

A COMPARISON OF THE RELATIONSHIP EXISTING BETWEEN CERTAIN
BODY MEASUREMENTS OF A SELECTED GROUP OF WOMEN

by

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B. S., Kansas State College
of Agriculture and Applied Science, 1929

A THESIS

submitted in partial fulfillment of the

requirements for the degree of

MASTER OF SCIENCE

KANSAS STATE COLLEGE
OF AGRICULTURE AND APPLIED SCIENCE

1933

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INTRODUCTION

A growing interest is evidenced in simplified practice in the field of clothing and textiles. This has touched for the most part those commodities which are not affected by style and design, or those qualities of a commodity little regulated by these factors. Underwear sizes for men, women, and children have been standardized (Commercial Standards, 1929); the same may be said for the sizes of men's and boys' shirts (Commercial Standards, 1929). Simplified practices as regards hosiery length have been adopted as a commercial standard (Federal Standard Stock Catalogue, 1932). As a result, in these instances, difficulties due to an endless number of sizes have been eliminated for both the merchant and the consumer.

Commercial standards have been adopted for the measurement of patterns, the acceptance of which is voluntary for pattern makers (Dress Patterns, Commercial Standard CS13-30). This regulation concerns only a few of the measures of importance to the users of patterns. There are other measurements which have as great significance, but because the experiences and practices of dress pattern manufacturers govern their acceptance as well as the existing anthropo-

metric measurements further standardization probably will come about slowly.

Producers of commercial patterns and of ready-to-wear garments, as well as the consumers of these products, realize more each year, the desirability of standardization of garment sizes. Quantity production of the last decade has presented this need with increasing emphasis as clothing manufacturers try to supply the demands of the public.

The present lack of standardization leads to numerous difficulties in fitting and altering, because the measurements often do not correspond to those of the individual figure, and two makes seldom show conformity of line measurements. This is a natural result of the present day system of cutting, by which most patterns and a large number of garments are made without knowledge of the individual who will use them. It then follows that alterations must be made, which result in increased costs to the purchaser.

A study made by the Bureau of Home Economics shows that the problems of altering and fitting patterns, as well as of ready-made garments, present more difficulty than do any others to women who do their own sewing. Wastes incurred in the attempt to gain a properly fitted garment are responsible for a considerable part of the eight and one-

half billion dollar annual clothing bill of the United States (Campbell, 1927).

Information concerning the relationships existing between certain body measurements other than the standard proportions of waist and hip to a given bust measure should be of value in pointing the need for the adoption of further standards.

The misfit of a garment is usually centered at some point of construction such as the armseye, sleeve cap, or shoulder. Many difficulties in fitting a garment arise when the armseye is cut too low. It seems that the establishing of a mean vertical depth of the armseye would eliminate many sleeve fitting problems. It appears reasonable that the vertical armseye depth should bear a relationship to some other vertical line of the human body.

While many difficulties in sleeve fitting arise because an armseye is cut too low, it is possible that other garment fitting problems can be traced to the poorly cut shoulder line. This line, properly adjusted in fitting, gives the swing to the entire garment. It often requires altering because the drop of the shoulder line varies among individuals and among different makes of patterns. The determination of the mean drop of the shoulder line, front

and back, would be of value in both cutting and fitting of garments.

Another source of difficulty in fitting sleeves arises because of incorrect proportions of the sleeve cap. It must often be widened or lengthened. It is believed that this is necessary because the top of the arm rounds out as flesh is added to the circumference of the upper arm, thus requiring more ample proportions. If a ratio of cap length to arm circumference could be established this difficulty would be partially solved and fewer changes would be necessary during the fitting process.

Recognition is given the fact that there is a wide variation in the physical measurements of persons, and that sufficient data to conclusively establish relationships cannot be collected in a brief study such as this, but the need for further study of these body measurements may be made evident.

PURPOSE

The purpose of this study was to determine what relationship exists between:

- (a) The length of the French dart line and the vertical depth of the armseye.
- (b) The length of the sleeve cap and the circumference of the upper arm.
- (c) The drop of the front and back shoulder lines.

REVIEW OF LITERATURE

Any study of the relationship existing between body measurements may be thought of as one phase of anthropometric investigation. This science was developed primarily for purposes of art rather than those of physiology or anthropology (Hrdlicka, 1919). Originally artists did not consider the true proportion of the human body, but tried to present an ideal that corresponded closely to the modern conventionalized forms. Artists, therefore, have been primarily concerned with the study of human proportions, and actual measurements of physical development have been left to specialists in other fields.

Those who have done the most work on the problem of physical measurements are the investigators who have had as

their object the determination of the relation of growth to health and education. Studies have been conducted with various objects in view, but with few exceptions these have been made by people untrained in anthropometry and for this reason the figures obtained are practically useless for means of comparison (O'Brien, 1930).

The system for obtaining measurements used in Anthropometry is not rigid, and is subject to such changes as may, in the course of time, be found advisable. Many attempts have been made since 1890 to secure international unification of Anthropometric measures and the first two reports to the International Congress of Prehistoric Anthropology have been adopted (Hrdlicka, 1919).

The need for a uniform and well understood system of procedure has been recognized since the 18th International Congress held in London in 1912 which laid the foundation for an international association of anthropologists in an attempt to bring about some standardization of method (Hrdlicka, 1919).

Nystrom (1928) sees possibilities of sometime using results of anthropometric research for Clothing and Textiles Research. He said, "The science underlying correct garment and pattern sizes is anthropometry, the science of human

physical measurements. It is well developed, but is so highly specialized that it is, perhaps, not so widely known and appreciated as many others. Any investigations made for the purpose of setting up suitable garment measurements should utilize the progress already made in this science." A review of certain studies treating of physical development and proportions is of interest in connection with this investigation.

A. Dastre (1904) says that no one has gone further than L. Manouvrier in determining precisely the relation, long ignored, that exists between the various parts of the skeleton. He made a sort of chart for ready reckoning, by the aid of which, from the dimensions of the femur and tibia, can be deduced the height and size of the human body, itself. His basic work was published in 1892; in 1902 he issued a study upon anthropometric relations and the principal proportions of the body, in which he proved that man's stature has not undergone any important changes or variations during the hundreds of thousands of years since his appearance upon the globe.

Recently a group of 350 women were measured by Goldstein and Goldstein (1928) to determine the number of head-lengths in the average woman's height. They found it to be

7.5009 headlengths. We are reminded that relationships exist more or less prevalently throughout human proportions.

At the close of the World War, Love, Ireland and Davenport (1921) directed the measurement of 100,000 soldiers to obtain measurements for the construction of uniforms. This seems to be the first published report of body measurements with clothing construction in view.

Several studies have been reported which deal with body measurements as they are related to the standardization of pattern sizes. Such investigations indicate the importance of a thorough understanding of the proportions of the human figure in the solution of fitting problems.

Little (1928) made a comparative study of the measurements of 583 women and 130 commercial patterns. Great differences were found in the measurements of the women but even greater discrepancies were observed in the patterns. The patterns did not agree with either the median or the maximum physical measurements as to rate of increase of size. The author concludes that this is because of a lack of standardization of sizes. It assuredly signifies a need of greater uniformity of proportions among patterns, which would, at least, result in the ability to predict similar alterations of patterns produced by one manufacturer.

Morgan (1931) studied the mature woman and found a typical distribution of body mass which she expressed in terms of the norm for the measurements taken for each subject. The majority of measurements clustered around the norm of the corresponding size of patterns. This fact seems to indicate that some attempt has been made to relate pattern sizes to human proportions, and it may be construed to show that effective work along the line of standardization of sizes is eventually possible.

La Fleur (1931) reported some important findings in her study in regard to variations in measurement of certain body lines. The least variation was in the size of the shoulder of her subjects. In no case was it found to deviate more than one-half inch from the median shoulder measurement. She also found that the greatest deviation was in the hip and waist measures of her group of subjects. If this investigation could be carried further by collecting sufficient data to insure conclusive results, these facts would be of considerable value to pattern manufacturers.

Eddy and Wiley (1932) made a study of eight commercial patterns, in which they found a great variation among the different makes as to front and back shoulder slant, the front slant varying from 1.25 to 1.88 inches and the back from 1.5 to 2.5 inches. They observed variations among

other measurements. They say, "There is a variation between the depth of the back and of the front armscye as measured from the end of the shoulder to a horizontal line running through the deepest curve of the armscye." It was seen that the depth of the front armscye varied from 5-1/2 to 6-5/8 inches, a difference of 1-1/8 inches, and the depth of the back armscye varied from 6 inches to 7-1/4 inches, a difference of 1-1/4 inches. The variations in depth of the front and back armscye range from the same depth for front and back, to 1-1/4 inches deeper in the back than in the front. Naturally, individuals differ, but it is doubted if there should be such a great variation as is found here.

