.625
13	7.5	8.5	9	9	8.25
14	7.5	8	9	9.375	9.25
15	7.25	9	10.25	10	9.375
16	6.125	7.5	8.75	9.375	9.375
17	6.75	8.125	8.625	9.625	10
18	6.625	8.5	9.5	9.375	9.125
19	6.25	8	9	9.125	9
20	6.5	7.5	8.5	8.5	8
21	6.375	8.75	9	8.75	7.375
22	5.25	6.375	7.625	8.375	8
23	6.125	8.125	8.125	8	7.5
24	8.625	10.125	10.5	9.25	7.125
25	6	7.75	10.25	10.75	9.75
26	6.375	7.375	8.75	9.5	8.375
27	7	8.25	9.25	9.5	9.375
28	6.25	6.875	7.5	8	6.5
29	6.875	8	9.875	10.5	9.25
30	6	7.5	8	8	6.5

Calculated Areas

No. of subjects	Area sitting (sq. in)	Area standing (sq. in)
1	138	85
2	112	59
3	101.125	68
4	126.125	73.75
5	111.25	73
6	114.125	86
7	103.125	67
8	107	89.5
9	109.5	78.375
10	105.5	58
11	115.625	93.25
12	117.5	74.125
13	123.375	86.5
14	126.125	73.75
15	133.125	68.875
16	106	73
17	103.625	58
18	127	62.5
19	129	65
20	105	60
21	115	90
22	111.125	50.625
23	135.625	57.75
24	127	54.5
25	123	55.5
26	115.75	55.25
27	112	53.375
28	100	55
29	115	52.25
30	126	55.5

Range in Differences

Range in differences between the waist and hip areas of the front and side-view silhouettes.

Item	3" below waist	5-6" hip	7-9" hip	13" hip
	(Difference in inches)			
1. Right-hip-curvature (Front view)	.375-2.125	.875-3	.25 -3.5	1.5-4.125
2. Left-hip curvature (Front view)	.625-2	.875-2.5	1-3	.625-3
3. Back curvature (Side view)	.25 -1.375	.75 -3.375	1-4.5	.25 -2.375
4. Stomach curvature	.125-1.375	.125-1.75	.125-1.75	.125-1.5

Rating Scale
(For judging the "bagginess" in skirts)

KEY

None = N
Little = L
Some = S
Much = M
Badly = B

Write in the space provided the most descriptive letter

Skirt no.	Letter
1.	____
2.	____
3.	____
4.	____
5.	____
6.	____
7.	____
8.	____
9.	____
10.	____
11.	____
12.	____
13.	____
14.	____
15.	____
16.	____
17.	____