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A COMPARISON OF THE VARIATION IN SIZE OF SOME COMMERCIALLY MADE GARMENTS WITH VARIATIONS IN BODY MEASUREMENTS OF A SELECTED GROUP OF WOMEN

by

FAITH ELEANOR JOHNSTON

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INTRODUCTION

The social and economic importance of clothing is generally recognized by people of today. Style and comfort are qualities sought by most purchasers. To give the highest satisfaction clothing should be well fitted, because it is upon the fit of the garment that style and comfort depends.

The consumer of clothing alone is not interested in this quality. Both the retailer and manufacturer are working to improve the fit of garments because of losses incurred through returned goods. According to Campbell (1927) the cost of fitting garments plus the decreased value and loss through misfits is an important part of the eight and one-half billion-dollar annual clothing bill of the United States. Because of fashion forces the ideal of the well fitted garment changes seasonally, hence the difficulty in establishing specifications for garment sizes.

As ready made garments have gained in importance, and production of clothing has passed from the hands of the housewife into those of the manufacturer an increasing proportion of the garments worn are designed and constructed without a knowledge of the individual's needs. Difficulty is sometimes experienced in purchasing a commercially made garment that will in every respect fit the human figure.

The English woman who buys a commercially made dress has three sizes from which to choose. She selects a style appropriate to her needs, and by an elaborate system of alteration the garment is adapted to her figure. The superiority of this method over the one in use in the United States is doubtful. It's use would seem to result in uncertainty as to satisfaction in fit and a loss of time and energy.

It is recognized that all individuals do not represent uniform proportions. Experience has also shown that the label on commercially made garments, bearing a given garment size, does not always represent uniform proportions. If it were possible to establish standards for sizes a perfect fit for every individual would not be insured, but fewer alterations would be needed and it would be possible to predict more accurately what these alterations would be.

Before standards for sizes can be established many more facts are needed concerning average body proportions. In addition further studies should be made of the proportions of commercially made dresses in comparison with those of the human figure to show what variations exist and wherein the greatest are to be found.

The purpose of this study, is then, to determine to what extent a direct relation exists between the measure-

ments of a selected group of commercially made garments and human proportions; to determine whether one size group of dresses corresponds to the measurements of the human figure more nearly than another; to determine whether there is a definite relation in the increase of measurements of dresses from one size group to another; and what measurements of the selected group of dresses show the greatest variation.

REVIEW OF LITERATURE

A knowledge of the human body is essential to garment construction. The points of articulation on the body are the strategic points upon which the fit of a garment depends. The basis for a clear understanding of the problems concerned with the fitting of garments is then, a scientific study of the proportions of the human figure. The science concerned with this phase of study is called anthropometry.

Anthropometry may perhaps be most simply and comprehensively defined as the conventional art or system of measuring the human body. Its purpose is to supplement visual observation by accurate mechanical determinations. The measurements of the body were begun by the artisan and the artist, the object of one being the perfect "fit", the other the correct or artistically superior production, (Hrdlicka 1919).

Our great mass of physical measurements have been compiled by scientists interested in the growth of children, and by physical directors who wanted data on physical development. Unfortunately many of these studies have been conducted by people untrained in anthropometry or statistics, according to O'Brien (1930), and the enormous volume of figures recorded is practically useless. Not even the anthropometrists who have done noteworthy work have reported data of value for clothing construction. The body land marks used by them are entirely different from those used in garment construction.

A diversity of measurements, instruments and methods used is a legitimate necessity, as the study of anthropometry extends over a great many phases. This system has no definite limits and is subject to such changes as may in the course of time be found advisable. Since 1880 many attempts have been made to secure international unification of anthropometric measures, and according to Hrdlicka (1919) the first two reports to the International Congress of Prehistoric Anthropology have been adopted.

A lack of uniformity exists in the instruments used in measuring the living. Matters of this nature, in all branches of science, are largely those of evolution, and the eventual survival of the fittest (Hrdlicka, 1919).

Dastre (1904) reported that L. Manouvrier had advanced further than any one in determining the relation that exists between the various parts of the skeleton. From the dimensions of the femur and tibia he can deduce the size of the human body. His basic work was published in 1892; in 1902 he crowned his efforts by issuing a study "upon anthropometric relations and the principal proportions of the body". He proved that man's stature has not undergone any important variation during the hundreds of thousands of years since his first appearance upon this globe.

At the close of the World War Love, Ireland and Davenport (1921) directed the measurement of 100,000 demobilized soldiers, to obtain measurements for uniforms. This seems to be the first work of this nature to be published.

Goldstein and Goldstein (1929) have measured the proportions of 350 women to determine the number of head-lengths in an average woman's height. They discovered it to be 7.5009 or approximately 7½ head-lengths. It is unlikely that there would be any marked variation if the numbers were greatly increased.

La Fleur (1931) reported some important findings in her study in regard to the variation of body measurements. The least variation was in the size of the shoulder of the subjects. In no case was the deviation more than one-half inch from the median shoulder measurement. The deviation

that was the most marked was in the waist and hips. The median, minimum and maximum of the front and back chest measurements were in direct proportion.

A group of mature women was studied by Morgan (1931). She found there was a typical distribution of body mass which is expressed in terms of the norm for each body measurement taken. Less variation was shown in the longitudinal measurements than in the girth and width measurements. Significant variations from the norm were found in hip, waist and bust measurements of certain individuals.

Musgrave (1933) studied certain measurements of mature women and found that little relationship existed between the French dart line and the vertical depth of the armseye. The conclusion drawn was that the limited data cannot be regarded as conclusive evidence that constant relationships exist between the measurements compared.

Jernberg (1932) studied certain measurements of 100 college women and found that as the shoulder slope increased it approached the average height of the sleeve cap, but that there was no relation between the shoulder slope and the height of the sleeve cap.

A comparative study of physical measurements for various size groups was conducted by Little (1928). She concludes that in the woman's group the variation is less, since the general physical development has materially stopped. The

difference within a group is caused primarily by the fact that it is possible to increase or decrease in weight and thus vary the physical body measurements. But few studies have dealt with the proportions of commercially made garments.

Nystrom (1928) concludes "that there should be systems of standard sizes that mean something in the garment field. There is common agreement upon this point, but there is as yet no common agreement as to what sizes should be or how they should be enforced. That some method of securing standard sizes will be found is practically certain."

Coles (1932) studied various phases of standardization and concluded that size is sometimes given on garments but these symbols are often only roughly indicative of the size, and it is necessary to try on the garments to insure fit. Sizes of garments vary with manufacturer and with style, and hence are not generally uniform.

Dunn and Cranor (1925) conducted a study of the variation in size of ready-to-wear garments. The measurements of the dresses indicated a lack of uniformity in different sizes of the same make of dress, and the same size of different makes. A great variation was found between the bust and hip measurements of different makes of dresses. In some, one was larger than the other, and in others they were the same.

Eddy and Wiley (1932) reported from a survey conducted by the National Retail Dry Goods Association, that seventy per cent of all the better dresses must be altered. One manufacturing company has been most successful in making dresses for stout women; they made a study of over 500 stout women and from this have developed their own patterns. Both retailers and manufacturers are working together to eliminate the evil of poor fitting garments.

From the above studies it may be noted that little research has been done which serves as a basis for a more exact procedure for establishing proportions of commercial garments. The task ahead is, by extensive study, to learn more concerning the mean measurement of lines on the body that relate to clothing construction. With the use of such data it would be possible to have garments that would require a minimum of alteration. According to O'Brien (1930) the measurements now in use are apparently the result of traditional practices somewhat modified in accordance with complaints received by manufacturers and influenced more or less by data of doubtful value that have come from various sources.

METHOD OF PROCEDURE

Physical Measurements

In order that physical measurements might be compared with those of commercially made dresses, measurements were taken of 146 college women. The subjects were chosen to correspond to sizes 14, 16, and 18, whose bust measure varied from 31 to 36.9 inches, weight from 100 to 145 pounds, and height from 59 to 68 inches. Approximately 50 subjects were placed in each of the three groups, there being 50 in size 14, 49 in size 16, and 51 in size 18.

Bust measures from 31 to 32.9 inches inclusive represented size 14, bust measures from 33 to 34.9 inches inclusive represented size 16, and bust measures from 35 to 36.9 inches represented size 18, based upon the accepted commercial standard for dress patterns, Commercial Standards CS13-30 (1930). These groupings were chosen as they were believed to correspond to the most representative sizes of college women.