In a study made by Jernberg (1932) of one hundred college women varying from 31 to 34 inches bust measure, and 110 to 130 pounds in weight, it was found that the drop of the shoulder has no relation to the height of the sleeve cap. Granting this, it still seems reasonable that the shoulder drop and also the sleeve cap length may have some definite relationships to some other measurement of the body.

In a study made by Anderson (unpublished) to determine the relation between the slope of the front shoulder line

to the slope of the back shoulder line, 22 college women varying from 31 to 35 inches bust measure, and 16 mature women were measured. The ratios of the front to the back shoulder slope were derived and their means for the two groups of women were found. These were 1:3.8 for the college group and 1:1.3 for the mature group. These findings coincide with other reports on the slope of the front and of the back shoulder lines, in that all studies find the back to drop more than the front.

The task ahead for clothing research is to determine by extensive measurements what is the mean drop for the front and the back shoulder, and on this basis establish a ratio indicating the relation existing between the two. While this task is being worked out, other measurements may be taken and data compiled by which every measurement necessary for pattern drafting and clothing construction can be reduced to a mean. Only then may we expect to reduce to a minimum the amount of alteration of patterns and garments necessary to result in a satisfactorily fitted garment.

PROCEDURE

The procedure followed in this study consisted of measuring 132 mature women varying from 62 to 68 inches in height, from 120 to 160 pounds in weight, and from 34 to 42.9 inches bust measure. The data were arranged in four groups according to bust measure, as follows:

Group I,	Bust	34	inches	to	35.9
Group II,	"	36	"	"	37.9
Group III,	"	38	"	"	39.9
Group IV,	"	40	"	"	42.9

A double stitched, 60 inch tape used for taking the measurements, was checked against the standard meter in the Physics Department of Kansas State College and found correct. It was rechecked after the data were collected and its variation was found to be negligible. All measurements were taken in the same order for each subject, in as nearly the same manner as possible and recorded as soon as read from the tape line or squares used.

The height was taken with the subject in stocking feet as she stood erect with heels touching the wall. A square placed against the wall was lowered to her head. This point was marked, and the distance to the floor measured with the tape.

The weight was recorded as reported by the subject.

All measurements were taken by the investigator with the tape held snugly in place but not tight enough to cause it to stretch.

No measurements were taken below the waist line for this study.

All location points were marked on the body with a soft pencil and tapes were used to establish lines having a bearing upon the investigation. These were center front, neck, waist, and scyeline. The scyeline for all measurements was located parallel to the floor by measuring from the scyeline to the floor in three places, and securing the scyeline marker firmly in place with clips or pins (See Plate I).

The following measurements were recorded in tables 1, 2, 3, and 4:

1. Bust line, entire
 Point of bust to center front
 " " shoulder to center back
2. Neck line
3. Scyeline
4. Shoulder line
5. Waist line
6. Armscye
7. French dart line to waist, front and back
8. Inner shoulder to scyeline, " " "
9. Outer " " " " "
10. Length of sleeve cap
11. Circumference of upper arm
12. Distance between inner shoulder to scyeline
 and outer shoulder to scyeline, front and back
13. Vertical depth of armscye

Table 1. Body Measurements (in inches) of Thirty-three Mature Women

Group I -- Bust Measure 34 to 35.9 inches

Subject	1	2	3	4	5	6	7	8	9	10	11
Weight (pounds)	121	135	125	127	140	127	120	120	120	124	132
Height (inches)	62.00	64.00	66.50	65.00	68.00	67.50	63.00	68.00	62.00	62.00	66.00
1. Bust measure, entire,	34.50	34.75	34.00	35.00	37.00	34.00	35.00	34.00	35.00	34.50	35.50
Point of bust to c. front	4.00	4.00	4.00	3.75	4.50	4.00	4.00	4.00	4.25	3.50	4.00
Tip of shoulder to c. back	3.50	4.00	4.00	4.00	3.75	4.50	4.00	3.50	4.00	6.50	4.00
2. Neck line (Front)	7.00	7.50	8.50	8.50	8.50	7.50	8.00	7.50	7.00	7.00	8.00
(Back)	6.00	6.50	5.00	6.00	6.00	6.00	6.25	6.50	6.00	7.00	6.50
3. Scye line	32.00	33.25	33.00	34.00	28.50	31.00	32.00	32.00	32.00	32.00	33.00
4. Shoulder line	4.50	4.50	4.50	5.25	5.50	4.75	5.25	5.00	5.00	5.00	5.00
5. Waist measure	30.00	28.00	27.00	30.00	31.00	27.50	29.00	26.50	24.50	29.00	30.00
6. Armseye (Front)	8.00	10.00	8.25	8.50	7.50	8.50	8.00	9.00	8.50	8.25	8.50
(Back)	7.00	8.50	8.25	7.50	7.00	7.50	8.50	7.50	7.50	7.50	8.00
7. French dart line to (Front)	16.00	15.00	16.00	16.00	18.00	15.00	16.50	16.50	16.50	16.50	17.00
waist (Back)	14.00	15.25	15.50	16.50	17.00	14.00	16.00	16.00	16.00	15.00	16.00
8. Inner shoulder to (Front)	7.50	7.75	8.25	9.00	7.50	8.00	9.00	7.50	8.00	8.50	7.00
scye line (Back)	8.25	10.00	8.25	10.00	8.00	8.50	9.50	9.00	8.75	9.00	7.50
9. Outer shoulder to (Front)	6.25	7.25	7.50	8.00	6.00	6.75	8.50	6.00	6.25	6.00	6.50
scye line (Back)	6.00	8.75	7.00	8.00	6.50	6.75	8.75	7.50	7.50	7.00	6.75
10. Length of sleeve cap	6.00	6.00	6.50	7.00	6.50	6.75	6.00	6.50	6.50	6.50	6.00
11. Circumference of upper arm	10.00	10.50	11.00	11.00	10.50	13.00	10.50	12.00	12.00	12.50	12.00
12. Distance between (Front)	4.00	4.00	4.50	4.00	4.50	4.75	4.50	5.00	5.00	4.50	4.00
measures (8) and (9) (Back)	4.00	4.00	4.00	4.00	4.50	4.00	5.00	4.50	5.00	3.00	4.00
13. Vertical depth of armseye	6.00	6.00	5.50	5.50	5.00	5.00	5.00	5.50	5.00	4.75	5.00

Table 1, Group I, cont'd

Subject	12	13	14	15	16	17	18	19	20	21	22
Weight (pounds)	145	129	123	120	129	123	130	120	125	122	120
Height (inches)	66.75	67.00	66.00	65.00	65.00	64.00	66.00	61.00	62.00	64.00	64.00
1. Bust measure, entire	35.00	35.00	34.00	35.00	35.50	35.00	35.00	34.00	35.00	34.00	34.00
Point of bust to c. front	3.75	4.00	4.00	3.50	3.75	3.50	4.00	3.50	4.00	4.00	3.50
Tip of shoulder to c. back	4.00	3.50	4.00	3.50	4.00	4.00	4.00	3.75	4.00	4.00	3.50
2. Neck line (Front)	7.50	7.50	8.00	7.00	8.50	8.50	6.00	7.00	7.00	7.50	7.00
(Back)	6.00	6.00	6.00	6.00	6.00	5.00	8.00	6.50	6.50	6.00	6.00
3. Scye line	33.00	28.00	31.00	32.00	33.00	32.00	33.00	30.00	29.00	29.00	
4. Shoulder line	5.00	5.00	5.25	5.00	4.75	5.00	5.50	4.50	5.00	5.00	5.00
5. Waist measure	28.00	32.00	28.00	26.00	26.00	28.00	28.00	27.00	26.00	26.00	29.00
6. Armseye (Front)	8.50	8.50	7.50	8.00	8.00	8.00	8.00	7.50	8.00	8.00	8.00
(Back)	8.00	7.00	7.50	7.00	7.50	8.00	8.50	7.50	7.50	7.00	7.00
7. French dart line to waist (Front)	16.00	15.50	15.25	16.00	16.50	15.50	16.00	15.00	16.00	15.00	16.00
(Back)	16.00	15.00	14.50	15.00	16.50	15.00	16.00	15.00	15.00	14.50	15.00
8. Inner shoulder to scye line (Front)	7.50	8.50	7.00	7.00	7.25	7.25	8.00	6.00	6.00	7.00	8.50
(Back)	8.50	8.50	7.25	7.50	8.25	9.25	9.75	7.50	7.50	8.50	9.50
9. Outer shoulder to scye line (Front)	6.50	6.50	5.50	6.00	6.50	7.00	6.50	6.00	6.00	6.00	8.25
(Back)	6.50	6.00	6.50	6.50	6.50	8.00	7.50	7.00	6.50	6.50	7.00
10. Length of sleeve cap	6.25	7.00	6.00	6.00	6.50	7.00	6.00	6.50	5.50	6.00	7.00
11. Circumference of upper arm	11.50	11.00	10.00	10.00	12.25	11.00	12.00	11.00	10.50	10.50	10.50
12. Distance between measures (8) and (9) (Front)	5.00	4.00	4.00	4.00	4.00	3.50	4.00	3.50	4.00	4.00	4.00
(Back)	5.00	4.00	4.00	4.00	4.00	4.00	4.50	3.00	4.00	4.00	4.25
13. Vertical depth of armseye	5.00	5.75	4.75	5.00	5.00	5.25	5.00	5.00	4.75	5.00	5.75

Table 1, Group I, cont'd

Subject	23	24	25	26	27	28	29	30	31	32	33
Weight (pounds)	120	128	134	125	120	122	121	120	120	124	128
Height (inches)	62.00	62.00	66.00	65.00	64.00	65.00	64.00	64.00	65.00	64.00	65.00
1. Bust measure, entire,	34.00	35.50	35.60	34.00	35.00	34.00	35.00	34.00	34.00	34.00	35.00
Point of bust to c. front	4.00	3.50	4.00	3.50	3.50	4.00	4.00	4.00	3.50	4.00	4.00
Tip of shoulder to c. back	3.50	3.50	4.00	3.50	4.00	3.50	3.00	3.50	3.00	4.00	3.50
2. Neck line (Front	7.50	8.00	8.00	8.00	7.50	7.50	7.00	8.00	7.00	7.50	8.00
(Back	6.50	6.00	6.00	5.50	5.50	6.00	6.00	6.00	6.00	6.00	6.00
3. Scye line	30.00	28.00	34.00	31.00	31.00	31.00	30.00	30.00	31.00	31.00	31.00
4. Shoulder line	4.75	4.75	5.00	5.00	5.00	4.50	4.50	5.00	4.00	5.00	4.50
5. Waist measure	24.00	33.00	27.00	26.00	26.00	27.00	25.00	25.00	25.00	27.00	33.00
6. Armseye (Front	8.00	8.50	9.00	9.00	8.50	8.00	9.00	9.00	7.50	8.50	9.00
(Back	7.50	7.50	8.00	8.50	7.50	7.00	6.50	6.50	7.50	8.00	8.00
7. French dart line to (Front	16.00	16.50	16.00	15.50	15.00	15.00	15.50	15.50	15.50	15.50	16.50
waist (Back	15.00	15.00	15.00	15.00	14.00	15.00	14.50	14.50	15.00	15.00	16.00
8. Inner shoulder to (Front	7.00	8.00	8.00	8.00	8.00	7.00	7.50	7.50	7.00	7.50	7.50
scye line (Back	8.00	9.50	9.50	9.25	9.25	8.25	8.00	9.00	7.50	8.50	9.00
9. Outer shoulder to (Front	6.50	7.00	8.00	6.50	7.00	6.25	6.00	7.00	7.00	7.00	6.50
scye line (Back	6.00	6.50	7.50	7.50	7.50	6.50	6.25	7.25	5.50	7.50	7.50
10. Length of sleeve cap	6.00	6.00	7.00	7.00	7.00	6.50	7.00	6.00	6.50	6.50	7.00
11. Circumference of upper arm	10.50	10.50	12.00	10.00	11.00	9.50	9.50	12.00	10.00	11.00	11.50
12. Distance between (Front	4.00	4.00	4.00	4.00	4.00	3.75	4.00	4.00	4.00	4.00	4.00
measures (8) and (9) (Back	3.50	4.00	4.00	4.00	4.00	3.75	4.00	4.00	4.00	4.50	4.00
13. Vertical depth of armseye	4.75	5.25	5.00	4.50	5.00	4.75	4.75	5.00	4.75	4.75	5.00

Table 2. Body Measurements (in inches) of Thirty-three Mature Women

Group II -- Bust Measure 36 to 37.9 inches

Subject	1	2	3	4	5	6	7	8	9	10	11
Weight (pounds)	134	131	150	140	124	140	142	160	135	132	131
Height (inches)	64.50	64.50	63.00	66.50	62.00	62.00	64.00	65.50	63.00	68.00	64.00
1. Bust measure, entire,	36.50	36.00	37.00	37.00	37.00	37.00	37.00	37.00	36.00	36.00	36.00
Point of bust to c. front	4.00	4.25	5.00	4.50	4.00	4.50	4.00	4.00	4.00	4.00	3.50
Tip of shoulder to c. back	4.00	3.50	4.00	4.00	4.25	4.00	4.00	4.25	5.00	3.50	3.75
2. Neck line (Front	6.75	8.00	8.50	8.00	7.50	8.00	8.00	8.25	7.50	8.00	8.00
(Back	6.50	6.00	6.00	6.25	6.50	6.00	6.00	6.00	6.50	6.00	6.00
3. Scye line	34.50	34.00	35.00	35.00	35.00	35.00	35.00	35.00	32.00	34.25	31.50
4. Shoulder line	5.00	5.00	5.00	4.75	5.25	5.00	5.00	5.00	4.75	5.75	5.00
5. Waist measure	34.00	32.00	32.00	31.00	29.00	30.00	31.00	31.00	29.50	28.50	26.00
6. Armseye (Front	9.00	9.25	9.00	9.00	8.50	8.50	9.00	9.00	9.00	9.00	7.50
(Back	9.00	8.25	8.00	8.00	8.75	8.75	8.00	8.00	8.00	9.00	7.50
7. French dart line to (Front	17.25	15.50	15.50	16.50	15.50	15.00	16.50	16.00	16.00	17.50	16.50
waist (Back	14.25	15.25	15.00	16.00	14.50	15.00	16.00	16.00	15.00	16.50	16.75
8. Inner shoulder to (Front	7.50	7.25	8.50	9.00	7.50	7.00	8.00	8.00	7.50	8.00	7.50
scye line (Back	9.25	8.00	9.00	9.50	8.50	8.50	9.75	9.00	8.50	8.00	8.75
9. Outer shoulder to (Front	6.25	7.00	8.00	7.50	6.00	6.50	6.00	7.00	7.00	7.00	6.00
scye line (Back	6.00	8.75	7.00	7.50	6.50	7.50	7.00	7.25	6.50	7.00	7.00
10. Length of sleeve cap	6.00	6.25	6.00	6.50	6.00	6.00	7.00	7.50	7.00	6.50	5.50
11. Circumference of upper arm	12.00	13.00	13.00	13.00	12.00	13.00	12.50	13.00	12.00	10.50	10.50
12. Distance between (Front	4.25	4.00	4.00	4.25	4.50	4.25	4.00	4.25	4.00	5.50	4.25
measures (8) and (9) (Back	4.00	4.00	4.00	4.25	4.50	4.50	4.50	4.00	4.00	4.50	4.00
13. Vertical depth of armseye	5.75	5.25	5.00	5.50	5.00	5.00	5.25	5.25	5.00	5.00	5.25