All of the measurements were taken with a Lufkin linen double selvage tape measure one-fourth inch wide, scaled for English and Metric systems, graduated in millimeters and in one-eighth inches. The finish was grayish white paint numbered with black, and the whole varnished. The tape measure was checked with the standard meter stick in the Physics

Department of Kansas State College and found to be accurate. Hrdlicka (1919) recommended the use of a linen tape measure as being both accurate and non-elastic.

The devise used for locating the underarm line was an improvised plumb line consisting of a pencil with a notch cut in the middle, into which was fastened a tape weighted at the opposite end.

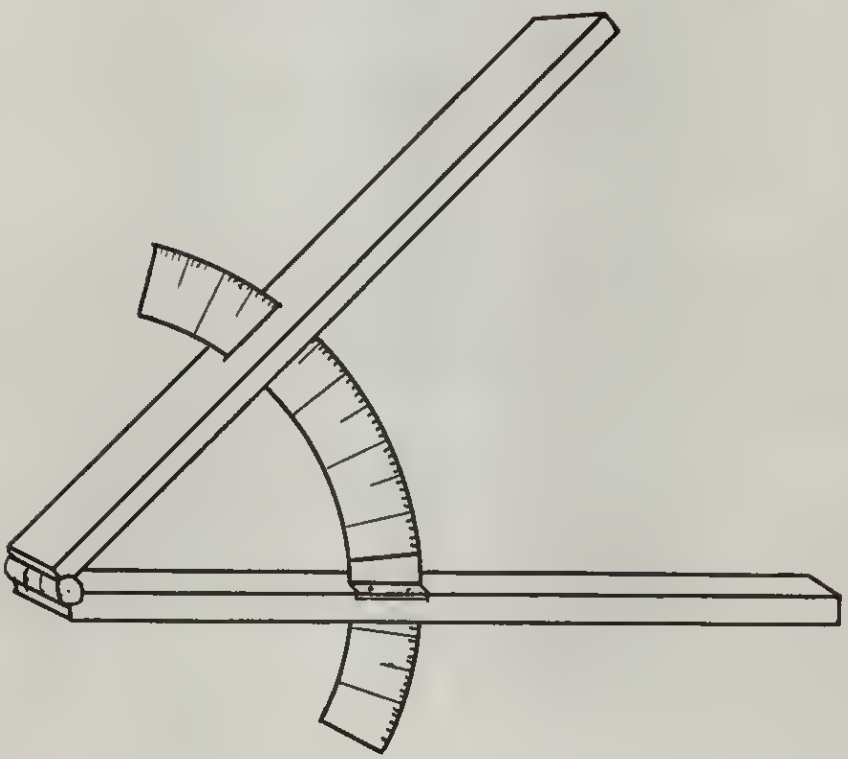
Separate tape measures were used for marking the bust, waist and hip lines. To facilitate the identification of these tapes a marker was placed on the front of each. The tape measures were clipped in place and clips were used to indicate the underarm lines.

The shoulder line on the subject was established with a device constructed for this purpose. It was necessary to establish two lines in the same plane, therefore two strips of wood were hinged together, adjustable to the angle formed by the neck and shoulder (see Plate I).

Standard scales with a measuring stick were used to obtain the weight and height of the subject.

In taking all measures the tape was held firmly in place, but not tight enough to bind the flesh. Each investigator took two readings of each measure, one reading was taken, the tape dropped and a second measure taken. One investigator recorded the data while the other measured. A record was kept of the four readings and an average taken

Plate I Devise used for establishing Shoulder line



to determine the final measurement.

The subject clad in undergarments stood with heels together, arms at sides and head erect. Commercially made dresses are fitted on the subject under similar conditions.

Pencil lines and flexible tapes were placed on the body in order that fixed points might be established.

The lines marked with pencil were the neck, shoulder, underarm and the chest and back lines. The shoulder line was bisected to locate the French dart line. The measurements at these points were obtained by each of the two investigators and the results recorded. A tape measure was placed around the fullest part of the bust, one at the normal waist, and another around the fullest part of the hips. The measurements on the French dart line were taken and recorded. The tape measures were then removed, care being taken not to disturb the clips, and the measurements of the bust, waist and hip were taken on the tapes and the data recorded.

The physical measurements of each subject were recorded on a chart. (See Form 1.)

Form 1

Blank for Recording Body Measurements

Name _____ Phone _____			
Weight	:	:	:
Height	:	:	:
Armseye line, entire	:	:	:
Armseye line, front	:	:	:
Drop of shoulder, front	:	:	:
Seyeline to neck	:	:	:
Seyeline to armseye	:	:	:
Drop of shoulder, back	:	:	:
Seyeline to neck	:	:	:
Seyeline to armseye	:	:	:
Width of chest	:	:	:
Width of back	:	:	:
Bust line entire	:	:	:
Bust line, front	:	:	:
Bust line, back	:	:	:
Waist line, entire	:	:	:
Waist line, front	:	:	:
Waist line, back	:	:	:
Hip line, entire	:	:	:
Hip line, front	:	:	:
Hip line, back	:	:	:
French dart line to bust	:	:	:
French dart line to waist, front		:	:
French dart line to waist, back		:	:
French dart line to floor, front		:	:
Length of arm, outer	:	:	:
Upper arm to elbow	:	:	:
Full length	:	:	:
Circumference of arm	:	:	:
Upper arm	:	:	:
Elbow	:	:	:
Wrist	:	:	:
Sleeve cap, height	:	:	:
Sleeve cap, width	:	:	:

The method adopted for the establishment of lines and the taking of physical measurements was that used and recommended by the Clothing and Textiles Department, Kansas State College with the exception of the shoulder line which was located as follows:

With the head erect and the face forward the devise for establishing the shoulder line was placed on the crest of the bone behind the ear. It was held parallel to the back contour line of the neck and touching the neck line. The shoulder line had its beginning at that point. The instrument was adjusted at right angles to the armscye. Three-eighth inches back of this point on the armscye, connected with the point of origin at the neck, formed the shoulder line.

Directions for the establishment of those body lines used in the study follow:

The neck line was located by placing the tape around the base of the neck allowing it to pass above the large bone at the base of the neck (the atlas upon which the head pivots), and dropping it to the middle of the pit in the front of the neck.

The location of the armscye line was determined in the following manner: With hands toward the body, the thumb and first finger were placed on either side of the top of the ball of the arm as it swings in the socket; a line was

dropped from these points of articulation parallel to the center front and center back respectively to the points where the arm leaves the body. Curved lines were used to continue the armseye to a point one and one-half inches below the highest point of the arm pit. This point was located with the arm raised at right angles to the trunk.

A tape measure was placed snugly around the armseye and loosened one and one-half inches; this gave the correct armseye measurement. A measurement was taken from the shoulder line around the front of the armseye to the under arm line, and from the shoulder line around the back of the armseye to the underarm line.

The chest line was established by bisecting the front armseyes and connecting these two points.

The width of back line was located by marking the distance between the point on each arm which indicated the intersection of the sleeve cap width and the back armseye line.

The bust line passed around the body over the points of the bust and slightly up over the tips of the shoulder blades. A measurement was taken on the bust line from under arm line to under arm line, both front and back.

The waist line was located at the smallest part of the trunk, which is located between the lower rib and top of the pelvic bone.

The hip line extended around the trunk at the largest part of the hips. This was usually about 10 inches below the waist line.

The under arm line bisected the arm pit and fell in a straight line directly under the arm to the floor. The plumb line was used to establish this line.

The French dart line was located in the front by extending a line from a point on the shoulder midway between the base of the neck and the armscye line, to the tip of the bust, thence to the floor parallel to the center front. To locate a similar line on the back, a line was dropped from the middle of the shoulder to the tip of the shoulder blade, and continued parallel to the center back.

The drop of the shoulder may be indicated by the difference between the measure of the inner shoulder to the chest line and the outer shoulder to the chest. The inner shoulder to chest was established by dropping a line from the shoulder at the neck, perpendicular to the chest line, both back and front. The outer shoulder to chest was established by dropping a line from the shoulder at the armscye perpendicular to the chest line, both back and front.

The length of the outer arm was found by measuring from the point of intersection of the shoulder line and armscye line, over the elbow, with the arm bent at right angles, to a point below the wrist bone. The length from the upper

arm to the elbow was the distance from the point of intersection of the shoulder and armscye to the point of the elbow.

The circumference of the upper arm was found by placing the tape measure around the arm one and one-half inches below the normal pit of the arm, with the arm held at right angles to the trunk. The arm was dropped to the side and the tape placed parallel to the floor.

The circumference of the arm at the elbow was found by placing the tape around the elbow with the arm bent at right angles.

The sleeve cap height was determined by erecting a perpendicular from the line which marked the arm circumference to the highest part of the armscye.