Table 2, Group II, cont'd

Subject	12	13	14	15	16	17	18	19	20	21	22
Weight (pounds)	121	138	125	120	121	124	143	123	120	125	123
Height (inches)	63.00	65.00	63.00	64.00	67.00	63.00	68.00	64.00	62.00	64.00	63.00
1. Bust measure, entire,	36.00	37.00	36.00	36.00	37.50	37.00	37.00	36.00	37.00	36.00	36.00
Point of bust to c. front	4.00	4.00	4.00	4.00	4.00	3.75	4.00	4.00	4.00	4.00	4.50
Tip of shoulder to c. back	4.50	4.00	3.50	4.00	3.75	4.00	4.00	4.00	3.50	4.00	3.50
2. Neck line (Front	8.00	8.00	8.00	7.50	5.00	6.00	8.25	5.50	6.00	8.00	7.50
(Back	6.50	6.00	6.00	6.00	8.50	8.00	6.00	8.00	7.50	6.00	6.00
3. Scye line	29.00	33.00	33.00	33.00	34.00	28.00	34.00	29.00	27.00	33.00	32.00
4. Shoulder line	5.50	5.00	6.00	5.00	5.50	8.50	5.00	5.25	5.00	5.50	5.00
5. Waist measure	31.00	32.00	32.00	30.00	29.50	29.00	31.00	26.00	31.00	30.00	26.00
6. Armseye (Front	9.00	8.00	8.25	7.50	8.50	7.50	8.50	8.50	8.50	8.00	8.00
(Back	8.00	8.00	8.00	8.00	8.00	7.50	8.00	8.00	7.00	7.50	5.00
7. French dart line to (Front	15.25	15.00	16.50	15.50	16.50	16.00	16.00	15.00	16.00	16.00	16.00
waist (Back	14.75	15.00	15.00	15.00	14.50	15.00	16.00	15.00	15.00	15.50	15.00
8. Inner shoulder to (Front	7.50	8.00	8.00	8.00	7.25	7.00	8.00	7.50	7.00	6.50	7.25
scye line (Back	9.00	9.00	9.50	9.50	9.50	8.50	10.00	9.00	7.50	7.50	9.00
9. Outer shoulder to (Front	7.00	6.00	7.00	6.00	6.50	6.50	6.50	6.50	6.00	6.50	6.00
scye line (Back	7.50	7.50	7.25	7.50	7.00	7.50	7.50	7.50	7.50	7.75	7.00
10. Length of sleeve cap	7.25	6.50	7.00	7.50	6.50	6.00	6.50	7.00	7.00	6.50	6.50
11. Circumference of upper arm	11.00	11.00	12.00	11.00	11.50	12.00	11.00	10.00	10.00	10.50	10.50
12. Distance between (Front	4.00	4.00	5.00	5.25	5.00	4.00	4.00	4.00	5.00	4.00	4.00
measures (8) and (9) (Back	4.50	4.50	5.50	5.00	4.50	4.50	4.00	4.00	4.50	4.00	4.00
13. Vertical depth of armseye	5.00	5.25	5.50	5.75	5.25	5.00	5.25	5.00	5.50	5.25	5.00

Table 2, Group II, cont'd

Subject	23	24	25	26	27	28	29	30	31	32	33
Weight (pounds)	120	120	124	130	123	125	125	120	128	130	133
Height (inches)	64.00	64.00	66.00	65.00	63.00	67.00	64.00	64.00	66.00	66.00	62.00
1. Bust measure, entire	36.00	35.00	36.00	37.00	37.00	36.00	36.00	36.00	36.00	36.00	36.00
Point of bust to c. front	3.50	4.00	4.00	4.00	4.00	4.00	4.00	3.50	3.50	3.50	4.00
Tip of shoulder to c. back	4.00	4.00	4.00	4.00	4.00	4.00	3.75	3.50	3.50	4.50	4.00
2. Neck line (Front)	7.50	7.50	7.00	8.00	8.50	8.00	7.50	6.00	6.00	8.00	7.50
(Back)	6.00	6.00	6.25	6.00	6.00	6.00	6.75	7.50	7.50	6.50	6.00
3. Scye line	31.00	31.00	33.20	28.00	32.50	27.00	32.00	32.00	29.00	33.00	34.00
4. Shoulder line	6.00	6.00	5.25	5.00	5.00	4.50	5.00	4.00	5.00	5.00	5.00
5. Waist measure	27.00	25.00	28.00	28.00	27.00	33.00	29.00	27.00	28.00	28.00	29.00
6. Armseye (Front)	8.00	8.00	8.50	8.50	8.50	8.50	8.25	9.00	8.50	8.00	8.00
(Back)	7.50	7.50	8.00	7.50	7.00	7.00	7.00	8.00	8.00	7.00	7.50
7. French dart line to waist (Front)	16.00	16.00	16.50	15.00	16.00	16.50	15.50	16.50	16.00	15.50	15.50
(Back)	15.00	15.50	15.50	15.00	15.50	16.00	15.00	16.00	15.00	15.00	15.00
8. Inner shoulder to scye line (Front)	7.00	7.00	7.50	7.50	7.50	7.00	7.00	7.00	8.00	7.00	7.00
(Back)	8.50	8.50	9.00	8.00	8.50	9.50	8.25	8.50	9.25	8.50	8.50
9. Outer shoulder to scye line (Front)	7.00	6.50	7.00	6.00	6.50	7.00	6.00	7.00	7.00	6.00	6.00
(Back)	7.00	7.00	8.00	7.00	7.25	8.00	6.50	7.50	7.25	6.75	6.50
10. Length of sleeve cap	7.00	6.00	6.50	6.00	6.50	6.00	7.50	6.00	7.00	6.00	6.50
11. Circumference of upper arm	11.50	10.00	11.00	11.00	12.25	11.50	10.50	10.50	10.00	11.00	12.00
12. Distance between measures (8) and (9) (Front)	4.00	4.00	4.50	4.00	4.00	4.00	4.00	3.00	3.50	4.00	4.00
(Back)	4.25	3.75	4.00	4.00	4.50	4.00	4.50	4.00	3.50	4.00	4.00
13. Vertical depth of armseye	5.00	5.00	5.00	4.75	5.00	4.50	5.00	5.00	4.75	4.75	5.00

Table 3. Body Measurements (in inches) of Thirty-three Mature Women

Group III -- Bust Measure 38 to 39.9 inches

Subject	1	2	3	4	5	6	7	8	9	10	11
Weight (pounds)	150	148	136	160	162	145	155	158	130	130	120
Height (inches)	62.00	64.00	62.00	66.00	65.00	64.00	63.00	64.00	67.00	64.00	64.00
1. Bust measure, entire,	39.50	39.50	38.00	39.00	39.00	38.00	39.00	38.50	38.00	39.00	38.00
Point of bust to c. front	4.80	5.25	4.00	4.50	4.00	5.00	4.00	4.00	4.00	4.00	3.50
Tip of shoulder to c. back	3.25	4.00	4.00	5.00	4.25	4.00	3.50	4.00	4.00	4.00	3.50
2. Neck line (Front	9.00	8.00	8.50	8.00	8.00	8.00	7.75	7.50	7.50	8.00	8.00
(Back	6.00	6.50	6.50	6.50	6.50	6.25	6.00	6.00	6.00	5.00	6.00
3. Scye line	37.50	36.00	35.00	34.00	36.00	35.00	35.00	34.00	34.00	35.00	33.00
4. Shoulder line	4.80	5.00	4.50	5.00	5.50	4.50	4.50	5.00	5.50	5.00	5.00
5. Waist measure	33.50	31.50	28.00	32.00	31.00	34.00	32.00	31.00	32.00	33.00	28.00
6. Armscye (Front	8.50	8.50	8.50	8.50	9.50	8.50	9.00	8.00	8.50	8.00	8.50
(Back	8.75	8.75	8.50	8.50	9.00	9.00	9.00	8.50	8.00	7.00	8.00
7. French dart line to (Front	16.50	15.50	17.00	18.00	17.50	16.00	16.25	16.00	17.50	16.50	17.00
waist (Back	15.25	16.00	14.75	16.50	16.00	16.00	16.00	15.00	16.00	15.00	15.00
8. Inner shoulder to (Front	8.50	7.25	6.75	8.00	8.00	7.50	7.50	7.50	8.00	9.00	9.00
scye line (Back	8.50	8.75	8.75	9.50	10.00	8.50	9.00	9.00	10.00	8.50	10.00
9. Outer shoulder to (Front	7.50	6.25	5.50	7.50	7.00	7.00	6.50	6.25	7.50	7.00	7.00
scye line (Back	7.50	7.50	7.75	8.00	8.50	7.50	7.00	6.50	7.50	7.00	8.00
10. Length of sleeve cap	7.00	5.50	6.75	7.50	7.50	7.00	7.00	6.00	7.00	6.00	6.00
11. Circumference of upper arm	13.00	13.00	12.00	12.50	13.50	12.50	12.50	12.00	10.50	11.00	14.00
12. Distance between (Front	4.50	5.00	3.75	4.75	5.00	4.50	4.00	4.00	4.00	4.50	4.00
measures (8) and (9) (Back	4.50	5.00	4.00	5.00	5.00	4.50	4.00	4.25	4.00	4.50	4.00
13. Vertical depth of armseye	6.00	5.00	4.75	6.00	5.75	5.50	5.25	5.00	5.00	5.00	5.25