The sleeve cap width was determined on a line parallel to the arm circumference, from the intersection of the chest and front armscye to the back armscye.

The wrist line was indicated as a line around the arm at the point where the hand joins the wrist, just below the end of the large bone in the arm.

Measurements of Commercially Made Dresses

In order that a comparison might be made of the proportions of commercially made dresses, and of the human figure, 150 dresses were measured in sizes 14, 16, and 18;

50 dresses in size 14, 49 in size 16, and 51 in size 18. A preliminary study of a group of dresses was made to determine those measurements upon which the fit of a garment depends. Some 26 measurements were decided upon as basic.

All of the measurements were taken with the Lufkin linen tape measure described above.

Pins were used for marking fixed points and lines on the dress. These were; origin of the French dart line, the chest, bust and hip lines, also the sleeve cap height and the position of the elbow on the sleeve. These points were pinned through to the back of the dress.

The dress was laid flat on a table while the lines were established and the measurements taken. Both investigators measured each line twice on the front of the dress; the dress was then turned and the measurements taken on the back. One investigator recorded the data while the other measured. A record was kept of the four readings and an average made to determine the final measurement.

The measurements of the commercially made dresses were recorded on a chart. (See Form 2.)

Form 2

Blank for Recording Dress Measurements

Name of firm _____ Trade name _____
Size _____ Price _____
Special features _____

Front					
Length of French dart line:					
Shoulder to waist					
Shoulder to hem					
Armscye line entire					
Shoulder seam to underarm					
Width of chest					
Drop of shoulder					
Seyeline to shoulder at neck					
Seyeline to shoulder at armscye					
Bust line					
Waist line					
Hip line					
Length of sleeve, outer					
Upper arm to elbow					
Full length					
Sleeve cap					
Height					
Width					
Width of sleeve					
Base of cap					
Elbow					
Wrist					
Back					
Shoulder seam to underarm					
Width of back					
French dart line					
Shoulder to waist					
Drop of shoulder slope					
Seyeline to shoulder at neck					
Seyeline to shoulder at armscye					
Bust line					
Waist line					
Hip line					

The method used for the establishment of lines and the taking of garment measurements was an adaptation of that used and recommended by the Clothing and Textiles Department of Kansas State College for the establishment of construction lines on the pattern.

The chest and back lines were located by bisecting the front armscye line and pinning the front and back of the dress together at this point.

The waist line was measured as indicated on the garment.

The point of origin of the French dart line was established 2½ inches from the armscye line on the shoulder seam of the dress. Because the necklines of the garments varied widely from the normal due to differences in style, a measurement which approximated one-half of the usual shoulder length seemed the nearest approach to the point of origin of the French dart line.

The point of the bust was marked by measuring down on the French dart line 9 inches for size 14, 9½ inches for size 16, and 10 inches for size 18. These measurements were determined by the mean measurement from the shoulder to tip of bust on the French dart line of the human figures used in this study. A line perpendicular to the center front and passing through the established points marked the bust line.

The hip measurement on the dress was taken at 10 inches below the waist line.

The base of the cap was established by measuring across the sleeve, at the base of the armscye curve.

The cap height was marked by a line drawn perpendicular to the base of the cap from the highest point of the armscye.

The width of the cap was marked by a line parallel to the base of the cap, and passing through the bisected front armscye line.

The elbow was indicated by the position of darts or elbow fullness on the sleeve.

The outer sleeve length was determined by measuring from the highest point of the armscye to the bottom of the sleeve.

The wrist measure was taken at the bottom of the sleeve.

The drop of the shoulder was indicated by the difference between the measurement of the inner shoulder to the chest line and the outer shoulder to the chest line. The inner shoulder to the chest was established by dropping a line from the highest point on the shoulder seam perpendicular to the chest line, both back and front. The outer shoulder to the chest line was established by dropping a line from the shoulder seam at the armscye perpendicular to

the chest line, both back and front.

INTERPRETATION

In order that the data under consideration might be interpreted, it was necessary to apply some measure of central tendency to the measurements collected. A study of the relative value of the mean and median as a suitable measure was made. Previous studies indicate that either may be used.

Holzinger (1928) points out that the most important and generally the most reliable average is the mean. It is rigorously defined in algebraic terms, and is based directly upon the actual values of all the items. This makes it possible to obtain a definite average for any quantitative series, and gives a result which is truly characteristic of the whole distribution. If samples are drawn from a large body of material and a number of means calculated, they will usually be closer to the mean of the whole material than if any other average had been employed. This property is often characterized as the reliability of the mean.

Mills (1930) points out that the mean is the value of an individual observation, or in a frequency distribution, the value of the mid-point of a class. The mean was therefore chosen for this study.

Minimum, mean and maximum measurements of the 146

women measured for this study are given in Table 1. Analysis shows that in a majority of cases a fairly definite rate of increase existed between the mean measurements of the human figure from size 14 to size 16 and from size 16 to 18. The amount of increase from one mean measurement to another was not uniform, the interval being 1/4 inch in such cases as the back armscye line and the width of chest; 1/2 inch in such cases as the entire armscye line and the French dart line to the waist in front. In some instances the rate of increase was somewhat greater from size 14 to 16 than from size 16 to 18. In a few instances the rate was greater as the size increased. Had the sample been larger the rate of increase in size from one group to another might have been more constant.

Minimum, mean and maximum measurements of 150 commercially made dresses are given in Table 2. Analysis shows that in some few cases such as the front and back armscye line, the width of the chest, the front and back bust lines, and the width of sleeve at the wrist there is a fairly definite rate of increase in the measurements from one size group to another. The amount of increase is not uniform, varying from 1/4 to 3/4 inches. In the remainder of the cases little relation seems to exist in the increase between measurements. In some instances the rate of increase was somewhat greater from size 14 to 16, or the rate of increase

Table 1. Minimum, Mean, and Maximum Measurements (in inches) of 146 Women

Body lines	Measurements			Size	Number of subjects
	Minimum	Mean	Maximum	Bust measure	
Armscye line, entire	14.38	15.75	16.13	31-32.9	51
	14.38	16.25	17.63	33-34.9	51
	15.38	16.75	18.38	35-36.9	44
Armscye line, front	6.13	7.00	8.25	31-32.9	51
	6.50	7.25	8.38	33-34.9	51
	6.13	7.25	8.63	35-36.9	44
Armscye line, back	6.00	7.00	8.00	31-32.9	51
	6.38	7.25	8.38	33-34.9	51
	6.50	7.50	8.50	35-36.9	44
Drop of shoulder					
Chest to neck, front	4.13	5.00	6.13	31-32.9	51
	4.38	5.25	5.88	33-34.9	51
	4.38	5.25	6.13	35-36.9	44
Chest to armscye, front	3.13	3.50	4.25	31-32.9	51
	3.00	3.50	4.13	33-34.9	51
	3.25	3.75	4.88	35-36.9	44
Chest to neck, back	4.13	5.00	6.25	31-32.9	51
	4.13	5.00	6.25	33-34.9	51
	4.38	5.00	6.13	35-36.9	44
Chest to armscye, back	1.75	2.75	3.75	31-32.9	51
	2.00	2.75	3.75	33-34.9	51
	2.00	2.75	3.75	35-36.9	44
Width of chest	10.63	12.00	13.50	31-32.9	51
	10.63	12.25	14.25	33-34.9	51
	11.25	12.50	14.88	35-36.9	44
Width of back	10.63	13.00	14.38	31-32.9	51
	11.25	13.25	14.63	33-34.9	51
	12.00	13.50	15.75	35-36.9	44
Bust line, front	14.50	16.25	18.38	31-32.9	51
	15.00	17.00	18.75	33-34.9	51
	16.25	18.50	20.50	35-36.9	44

Table 1, cont'd

Body lines	Measurements			Size	Number of subjects
	Mini-mum	Mean	Maxi-mum	Bust measure	
Bust line, back	12.88	15.75	18.00	31-32.9	51
	14.75	17.00	19.25	33-34.9	51
	15.63	17.50	19.25	35-36.9	44
Waist line, front	11.00	13.75	15.25	31-32.9	51
	10.38	14.50	17.13	33-34.9	51
	11.50	15.00	17.38	35-36.9	44
Waist line, back	10.00	11.50	14.25	31-32.9	51
	10.25	12.25	15.13	33-34.9	51
	10.88	12.75	16.13	35-36.9	44
Hip line, front	16.63	18.75	21.13	31-32.9	51
	15.75	19.00	22.75	33-34.9	51
	17.38	20.00	22.75	35-36.9	44
Hip line, back	15.13	17.75	25.00	31-32.9	51
	14.38	18.50	23.00	33-34.9	51
	15.68	19.00	23.25	35-36.9	44
French dart line to bust	7.50	9.00	10.13	31-32.9	51
	8.50	9.75	11.00	33-34.9	51
	8.50	9.25	13.38	35-36.9	44
French dart line to waist, front	12.88	14.50	15.88	31-32.9	51
	13.50	15.00	16.25	33-34.9	51
	13.75	15.50	16.50	35-36.9	44
French dart line to waist, back	13.00	14.50	16.38	31-32.9	51
	13.00	14.75	16.38	33-34.9	51
	13.25	14.75	16.38	35-36.9	44
French dart line to floor	53.00	57.00	61.00	31-32.9	51
	53.38	58.00	62.75	33-34.9	51
	55.38	58.50	62.75	35-36.9	44
Full length of outer arm	21.50	23.00	24.88	31-32.9	51
	20.75	23.25	25.25	33-34.9	51
	22.00	23.50	25.00	35-36.9	44

Table 1, cont'd

Body lines	Measurements			Size	Number of subjects
	Minimum	Mean	Maximum	Bust measure	
Outer length of arm to elbow	11.75	13.25	14.75	31-32.9	51
	11.88	13.50	15.63	33-34.9	51
	13.00	13.75	15.50	35-36.9	44
Circumference, upper arm	8.75	9.75	10.88	31-32.9	51
	8.38	10.50	12.25	32-33.9	51
	9.63	11.00	12.75	34-35.9	44
Circumference, elbow	9.25	10.00	10.75	31-32.9	51
	9.38	10.25	11.63	32-33.9	51
	9.50	10.50	11.75	34-35.9	44
Circumference, wrist	5.25	5.75	6.38	31-32.9	51
	5.25	6.00	6.38	33-34.9	51
	5.50	6.00	6.75	35-36.9	44
Sleeve cap height	4.25	5.00	6.38	31-32.9	51
	4.00	5.25	5.88	33-34.9	51
	4.50	5.25	6.00	35-36.9	44
Sleeve cap width	4.25	5.25	5.88	31-32.9	51
	4.63	5.50	6.13	33-34.9	51
	4.75	5.50	6.25	35-36.9	44

Table 2. Minimum, Mean, and Maximum Measurements (in inches) of 150 Commercially Made Dresses

Garment lines	Measurements			Size	Number of dresses
	Minimum	Mean	Maximum	Groups	
Armscye line, front	7.38	8.75	10.25	14	50
	7.25	9.00	10.13	16	49
	8.25	9.25	10.38	18	51
Armscye line, back	7.38	8.50	10.00	14	50
	7.13	8.75	10.50	16	49
	7.38	9.00	11.38	18	51
Drop of shoulder Chest to neck, front	4.25	6.00	7.13	14	50
	4.13	5.75	7.25	16	49
	4.63	6.25	7.63	18	51
Chest to armscye, front	3.50	4.25	6.00	14	50
	3.75	4.50	6.38	16	49
	4.00	4.50	5.38	18	51
Chest to neck, back	4.63	6.00	8.13	14	50
	4.13	6.00	8.00	16	49
	4.00	6.25	8.13	18	51
Chest to armscye, back	3.00	4.50	6.13	14	50
	2.50	4.50	7.00	16	49
	3.00	4.50	6.50	18	51
Width of chest	12.50	13.75	16.00	14	50
	12.75	14.00	16.88	16	49
	13.25	14.50	16.38	18	51
Width of back	12.38	14.00	15.50	14	50
	13.25	14.25	15.38	16	49
	12.50	14.75	17.38	18	51
Bust line, front	16.63	18.25	20.00	14	50
	17.13	19.00	21.25	16	49
	16.13	19.25	21.38	18	51

Table 2, cont'd

Garment lines	Measurements			Size	Number of dresses
	Minimum	Mean	Maximum	Groups	
Bust line, back	15.00	17.50	19.38	14	50
	15.63	18.25	19.38	16	49
	17.25	19.00	20.38	18	51
Waist line, front	13.63	15.00	16.63	14	50
	13.75	15.75	17.13	16	49
	14.88	16.50	18.25	18	51
Waist line, back	13.00	14.25	16.00	14	50
	13.25	15.00	16.50	16	49
	14.50	16.00	18.00	18	51
Hip line, front	17.38	19.00	20.88	14	50
	18.00	19.75	22.00	16	49
	17.88	20.75	23.00	18	51
Hip line, back	16.38	18.75	20.00	14	50
	15.50	19.75	21.50	16	49
	19.00	20.50	22.13	18	51
French dart line to bust	9.00	9.00	9.00	14	50
	9.50	9.50	9.50	16	49
	10.00	10.00	10.00	18	51
French dart line to waist, front	13.65	15.50	17.50	14	50
	13.75	15.50	18.00	16	49
	14.50	16.00	17.75	18	51
French dart line to waist, back	13.25	15.00	16.88	14	50
	12.75	15.25	17.00	16	49
	14.00	15.50	18.38	18	51
French dart line to bottom of dress	43.00	48.00	52.00	14	50
	45.00	48.50	52.38	16	49
	45.38	48.50	52.00	18	51
Length of sleeve to elbow	12.00	13.50	15.50	14	17
	12.75	14.50	16.50	16	18
	12.50	13.75	16.00	18	11

Table 2, cont'd

Garment lines	Measurements: Mini-mum	Mean	Maxi-mum	Size: Groups	Number of dresses
Full length of sleeve	21.00	23.25	24.75	14	24
	21.13	24.00	26.25	16	27
	21.63	23.50	26.50	18	26
Base of sleeve cap	11.00	14.25	18.50	14	31
	11.88	13.75	17.00	16	30
	12.00	13.75	16.38	18	38
Width of sleeve at elbow	10.00	11.00	13.00	14	19
	8.75	10.75	12.00	16	19
	10.13	11.75	13.13	18	14
Width of sleeve at wrist	6.50	7.25	8.50	14	22
	6.50	7.50	8.13	16	22
	5.88	7.75	11.00	18	23
Sleeve cap height	3.00	3.75	5.00	14	41
	2.88	3.75	5.13	16	42
	2.63	3.75	4.88	18	45
Sleeve cap width	6.38	8.50	11.00	14	39
	5.88	8.00	11.00	16	41
	6.25	7.75	10.25	18	44

was greater from size 16 to 18. In some cases there was no increase from size 14 to 16, while a definite increase existed from size 16 to 18. Again, the order of increase might be reversed. In the case of the sleeve cap height there was no increase of measurement between either of the size groups.

The greatest variations from the mean for the various dress measurements were as follows: the French dart line to the bottom of the dress for size 14 showed a range of 9 inches; the back hip line for size 16 dresses, 6 inches; the width of back for size 18 dresses, 5 7/8 inches; and the base of the sleeve cap for size 14 dresses, 7 1/2 inches. Other measurements that showed variation to a lesser degree were the back bust line for size 14 dresses, 4 3/8 inches; the width of back for size 16 dresses, 2 1/8 inches; the French dart line to the waist front for size 16 dresses, 4 1/4 inches; and the back waist line for size 18 dresses, 3 1/2 inches. These variations may be attributed to differences in fitting qualities rather than to variations due to the style element. These data are to be found in Table 2.

In some few instances such as the full length of sleeve, the width of the sleeve at the elbow and wrist, and the sleeve cap height and width, the investigators were unable to obtain measurements on all the garments. This was due to the style element. In such cases the measurements

were disregarded and the fact is so indicated through a decreased number of measurements recorded.

Comparison of Garment with Physical Measurements

A comparison of the mean physical and dress measurements revealed that the differences between physical and dress measurements varied in amount from one measurement to another and from one size group to another.

The front armseye line of the dresses in sizes 14 and 16 was 1½ inches larger than the corresponding body lines; the similar measurement in size 18 was 2 inches larger than the body.

The back armseye line of the dresses in the three size groups was 1½ inches larger than the corresponding physical measurements.

In size 14 the measurement of the front drop of the shoulder on the human figure was 3/4 inch greater than the corresponding measurement on the dresses; in size 16 the physical and dress measurements were identical; and in size 18 the drop of the shoulder of the dress was 1/4 inch greater.

In sizes 14 and 16 the physical measurement of the back drop of the shoulder was 3/4 inch larger than the dress measurement; in size 18 the physical measurement was 1/2 inch larger.

The chest measurements on the dresses of sizes 14 and 16 were 1⅝ inches larger than the physical measurements; in size 18 dresses the chest measurement was 2 inches larger.