Table 3, Group III, cont'd

Subject	12	13	14	15	16	17	18	19	20	21	22
Weight (pounds)	120	130	133	132	136	127	130	153	145	132	135
Height (inches)	63.00	64.00	62.00	63.00	66.00	63.00	65.00	68.00	66.00	67.00	63.00
1. Bust measure, entire,	38.00	38.00	38.00	38.00	38.00	39.00	37.00	38.00	38.00	38.00	38.00
Point of bust to c. front	3.50	3.50	4.00	4.00	4.00	4.00	4.00	4.00	3.50	4.00	4.00
Tip of shoulder to c. back	3.50	3.50	3.50	4.00	4.00	3.50	3.50	3.00	3.00	3.50	3.50
2. Neck line (Front	8.00	8.50	7.50	8.00	8.00	8.00	7.50	6.25	6.00	6.00	6.00
(Back	5.50	6.00	6.50	6.50	6.50	5.50	6.00	8.50	8.00	8.00	8.50
3. Scye line	28.00	34.00	34.00	33.00	33.00	35.00	34.00	33.00	33.00	33.00	35.00
4. Shoulder line	5.00	5.00	5.00	5.00	5.00	5.00	5.50	5.50	5.00	5.00	5.00
5. Waist measure	26.00	29.00	31.00	29.00	29.00	31.00	31.00	29.00	30.00	27.00	29.00
6. Armscye (Front	7.50	8.50	8.50	9.00	8.00	8.50	8.00	8.50	8.00	8.50	8.50
(Back	7.50	8.00	8.00	7.00	7.50	8.00	7.50	8.00	9.00	8.00	8.00
7. French dart line to (Front	16.50	16.00	16.00	14.00	15.50	15.50	16.00	16.50	15.00	16.50	15.00
waist (Back	16.00	15.00	15.00	13.00	15.00	15.00	15.50	15.00	15.00	16.00	15.00
8. Inner shoulder to (Front	8.00	8.00	7.00	8.00	8.00	8.00	8.00	7.75	8.00	7.50	7.00
scye line (Back	9.50	9.50	8.50	9.50	9.50	9.50	9.50	9.00	9.50	8.50	8.25
9. Outer shoulder to (Front	6.50	6.50	6.50	7.00	6.50	6.25	6.00	6.50	7.50	6.50	6.00
scye line (Back	7.50	7.50	7.50	7.50	7.00	7.50	6.50	6.00	7.00	7.00	6.00
10. Length of sleeve cap	6.00	6.50	6.50	6.00	7.00	6.50	6.00	6.25	6.00	6.50	7.00
11. Circumference of upper arm	11.25	11.00	12.00	11.00	12.00	11.00	12.00	12.00	12.00	11.00	12.00
12. Distance between (Front	4.00	4.00	5.00	4.00	4.00	4.50	4.00	4.25	4.00	5.00	4.00
measures (8) and (9) (Back	4.00	4.00	5.00	4.50	4.00	4.50	4.50	4.00	4.25	5.00	4.00
13. Vertical depth of armseye	5.00	5.25	4.50	5.00	4.75	5.00	5.00	4.75	5.00	5.00	5.25

Table 3, Group III, cont'd

Subject	23	24	25	26	27	28	29	30	31	32	33
Weight (pounds)	130	130	127	145	160	135	137	137	126	145	132
Height (inches)	66.00	63.00	62.00	66.00	66.00	67.00	66.00	63.00	66.00	66.00	64.00
1. Bust measure, entire	38.00	38.00	39.00	38.00	40.00	38.00	38.00	38.00	38.00	38.00	38.00
Point of bust to c. front	3.50	4.00	3.50	3.50	4.00	4.00	4.00	4.00	4.00	4.00	4.00
Tip of shoulder to c. back	3.50	4.00	3.50	3.00	4.00	4.00	3.50	4.00	3.50	3.50	4.00
2. Neck line (Front)	6.00	6.00	8.00	8.50	8.50	8.00	8.00	7.50	8.00	8.00	7.50
(Back)	8.50	8.00	6.00	6.00	6.50	6.00	6.00	6.00	6.00	6.00	6.00
3. Scye line	32.00	29.00	36.00	33.00	36.00	34.00	34.00	34.00	33.00	34.00	34.00
4. Shoulder line	4.50	5.00	5.50	5.00	6.00	4.50	6.00	5.00	5.00	5.00	5.00
5. Waist measure	27.00	30.00	31.00	32.00	32.00	31.00	31.00	32.00	32.00	28.00	29.00
6. Armseye (Front)	8.00	8.00	9.50	8.50	8.00	8.50	8.50	8.00	8.50	8.50	7.75
(Back)	8.00	8.00	7.50	8.00	8.00	8.00	8.00	8.00	8.00	8.50	7.00
7. French dart line to (Front)	17.00	16.50	16.00	16.50	17.00	16.00	16.00	16.00	16.50	16.50	16.00
waist (Back)	16.00	15.00	15.00	16.00	16.00	16.00	15.50	15.00	16.00	16.00	16.00
8. Inner shoulder to (Front)	7.00	8.00	7.50	8.00	7.00	8.00	7.50	8.00	7.50	7.50	7.00
scye line (Back)	8.00	8.50	8.00	9.00	9.00	9.50	9.00	9.00	9.00	8.50	7.50
9. Outer shoulder to (Front)	6.00	6.00	6.50	7.00	6.50	6.00	7.00	7.00	6.50	7.00	6.00
scye line (Back)	6.00	6.00	6.00	7.00	7.00	7.00	7.50	7.00	7.00	7.00	5.50
10. Length of sleeve cap	6.00	5.50	6.50	7.00	6.00	7.00	6.00	6.50	6.50	7.50	6.00
11. Circumference of upper arm	11.00	11.00	11.00	11.00	12.00	11.00	11.00	13.00	12.00	11.00	12.00
12. Distance between (Front)	4.00	4.00	4.50	4.00	4.50	4.00	4.50	4.00	4.00	4.00	4.00
measures (8) and (9) (Back)	4.00	4.00	4.50	4.00	4.00	4.00	4.50	4.00	3.50	4.00	4.00
13. Vertical depth of armseye	5.25	4.50	5.00	5.00	5.25	5.75	5.50	5.25	5.00	5.00	5.00

Table 4. Body Measurements (in inches) of Thirty-three Mature Women

Group IV -- Bust Measure 40 to 42 inches

Subject	1	2	3	4	5	6	7	8	9	10	11
Weight (pounds)	150	160	160	135	140	160	160	160	160	160	158
Height (inches)	66.00	64.00	64.00	62.00	64.00	67.00	67.50	66.50	68.00	55.00	64.00
1. Bust measure, entire,	42.00	42.00	42.00	40.00	41.00	42.00	40.00	40.00	40.50	42.00	42.00
Point of bust to c. front	5.00	5.00	4.00	4.00	4.00	4.00	4.00	4.00	4.25	4.00	4.50
Tip of shoulder to c. front	4.00	4.50	4.50	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.50
2. Neck line (Front	8.75	8.50	9.50	9.00	8.00	9.50	7.75	8.00	9.00	8.00	8.50
(Back	6.00	6.00	5.50	6.00	6.50	6.00	7.00	7.00	6.50	6.75	7.00
3. Scye line	38.50	39.00	39.50	35.00	37.50	39.00	39.00	37.00	36.00	35.00	37.00
4. Shoulder line	5.50	6.00	5.50	5.00	5.00	5.00	5.00	5.50	5.50	5.00	5.50
5. Waist measure	38.00	38.00	40.00	37.00	34.00	38.00	35.50	35.00	34.50	36.00	36.00
6. Armscye (Front	9.00	9.00	10.00	9.00	8.50	9.50	9.50	9.50	9.00	8.50	9.00
(Back	8.50	9.00	9.00	8.50	8.50	9.00	9.00	9.00	9.00	8.00	8.00
7. French dart line to (Front	17.50	17.50	16.50	15.50	18.00	17.50	18.00	17.00	18.50	16.00	16.50
waist (Back	14.50	15.50	17.00	15.00	16.50	16.50	17.50	16.50	16.50	16.00	15.50
8. Inner shoulder to (Front	9.00	9.25	9.00	10.00	9.00	8.50	9.00	9.00	8.00	7.50	8.00
scye line (Back	9.00	9.50	9.00	8.50	8.00	10.00	10.00	10.50	9.50	9.00	9.50
9. Outer shoulder to (Front	7.25	7.25	8.00	9.00	8.00	8.00	8.00	8.00	7.25	6.00	7.00
scye line (Back	7.00	7.50	7.00	8.00	6.00	8.00	8.00	9.00	9.00	7.50	7.00
10. Length of sleeve cap	6.00	6.50	7.50	6.00	6.75	6.50	7.00	6.50	6.50	6.50	6.50
11. Circumference of upper arm	14.00	14.00	14.00	12.00	13.25	14.00	14.00	14.00	14.00	13.00	15.00
12. Distance between (Front	4.50	5.25	5.00	4.00	4.00	4.50	4.50	5.50	5.00	4.50	5.00
measures (8) and (9) (Back	4.50	5.00	5.00	4.00	4.00	5.00	4.00	5.00	4.50	4.00	5.00
13. Vertical depth of armseye	6.50	6.00	5.75	5.00	5.25	5.75	5.75	6.00	4.75	5.00	5.75