The mean measurement of the width of back on dresses of sizes 14 and 16 was 1 inch larger than the corresponding physical measurement; the dress measurement was 1½ inches larger for size 18.

The mean front bust measurement of the dresses proved to be larger than the physical in all three size groups, 2 inches for size 14 and 16 and 3/4 inch for size 18.

The back bust measurement of the dresses was 1¼ inches larger than the physical measurement for size 14; 1½ inches larger for size 16; and 1⅝ inches larger for size 18.

The front waist line of the dresses in sizes 14 and 16 was 1½ inches greater than the body measurement; the corresponding measurement in size 18 dresses was 1⅝ inches greater.

The back waist line of the dresses of sizes 14 and 16 was 2⅝ inches larger than the corresponding body measurement; in the group of dresses of size 18, the measurement was 3¼ inches larger.

The mean front hip measurement of size 14 dresses was 1/4 inch larger than the corresponding physical measurement; in sizes 16 and 18 the dresses were 3/4 inches larger.

The back hip measurement of the dresses exceeded that of the human figure by 1/4 inch in the three size groups.

The dress and physical measurements of the French dart line to the bust were identical for each size group. The mean measurement was taken on the body for each size group and the result used to establish the bust line on the dress.

The front measurement of the French dart line to the waist was greater on the dresses than the body measurements in all three size groups; 1 inch for size 14 and 1/2 inch for sizes 16 and 18.

In sizes 14 and 16 the dress measurement of the French dart line to the waist in back was 1/2 inch larger than the body measurement; in size 18 it was 3/4 inch larger.

The measurement of the French dart line on the body to within 10 inches of the floor compared with the French dart line to the bottom of the dress, showed that in size 14 the dresses were 1 inch longer than the body measurement; in size 16, 1/2 inch longer; and in size 18 there was no difference.

The sleeve measurement of size 14 dresses was 1/4 inch longer than the arm measurement of the corresponding group; for size 16 dresses it was 3/4 inches longer; and for size 18 the measurements were identical.

There was considerable variance in the measurement of the length of arm to the elbow for the three size groups. In size 14 the dresses were 1/4 inch longer than the arm measurement; in size 16 they were 1 inch longer; and in size

18 there was no variation.

The measurement of the circumference of the upper arm was comparable to the measurement of the base of the sleeve cap on the dresses. In size 14 the base of the sleeve cap was 4⅛ inches larger than the circumference of the upper arm; 3¼ inches larger for size 16 dresses; and 2⅜ inches larger for size 18 dresses.

There was considerable variation in the measurements of the circumference of the elbow. The dress measurement was 1 inch larger for size 14 dresses; 3/4 inch larger for size 16; and 1½ inches larger for size 18 dresses than the mean measurements of the body.

The wrist measurement on the dresses was 1⅛ inches larger than the physical measurement for sizes 14 and 16, and 1⅝ inches larger for size 18.

The physical measurement of the sleeve cap height was greater than the dress measurement by 1½ inches for sizes 14 and 16, and 1⅛ inches for size 18.

In all three groups of dresses the sleeve cap width was greater than the body measurement: 2½ inches for size 14; 2⅛ inches for size 16; and 2¼ inches for size 18.

The relations discussed above are to be found in Table 3. A graphic presentation of this material is given in figures 1, 2, and 3.

Table 3. Comparison of the Mean Physical and Dress Measurements

Body and garment lines	Measurements		Inches larger than body	Size Groups
	Body	Garment		
Armscye line, front	7.00	8.75	1.75	14
	7.25	9.00	1.75	16
	7.25	9.25	2.00	18
Armscye line, back	7.00	8.50	.50	14
	7.25	8.75	1.50	16
	7.50	9.00	1.50	18
Drop of shoulder, front	1.50	1.75	.25	14
	1.75	1.25	.50*	16
	1.50	1.75	.25	18
Drop of shoulder, back	2.25	1.50	.75*	14
	2.25	1.50	.75*	16
	2.25	1.75	.50*	18
Width of chest	12.00	13.75	1.75	14
	12.25	14.00	1.75	16
	12.50	14.50	2.00	18
Width of back	13.00	14.00	1.00	14
	13.25	14.25	2.00	16
	13.50	14.75	1.25	18
Bust line, front	16.25	18.25	2.00	14
	17.00	19.00	2.00	16
	18.50	19.25	.75	18
Bust line, back	15.75	17.50	1.75	14
	17.00	18.25	1.25	16
	17.50	19.00	1.50	18
Waist line, front	13.75	15.00	1.25	14
	14.50	15.75	1.25	16
	15.00	16.50	1.50	18
Waist line, back	11.50	14.25	2.70	14
	12.25	15.00	2.75	16
	12.75	16.00	3.25	18

*Body measurement larger than dress.

Table 3, cont'd

Body and garment lines	Measurements		Inches larger than body	Size Groups
	Body	Garment		
Hip line, front	18.75	19.00	0.25	14
	19.00	19.75	.75	16
	20.00	20.75	.75	18
Hip line, back	17.75	18.75	1.00	14
	18.50	19.75	1.25	16
	19.00	20.50	1.50	18
French dart line to bust	9.00	9.00	.00	14
	9.50	9.50	.00	16
	10.00	10.00	.00	18
French dart line to waist, front	14.50	15.50	1.00	14
	15.00	15.50	.50	16
	15.50	16.00	.50	18
French dart line to waist, back	14.50	15.00	.50	14
	14.75	15.25	.50	16
	14.75	15.50	.75	18
French dart line:	47.00	48.00	1.00	14
To within 10 in. of floor	48.00	48.50	.50	16
To bottom of dress	48.50	48.50	.00	18
Outer length of arm to elbow	13.25	13.50	.25	14
	13.50	14.50	1.00	16
Outer length of sleeve to elbow	13.75	13.75	.00	18
Full length of arm	23.00	23.25	.25	14
Full length of sleeve	23.25	24.00	.75	16
	23.50	23.50	.00	18
Circumference of upper arm	9.75	14.25	4.50	14
	10.50	13.75	3.25	16
Base of sleeve cap	11.00	13.75	2.75	18

Table 3, cont'd

Body and garment lines	Measurements		Inches larger than body	Size Groups
	Body	Garment		
Circumference of elbow	10.00	11.00	1.00	14
	10.25	10.75	.50	16
	10.50	11.75	1.25	18
Circumference of wrist	5.75	7.25	1.50	14
Width of sleeve at wrist	6.00	7.50	1.50	16
	6.00	7.75	1.75	18
Sleeve cap height	5.00	3.75	1.25*	14
	5.25	3.75	1.50*	16
	5.25	3.75	1.50*	18
Sleeve cap width	5.25	8.50	2.75	14
	5.50	8.00	2.50	16
	5.50	7.75	2.25	18

*Body measurement larger than dress.

These data reveal that with the exception of a few cases there seems to be no definite rate of increase in the measurements of the dresses from one size group to another when compared with those of the body. In some measurements the body and dress measurements are identical for size 18; considering the same measurements in size 16, those of the dresses were found to be much greater than the body; while in size 14 only a small variation existed between the body and garment measurements.

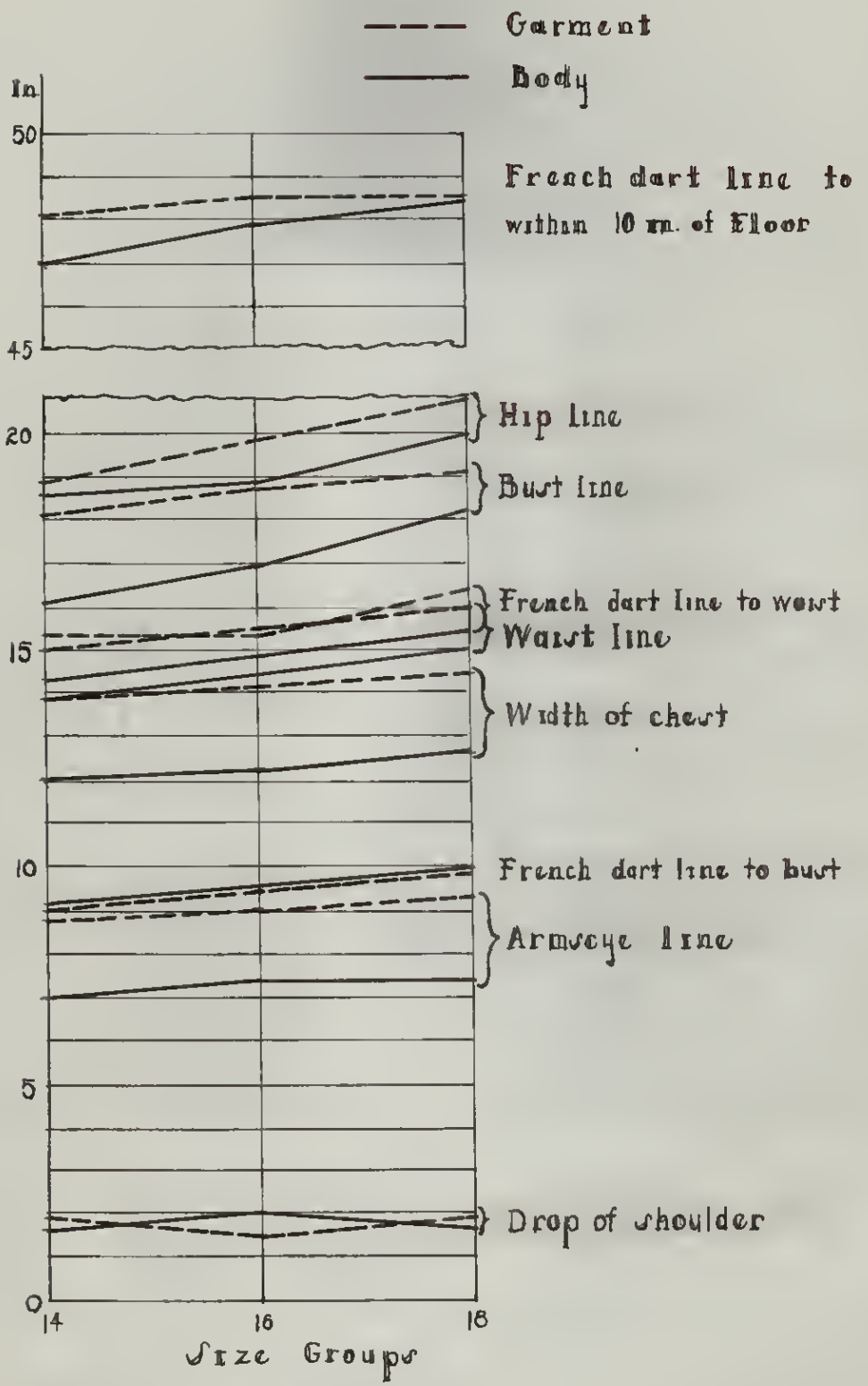


Figure I Comparison of front body and dress Measurements based upon the mean

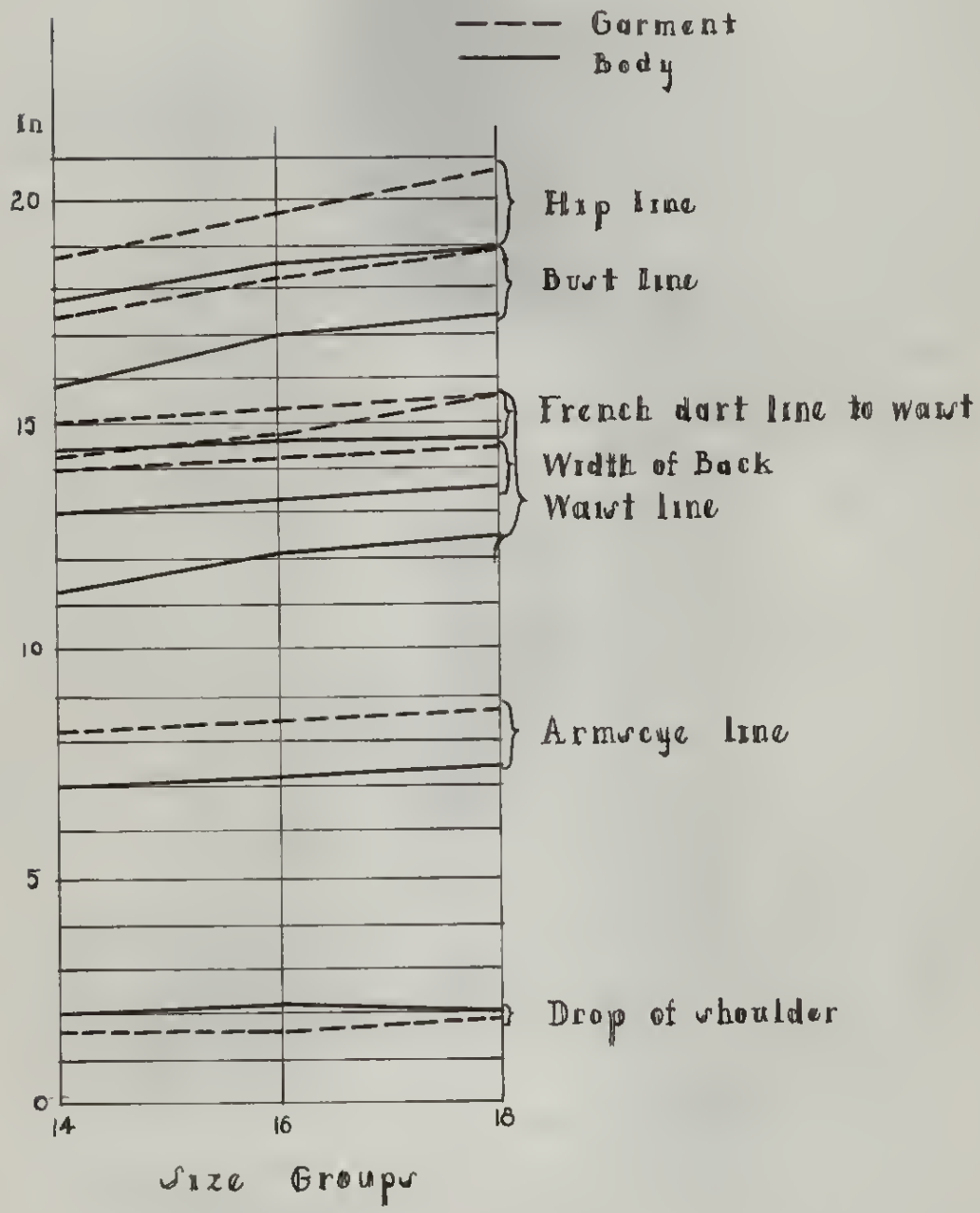


Figure 2 Comparison of Back Body and Dress Measurements based upon the mean

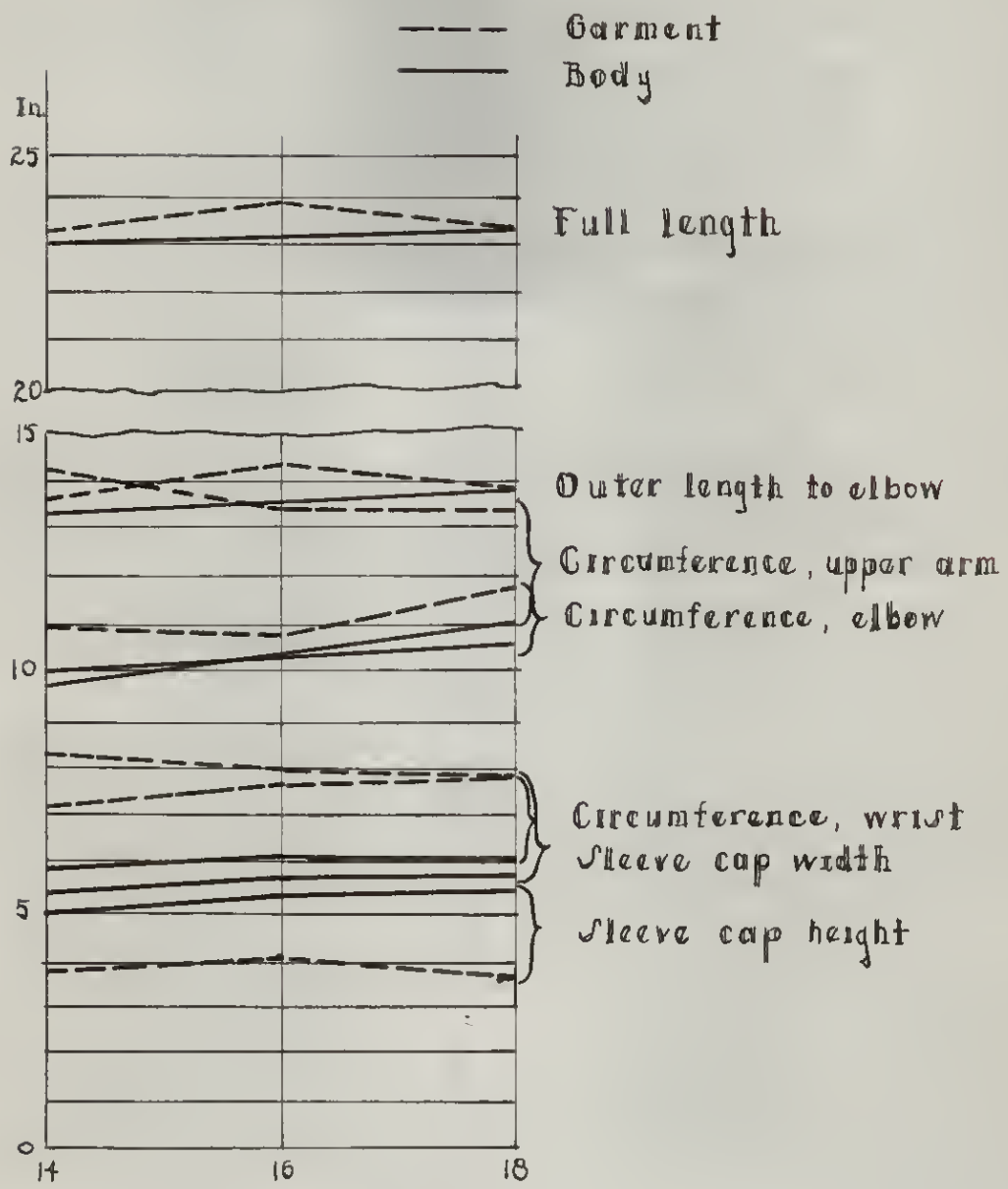


Figure 3 Comparison of Body and sleeve measurements based upon the mean

In some cases the same increase in dress measurements over body measurements existed for sizes 14 and 16. When this occurred the amount of increase might be greater for size 18. When sizes 16 and 18 showed the same increase, the amount of increase might be greater for size 14.

In other cases the increase in the measurement of the dresses over body measurements was smaller for size 18 than for sizes 14 and 16.

In some few cases such as the front and back drop of the shoulder, and the sleeve cap height, the body measurements were greater than the dress measurements.

The examples cited suggest only in part the existing differences between garment and body measurements. These, however, suggest that there is little uniformity in the allowances made in garments for ease of movement and variations due to style.

Because of the lack of definite specifications for garment measurements it is difficult to judge the adequacy of the amount allowed for ease of movement or that allowed to meet style requirements. For this reason definite conclusions cannot be drawn as to the tolerances in measurements necessary beyond the actual measurements of the body.

Nevertheless, it would seem that a definite rate of increase in dress measurements, from one size group to another would be desirable, and would help to eliminate some of the

difficulties met by the dress consumer. A revolution in the standardization of sizes for commercially made garments is not to be expected from such studies as this, but it is hoped that they may serve to emphasize the need for some uniformity in garment measurements.

Observation has often shown that the under arm seam of a dress, when worn, swings either to front or back. A comparison of the mean front and back waist measurements and similar hip measurements of the body and of the dress showed that the front and back dress measurements did not vary to as great an extent as did the physical measurements. Data relating to these facts may be found in Tables 4 and 5.

Variations of the Physical and Dress Measurements from the Mean

Among the measurements obtained from the 146 subjects and the 150 commercially made dresses in the three size groups, quite a variation existed from the mean. In all measurements there were fewer cases coinciding with the mean measurement than there were cases either greater or less than the mean.

The mean of the front waist measurement on the body for size 14 was 13¾ inches. Of the 51 cases measured, 23 proved to be less than the mean, 6 coincided with it, and 22 were greater.

Table 4. Relation Existing between the Front and Back Waist Measurements of the Body and the Dresses

Size	Number cases measured	Number cases front larger than back	Amount variation in inches	Number cases back larger than front	Amount variation in inches	Number cases variation one inch or less	Number cases having no variation
			(a) Body Measurements				
14	51	48	1/8-4 3/8	3	2/8-2 5/8	9	0
16	51	46	1/8-5 1/4	4	6/8-1	10	1
18	44	39	1/8-6 1/8	5	3/8-1	9	0
			(b) Dress Measurements				
14	50	38	1/8-2 1/4	9	3/8-1 3/8	31	3
16	49	37	1/8-2 4/8	8	1/8-5/8	30	4
18	51	42	1/8-2 1/2	6	1/4-1 1/4	35	3

Table 5. Relation Existing between the Front and Back Hip Measurements of the Body and the Dresses

Size	Number cases measured	Number cases front larger than back	Amount variation in inches	Number cases back larger than front	Amount variation in inches	Number cases variation one inch or less	Number cases having no variation