Table 4, Group IV, cont'd

Subject	12	13	14	15	16	17	18	19	20	21	22
Weight (pounds)	160	158	160	160	159	150	125	160	155	154	160
Height (inches)	65.00	64.00	66.00	63.00	64.00	67.00	62.00	62.00	62.00	66.00	64.00
1. Bust Measure, entire,	42.00	42.00	42.00	42.00	42.00	42.00	40.00	42.00	42.00	42.00	40.00
Point of bust to c. front	4.50	4.00	4.00	4.50	4.25	4.25	4.00	4.00	4.00	4.00	4.00
Tip of shoulder to c. back	4.50	3.50	4.00	4.50	4.50	4.00	4.00	4.00	4.00	3.75	4.00
2. Neck line (Front	8.00	8.50	8.25	8.00	9.00	9.25	7.50	8.00	8.00	8.00	8.00
(Back	6.00	6.00	6.00	6.00	6.50	6.00	6.00	7.00	6.00	6.00	6.00
3. Scye line	39.00	33.00	40.00	40.00	40.00	38.00	32.00	40.00	38.00	35.00	36.00
4. Shoulder line	5.50	5.00	5.00	6.00	6.00	6.00	5.00	5.50	5.50	4.50	5.50
5. Waist measure	36.00	28.50	35.00	36.00	38.00	33.00	34.00	40.00	39.00	33.00	33.00
6. Armseye (Front	9.00	9.25	10.00	9.50	9.50	9.00	8.50	9.00	9.00	9.50	9.50
(Back	8.00	8.25	9.00	8.50	8.00	8.00	7.00	8.00	8.00	9.00	8.00
7. French dart line to (Front	17.00	18.00	16.00	16.00	15.50	17.00	16.00	16.00	17.00	17.00	16.50
waist (Back	16.50	16.25	15.00	15.00	15.00	16.00	15.00	15.00	15.00	16.00	15.50
8. Inner shoulder to (Front	8.00	7.00	7.00	8.00	7.00	8.00	7.00	8.50	8.00	8.00	8.00
scye line (Back	9.00	8.50	8.75	9.00	7.50	9.50	8.50	10.00	10.00	9.50	9.75
9. Outer shoulder to (Front	7.00	6.00	6.50	7.00	6.50	7.00	6.00	7.50	8.00	7.00	7.25
scye line (Back	7.50	6.25	7.50	8.50	7.00	8.00	6.50	7.50	7.50	8.00	8.50
10. Length of sleeve cap	6.50	6.00	7.00	7.00	7.00	7.00	6.00	7.00	6.50	7.50	7.00
11. Circumference of upper arm	12.50	13.50	13.50	14.00	13.00	13.50	12.00	14.00	14.00	13.00	13.50
12. Distance between (Front	4.00	4.00	4.00	5.00	5.00	4.50	6.00	4.00	4.00	4.00	4.50
measures (8) and (9) (Back	4.50	4.25	4.50	5.00	5.00	4.50	7.00	4.00	4.00	4.00	4.50
13. Vertical depth of armseye	5.50	5.00	5.00	5.50	5.50	5.00	5.00	5.50	5.75	5.00	5.50

Table 4, Group IV, cont'd

Subject	23	24	25	26	27	28	29	30	31	32	33
Weight (pounds)	150	160	159	160	145	160	155	160	145	160	160
Height (inches)	64.00	63.00	62.00	65.00	57.00	68.00	67.00	64.00	63.00	65.00	64.00
1. Bust measure, entire,	41.00	42.00	42.00	42.00	40.00	41.00	40.00	42.00	41.00	42.00	42.00
Point of bust to c. front	4.00	4.50	4.00	4.00	3.50	4.00	4.50	4.00	4.00	4.00	4.00
Tip of shoulder to c. back	4.00	4.50	4.00	3.50	3.00	4.00	4.00	4.00	4.00	4.00	4.00
2. Neck line (Front	8.00	8.50	8.00	8.50	8.00	8.50	8.00	8.50	8.50	8.00	8.50
(Back	6.50	6.00	6.00	6.00	6.00	6.50	6.50	6.00	6.00	6.00	6.00
3. Scye line	36.00	39.00	36.00	36.00	35.00	36.00	35.00	36.00	37.00	37.00	36.00
4. Shoulder line	5.50	5.00	5.00	5.50	5.50	6.00	5.00	5.50	5.50	5.00	5.00
5. Waist measure	32.00	36.00	32.00	36.00	31.00	35.00	31.00	33.00	31.00	35.00	35.00
6. Armseye (Front	8.50	8.75	8.50	9.00	9.00	9.00	8.50	9.50	9.00	9.00	9.00
(Back	7.00	8.50	7.50	8.00	8.00	8.50	8.00	8.00	8.00	8.00	8.50
7. French dart line to (Front	16.50	16.50	16.50	17.00	17.50	17.50	17.50	17.50	17.00	17.50	18.00
waist (Back	15.00	15.00	15.00	15.75	15.00	16.00	16.00	16.00	15.00	16.00	18.50
8. Inner shoulder to (Front	8.00	8.50	7.50	8.50	7.50	8.00	7.25	8.00	8.00	7.00	6.00
scye line (Back	9.50	10.00	9.00	10.00	9.00	10.00	8.50	9.25	9.00	8.00	7.00
9. Outer shoulder to (Front	7.00	7.50	6.50	7.50	7.50	7.00	7.00	7.00	6.00	6.00	6.00
scye line (Back	7.50	8.00	7.50	7.50	7.50	7.50	7.25	7.00	6.50	6.50	6.50
10. Length of sleeve cap	7.00	6.50	7.50	6.50	7.00	7.00	7.00	7.00	6.50	6.50	6.50
11. Circumference of upper arm	12.00	13.50	13.00	13.00	13.00	13.00	12.00	13.00	13.00	13.00	13.00
12. Distance between (Front	4.00	4.00	4.00	5.00	5.00	5.00	4.00	4.50	4.00	4.00	4.50
measures (8) and (9) (Back	4.50	4.50	4.00	5.00	5.00	4.00	4.00	4.50	4.50	4.00	4.50
13. Vertical depth of armseye	5.00	5.00	5.50	5.00	5.50	5.50	5.50	5.25	4.75	5.50	5.00

The line locations were made according to the plan established by the Clothing and Textiles Department of the Kansas State College, directions for which follow:

1. The bust line passes around the body over the points of the bust and slightly up over the tips of the shoulder blades. This line was measured with the investigator directly back of the subject who held the tape over the points of the bust while the operator held it over the tips of the shoulder blades.

2. The neck line was located by placing a tape around the base of the neck and allowing it to pass above the large bone at the base of the neck and dropping it to the middle of the pit in the front of the neck.

In order to obtain the front neck line measure, the end of the tape was placed on the point indicating the shoulder line at the neck and passed around in front to the shoulder line at the neck on the opposite side. The measurement was read and recorded. The back measurement was the distance between these two points in the back.

3. The scye line connects the two lowest points of the armscyes when the arms are extended parallel to the floor, the scyeline also being parallel to the floor.