			(a) Body Measurements				
14	51	35	1/8-2 1/8	16	2/8-2 1/8	25	0
16	51	33	1/8-6 3/8	18	1/8-7 3/8	20	0
18	44	27	1/8-4 1/2	16	1/8-4 4/8	19	1
			(b) Dress Measurements				
14	50	34	1/8-2 1/8	14	2/8-1 3/8	35	2
16	49	26	1/8-3 4/8	17	1/8-3	33	6
18	51	27	1/8-2 3/8	19	1/8-2 7/8	40	5

The mean measurement of the French dart line to the bust on the body for size 14 was 9 inches. Of the 51 cases measured, 10 fell within the mean, 18 were less, and 23 were greater than the mean measurement.

The mean measurement of the circumference of the elbow for size 14 was 10 inches. Eight cases corresponded to the mean measurement, 12 were less than the mean, and 31 were greater.

The mean of the back hip measurement of 50 dresses of size 14 was 18⅝ inches. Six cases coincided with the mean measurement, 18 were less than the mean, and 26 were greater.

The mean of the front waist measurement of 50 dresses for size 14 was 15 inches. Twenty-five measurements were less than the mean, 6 coincided with it, and 19 were greater.

The mean of the back hip measurement of the 51 women measured who corresponded to size 16 was 18½ inches. Twenty-one had a hip measurement smaller than the mean, 1 corresponded to it, and 29 were greater.

Of the 51 women measured who corresponded to size 16, the mean measurement on the French dart line to the floor was 58 inches. Twenty-four of these were less than the mean, 3 corresponded to it, and 24 were greater than the mean measurement.

The mean measurement of the French dart line to the waist front of 49 size 16 dresses was 15½ inches. Twenty-

four measurements were less than the mean, none fell within the mean, and 25 were greater.

The mean measurement of the width of chest of the 49 size 16 dresses was 14 inches. Twenty-one measurements were less than the mean, 4 corresponded to it, and 24 were greater.

The mean measurement for the full length of outer arm for size 18 was 23½ inches. Of the 44 women measured 18 proved to be greater than the mean, 1 corresponded to it, and 26 were less than the mean measurement.

The mean of the front hip measurement for size 18 was 20 inches. Of the 44 women measured 24 proved to have a front hip measurement less than the mean, 2 corresponded to it, and in 18 cases the measurement was greater.

The mean measurement of the front bust line of the 51 dresses measured for size 18 was 19½ inches. Of this number 28 were less than the mean, 3 coincided with it, and 18 were greater.

The mean measurement of the base of the sleeve cap for size 18 dresses was 13⅞ inches. Of the 36 dresses measured 19 were less than the mean, none coincided with it, and 18 were greater than the mean measurement.

In this discussion no attempt has been made to give all of the measurements, but rather to discuss a few that seemed the most representative. Table 6 gives a complete record of

the variations from the mean measurements.

The largest proportion of any physical measurements coinciding with the mean was 20 per cent. This occurred in the measurements of the French dart line to the bust for size 14; the circumference of the wrist for sizes 14, 16 and 18; and the sleeve cap height for size 18.

The differences in skeletal proportions and muscular development between individual subjects is evident from these data. The number coinciding for other measurements studied varied, but in no other case were there as many as for the measurements named.

The largest proportion of dress measurements coinciding with the mean was 16 per cent in the case of the back French dart line to the waist in size 18 dresses. The waist line back in size 16, the French dart line to the waist in back for size 14, and the French dart line to the bottom of the dress in size 14 coincided with the mean in 14 per cent of the cases. All others showed fewer measurements coinciding with the mean.