4. The shoulder line was located as follows: With the

head erect and the face forward, the length of a pencil was placed on the crest of the bone behind the ear. The pencil was held parallel to the back contour line of the neck and touching the neck line. The shoulder line has its beginning at this point. The pencil is extended at right angles to the armscye. A point $\frac{3}{8}$ inch back of this point on the armscye, connected with the point of origin at the neck, forms the shoulder line.

5. The waist line was located by passing a tape line around the smallest part of the trunk, which lies between the lower rib and the top of the pelvic bone.

6. The armscye line was located in the following manner: The thumb and forefinger were placed on either side of the top of the ball of the arm as it swung in its socket; lines were 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 armscye line to a point $1\text{-}\frac{1}{2}$ inches below the highest point of the armpit. This point was located with the arm raised at right angles to the trunk.

A tape was placed snugly around the armscye and loosened $1\text{-}\frac{1}{2}$ inches; this gave the correct armscye measurement.

The front armscye measurement was the distance from the point which bisects the armpit, around the front of the armscye to the shoulder seam, and the back armscye measurement extended from the shoulder seam around the back to the point which bisects the armpit.

7. The French dart line extends, in front, from a point on the shoulder line midway between the base of the neck and the armscye line, to the tip of the bust, then extends to the waist along a line parallel to the center front.

In the back, a similar line is located by dropping a line from the midpoint of the shoulder line to the tip of the shoulder blade, and continuing the line downward parallel to the center back to the waist line.

8. Inner shoulder to scyeline was established by dropping a line from the shoulder line at the neck perpendicular to the scyeline, both front and back (X in Plate II).

9. Outer shoulder to scyeline was established by dropping a line from the shoulder line at the armscye perpendicular to the scyeline, both front and back (Y in Plate II).

10. The circumference of the upper arm was established

by passing a tape measure around the arm 1-1/2 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. No allowances were made for ease of movement.

11. Length of sleeve cap was determined by erecting a perpendicular from the line which marked the arm circumference to the highest point of the armscye. No allowance was made for molding the sleeve cap over the upper part of the arm.

There were two additional measurements recorded other than those in the established plan:

(a) The vertical depth of armscye.

(b) Drop of front and back shoulder lines.

The vertical depth of the armscye was found by placing a square beneath the arm of the subject, with the top of the square parallel to the scyeline and the side of the square parallel to the center front line. A second square was placed over and above the first square (held with both hands of the operator to prevent slipping) with the top of the first square resting on the outer end of the shoulder line. The distance between the top of the lower square and the lower angle of the top square was recorded as the verti-

cal depth of the armscye.

The drop of the shoulder line, both front and back, was the difference in the distance between the shoulder line from the armscye to the scyeline, and the shoulder line from the neck to the scyeline or Y-X (See Plate II).

A summary of the measures for each group based upon the arithmetrical means will be found in Table 5.

Plate I - Showing method used to determine vertical depth of armscye.

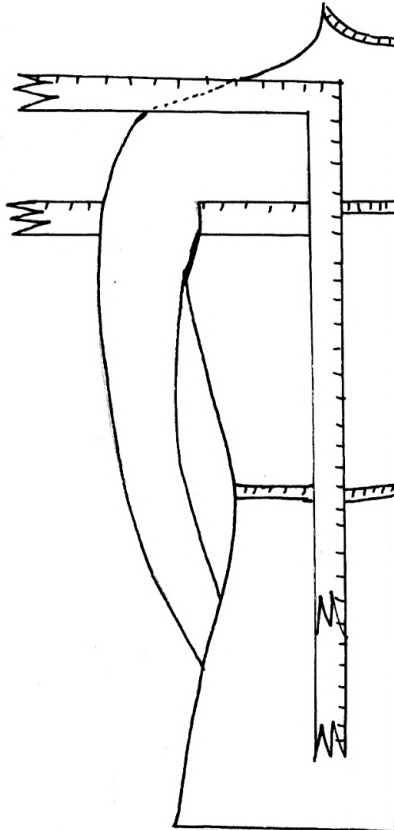


Plate II - Showing method of determining drop of the front and of the back shoulder line.

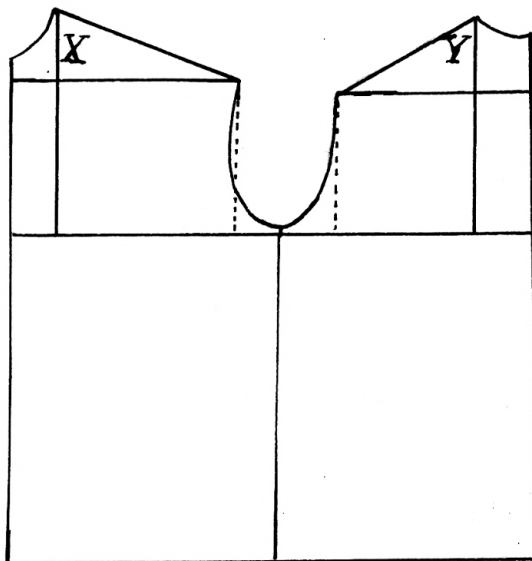


Table 5. Showing Means of the Thirteen Measurements
for the Four Groups

Group	I	II	III	IV
1 Bust line, entire	34.69	36.31	38.43	41.01
Point of bust to center front	3.22	3.97	3.84	4.75
" " shoulder to " back	3.18	3.94	3.81	4.55
2 Neck line	13.70	13.81	14.21	14.74
3 Scyeline	31.67	32.91	32.95	34.99
4 Shoulder line	4.89	5.00	4.98	5.10
5 Waist line	27.90	28.10	28.17	29.31
6 Armscye	15.91	16.01	16.00	16.35
7 French dart line to waist				
Front	16.14	16.21	15.81	16.72
Back	14.89	14.94	15.56	16.37
8 Inner shoulder to scyeline				
Front	7.67	7.77	7.59	7.82
Back	8.94	8.03	8.42	7.98
9 Outer shoulder to scyeline				
Front	6.59	6.82	6.90	6.94
Back	6.09	6.25	6.21	6.33
10 Length of sleeve cap	6.49	6.51	6.50	6.74
11 Circumference of upper arm	11.53	11.64	12.42	12.80
12 Distance between inner shoulder to scyeline and outer shoulder to scyeline				
Front	5.54	5.61	5.64	5.89
Back	4.60	4.72	4.64	4.71
13 Vertical depth of armscye	5.27	5.18	5.39	5.64

INTERPRETATION

In order that the data under consideration might be compared, it was necessary to apply some measure of central tendency to the physical measurements collected. A study of the relative value of the mean and median as a suitable measure was therefore made, since too few subjects were measured to permit the use of the mode. Previous studies indicate that either measure may be used.

Porter (1896) points out that the median value of an anthropometric series expresses the physiological type of the series and that each deviation from this value expresses the physiological difference between an individual and a type. He further points out that in a series as large as one to two hundred, the difference between mean and median is so small, that either may be used.

Bean (1928) speaking before the anthropology section of the American Association for Advancement of Science, recommends the median as the fairest average measure. The median therefore was chosen for use in this problem.

The data for the 132 women measured are found in tables 1 to 4 inclusive, and the minimum, median and maximum values for the lines studied in each group of women are

given in Table 6.

Analysis of these data shows a tendency for other physical measurements to increase with increase of bust measure. It should be noted, however, (Table 6) that the drop of the back shoulder line, decreases with the increase of bust measure in the four groups as listed. It is also noted that the larger bust measure is accompanied by increase in the drop of the front shoulder line. These statements are based upon the median measurements. Slight variations are doubtless due to the irregularities among the cases studied.

The deviation of the minimum and maximum, either side of the median, for these particular measurements is shown in Table 6.

These data show the effect of the many factors which may influence physical development, such as race or stock, environment, food habits, or exercise (Hrdlicka, 1919). They doubtless, have tended to influence the range of measurements, and partially account for the extreme cases.