Table 6. Variation from the Mean of Body and Dress Measurements of Each Size Group

Lines measured	Mean measurements in inches		Number of cases			Size
	Dress	Body	Coincide with mean	Greater than mean	Less than mean	Groups
Armseye line, front	--	7.00	9	25	17	14
	8.75	--	5	29	16	14
	--	7.25	1	22	28	16
	9.00	--	2	28	19	16
	--	7.25	6	20	18	18
	9.25	--	4	27	20	18
Armseye line, back	--	7.00	5	20	26	14
	8.50	--	3	24	20	14
	--	7.25	6	22	23	16
	8.75	--	1	28	18	16
	--	7.50	5	20	19	18
	9.00	--	6	19	26	18
Width of chest	--	12.00	4	20	27	14
	13.75	--	0	24	25	14
	--	12.25	6	22	23	16
	14.00	--	4	24	21	16
	--	12.50	1	25	19	18
	14.50	--	4	20	27	18
Width of back	--	13.00	3	22	26	14
	14.00	--	4	22	24	14
	--	13.25	2	27	22	16

Table 6, cont'd

Lines measured	Mean measurements in inches		Number of cases			Size
	Dress	Body	Coincide with mean	Greater than mean	Less than mean	Groups
Width of back	14.25	--	1	23	24	16
	--	13.50	5	22	17	18
	14.75	--	3	19	29	18
Bust line, front	--	16.25	2	20	29	14
	18.25	--	2	20	27	14
	--	17.00	2	29	20	16
	19.00	--	5	16	28	16
	--	18.50	3	23	18	18
	19.25	--	3	18	28	18
Bust line, back	--	15.75	3	21	21	14
	17.50	--	3	25	21	14
	--	17.00	4	19	28	16
	18.25	--	4	24	21	16
	--	17.50	3	18	23	18
	19.00	--	1	25	24	18
Waist line, front	--	13.75	6	22	23	14
	15.00	--	6	19	25	14
	--	14.50	2	23	26	16
	15.75	--	2	23	24	16
	--	15.00	5	23	16	18
	16.50	--	5	25	20	18
Waist line, back	--	11.50	1	29	21	14
	14.25	--	4	19	26	14
	--	12.25	3	23	25	16
	15.00	--	7	21	21	16

Table 6, cont'd

Lines measured	Mean measurements in inches		Number of cases			Size
	Dress	Body	Coincide with mean	Greater than mean	Less than mean	Groups
Waist line, back	--	12.75	0	11	33	18
	16.00	--	4	23	23	18
Hip line, front	--	18.75	1	24	26	14
	19.00	--	2	25	22	14
	--	19.00	1	30	20	16
	19.75	--	5	25	19	16
	--	20.00	2	18	24	18
	20.75	--	2	18	29	18
Hip line, back	--	17.75	0	27	24	14
	18.75	--	6	25	18	14
	--	18.50	1	29	21	16
	19.75	--	4	21	23	16
	--	19.00	1	20	23	18
	20.50	--	4	27	20	18
French dart line to bust	--	9.00	10	23	18	14
	9.00	--	*	--	--	14
	--	9.50	5	28	18	16
	9.50	--	*	--	--	16
	--	10.00	2	22	19	18
	10.00	--	*	--	--	18

*Dress measurement for French dart line to the bust based upon mean physical measurement.

Table 6, cont'd

Lines measured	Mean measurements in inches		Number of cases			Size
	Dress	Body	Coincide with mean	Greater than mean	Less than mean	Groups
French dart line to waist, front	--	14.50	3	28	20	14
	15.50	--	3	15	32	14
	--	15.00	1	24	26	16
	15.50	--	0	25	24	16
	--	15.50	3	19	22	18
	16.00	--	4	20	27	18
French dart line to waist, back	--	14.50	3	23	25	14
	15.00	--	7	23	20	14
	--	14.75	1	23	26	16
	15.25	--	4	27	17	16
	--	14.75	2	24	18	18
	15.50	--	8	16	27	18
French dart line:						
To within 10 in. of floor	--	47.00	4	23	24	14
To bottom of dress	48.00	--	7	22	21	14
To within 10 in. of floor	--	48.00	3	24	24	16
To bottom of dress	48.50	--	2	21	26	16
To within 10 in. of floor	--	48.50	0	22	22	18
To bottom of dress	48.50	--	2	24	24	18
Outer length of arm to elbow	--	13.25	0	23	28	14
Outer length of sleeve to elbow	13.50	--	1	8	8	14
Outer length of arm to elbow	--	13.50	5	22	24	16
Outer length of sleeve to elbow	14.50	--	2	7	9	16
Outer length of arm to elbow	--	13.75	2	24	18	18
Outer length of sleeve to elbow	13.75	--	0	6	5	18

Table 6, cont'd

Lines measured	Mean measurements in inches		Number of cases			Size
	Dress	Body	Coincide with mean	Greater than mean	Less than mean	Groups
Full length of arm	--	23.00	3	21	27	14
Full length of sleeve	23.25	--	0	12	12	14
Full length of arm	--	23.25	2	21	28	16
Full length of sleeve	24.00	--	2	14	11	16
Full length of arm	--	23.50	0	26	10	18
Full length of sleeve	23.50	--	1	13	12	18
Circumference of upper arm	--	9.75	5	23	23	14
Base of sleeve cap	14.25	--	0	13	18	14
Circumference of upper arm	--	10.50	5	18	28	16
Base of sleeve cap	13.75	--	0	12	15	16
Circumference of upper arm	--	11.00	2	18	24	18
Base of sleeve cap	13.75	--	0	17	19	18
Circumference of elbow	--	10.00	8	31	12	14
Width of sleeve at elbow	11.00	--	0	7	12	14
Circumference of elbow	--	10.25	9	22	20	16
Width of sleeve at elbow	10.75	--	3	7	9	16
Circumference of elbow	--	10.50	2	23	19	18
Width of sleeve at elbow	11.75	--	0	7	7	18
Circumference of wrist	--	5.75	10	27	14	14
Width of sleeve at wrist	7.25	--	2	11	9	14
Circumference of wrist	--	6.00	10	17	24	16
Width of sleeve at wrist	7.50	--	2	9	11	16
Circumference of wrist	--	6.00	11	25	8	18
Width of sleeve at wrist	7.75	--	0	9	14	18

Table 6, cont'd

Lines measured	Mean measurements in inches		Number of cases			Size
	Dress	Body	Coincide with mean	Greater than mean	Less than mean	Groups
Sleeve cap height	--	5.00	8	27	16	14
	3.75	--	1	19	21	14
	--	5.25	3	22	26	16
	3.75	--	2	22	18	16
	--	5.25	7	22	15	18
	3.75	--	6	19	20	18
Sleeve cap width	--	5.25	6	29	16	14
	8.50	--	3	18	16	14
	--	5.50	7	14	30	16
	8.00	--	1	19	19	16
	--	5.50	10	15	19	18
	7.75	--	1	19	24	18

The correlation coefficient and probable error between certain measurements on the human body taken by two investigators show a relation of significance to exist. Between the measurements taken of the full length of the arm, the relation may be expressed as 0.99 ± .001; for the chest line, 0.96 ± .004; for the French dart line to the floor, 1.0 ± .000; the hip line, 0.93 ± .007; the armseye line entire, 0.87 ± .013. This was determined by the product-moment correlation coefficient, the formula for which is

$$r_{xy} = \frac{\Sigma xy}{\sqrt{\Sigma x^2 \, \Sigma y^2}}$$

when x and y are the measurements taken by the two investigators, respectively.

The probable error of the coefficient of correlation was determined in the five cases by using the following

$$P.E. = \frac{.6745 \, (1-r^2)}{\sqrt{N}}$$

From these results, it is seen that the relationship existing between the measurements taken of the same subject by two investigators is significant. That of the entire armseye line is the lowest, 0.87 ± .013, but this shows a significant relationship existing between the two measurements.

The relationship existing between the two groups of measurements of the French dart line to the floor is indicated by a perfect coefficient of correlation. A closer correlation exists for those measurements taken over the skeletal frame work of the body, than is found for the measurements taken on the muscular or fleshy parts.

SUMMARY

Certain measurements of 146 college women varying from 59 to 68 inches in height, from 100 to 145 pounds in weight, and from 31 to 36.9 inches bust measure, compared with 150 commercially made dresses in sizes 14, 16 and 18 indicate that:

1. The mean physical and dress measurements varied in amount from one measurement to another, and from one size group to another.

2. There seemed to be little relation between the increase in each measurement of the commercially made dress from one size group to another.

3. In a majority of cases a fairly definite rate of increase existed between the mean measurements of the human figure from one size group to another.

4. The greatest variations from the mean of the various dress measurements were as follows: the French dart line to the bottom of the dress for size 14 dresses, 9 inches; the back hip line for size 16 dresses, 6 inches; the width of the sleeve at the wrist for size 18 dresses, 5 1/8 inches, the base of the sleeve cap for size 14 dresses, 7 1/2 inches.

5. A relationship of significance existed between the measurements taken by the two investigators.

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