It is noted that the curves (Fig. 1) for front French dart line, depth of armseye, sleeve cap, arm girth, and drop of front shoulder line rise with some regularity in the four groups, indicating that as the bust measure in-

Table 6. Minimum, Median and Maximum Measurements
for Lines Studied for the Four Groups

Group	I	II	III	IV
Bust measure in inches	34-35.9	36-37.9	38-39.9	40-42.9
Front French dart line				
Min.	15.00	15.00	14.00	15.00
Med.	16.50	16.25	15.75	16.75
Max.	18.00	17.50	17.50	18.50
Depth of Armscye				
Min.	4.50	4.50	4.75	4.75
Med.	5.25	5.12	5.37	5.62
Max.	6.00	5.75	6.00	6.50
Length of Sleeve Cap				
Min.	5.50	4.50	5.50	6.00
Med.	6.25	6.00	6.50	6.75
Max.	7.00	7.50	7.50	7.50
Circumference of Upper Arm				
Min.	9.50	10.00	10.50	12.00
Med.	11.25	11.50	12.25	13.00
Max.	13.00	13.00	14.00	14.00
Drop of Front Shoulder Line				
Min.	.50	.50	.50	.50
Med.	1.50	1.75	1.75	1.17
Max.	2.50	2.00	2.00	1.75
Drop of Back Shoulder Line				
Min.	1.00	.75	1.00	.50
Med.	2.00	1.87	1.75	1.50
Max.	3.00	3.00	2.50	2.50

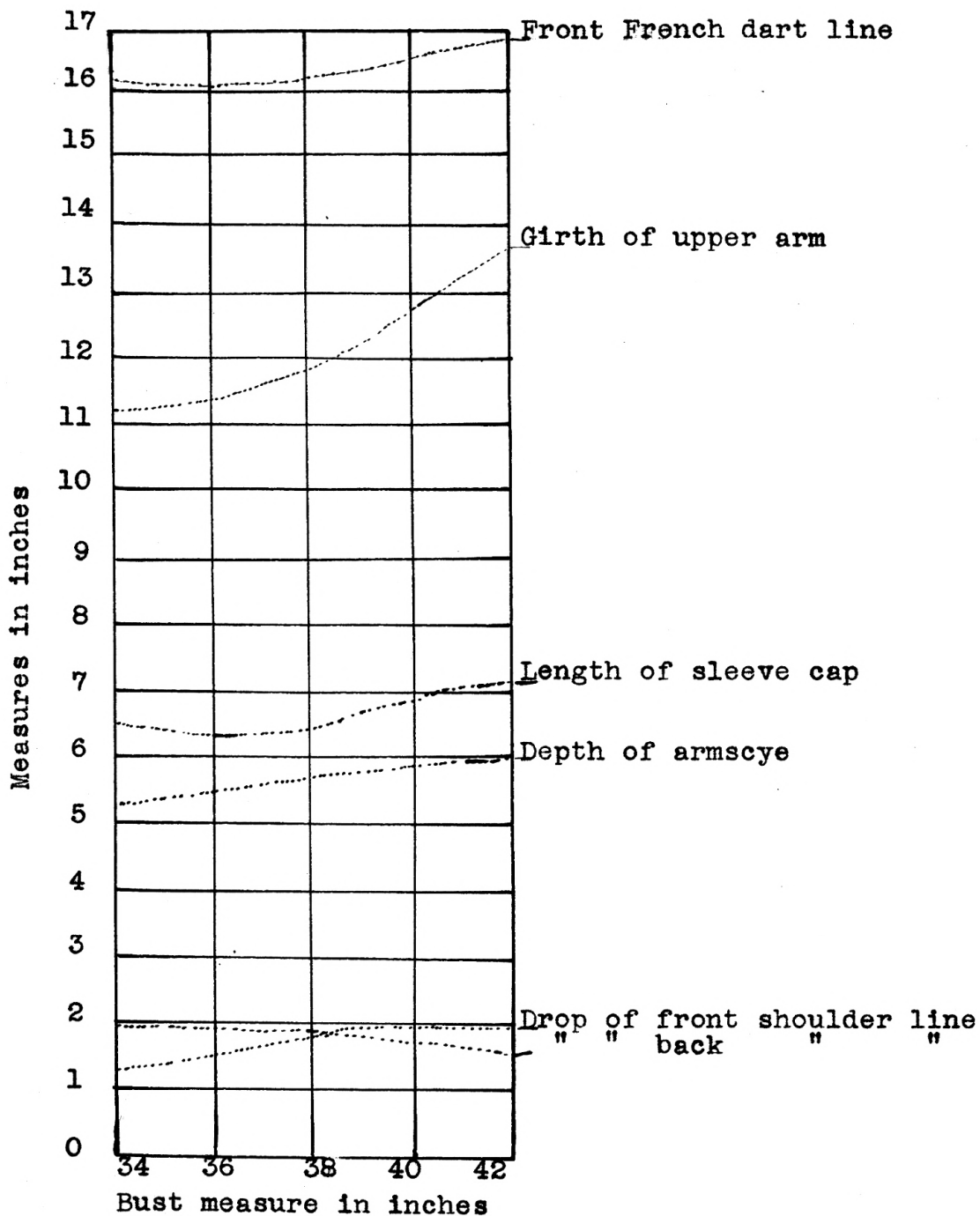


Fig. 1. Showing Increase of Certain Measurements with Bust Measures.

creases, the other measures increase. This is to be expected, but the investigator observed while measuring subjects that length measures of the subjects studied tend to remain more nearly constant than do the horizontal measures. The French dart line and the depth of armscye do not show the same rate of increase as the girth of upper arm. These measurements are more dependent upon the skeletal framework of the body than upon flesh added to it. It would appear that added flesh with increase of bust measure would increase the length of the front French dart line, but when the average front French dart line measure is plotted against the bust measure for the four groups, only a slight rise is evident.

The range of values found differs with the various measurements. The upper arm circumference shows the greatest range of the six lines studied, reaching its maximum, 14 inches, in size 42 bust measure. The minimum, 9.5 inches, is in size 36 bust measure.

The range for vertical depth of the armscye remains relatively constant throughout the entire series of measurements. The shoulder line drop remains more nearly constant, indicating that the limits for this measurement are apparently well fixed, and that increase in bust measure

with the consequent increase in body weight, does not affect the drop of the shoulder line in proportion to other changes. However, as the drop of the front shoulder line tends to increase, the drop of the back shoulder line seems to decrease slightly (Fig. 1). This was noted in the discussion of Table 6, page 35.

The relationships that exist between:

(a) Vertical depth of arm-scye and front French dart line.

(b) Length of sleeve cap and circumference of upper arm.

(c) Drop of front shoulder line and drop of back shoulder line based upon ratios derived from the medians of the pairs of measurements, a, b and c of this study are shown in Table 7.

Table 7. Ratios of Pairs of Measurements Based on the Median for the Four Groups Studied.

Group	I	II	III	IV
Bust measure in inches	34-35.9	36-37.9	38-39.9	40-42.9
Vertical depth of arm-scye to front French dart line	1:3.0	1:3.0	1:3.1	1:3.1
Length of sleeve cap to circumference of upper arm	1:1.7	1:1.6	1:1.8	1:1.9
Drop of front shoulder line to drop of back shoulder line.	1:1.1	1:1.7	1:1.6	1:1.8

Comparisons based upon ratios of medians derived for each measurement considered in this study show that

- (a) The French dart line is 3.1 times as long as the vertical depth of the armscye.
- (b) The circumference of the upper arm is 1.7 times as long as the sleeve cap.
- (c) The drop of the back shoulder line is 1.6 times as great as the drop of the front shoulder line.

The correlation coefficient and probable error

- (a) Of French dart line and depth of armscye is:

$$r_{xy} = \frac{\sum XY}{\sqrt{\sum X^2 \sum Y^2}} = +.2534 \pm .055$$

when "x" is French dart line and "y" is depth of armscye.

- (b) Of circumference of the upper arm and depth of sleeve cap:

$$r_{xy} = \frac{\sum XY}{\sqrt{\sum X^2 \sum Y^2}} = +.456 \pm .046$$

when "x" is circumference of upper arm and "y" is depth of sleeve cap.

- (c) Of drop of back shoulder line and drop of front shoulder line:

$$r_{xy} = \frac{\sum XY}{\sqrt{\sum X^2 \sum Y^2}} = +.405 \pm .049$$

when "x" is drop of front shoulder line and "y" is drop of back shoulder line.

The probable error of the coefficient of correlation was determined in the three cases by using the formula:

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

From these results, it is seen that the relationship existing in each case falls below or near .4 which is conceded to be the lowest relationship that can be of practical value in research. That of the French dart line and the depth of the armscye is the lowest, $\pm .253$, $\pm .055$ and shows very little relationship existing between these two lines.

The relationship as indicated by the coefficient of correlation for the drop of the front and of the back shoulder lines, $\pm .405$ $\pm .049$ is much higher than for the French dart line and the armscye depth, and shows a usable relationship.

However, the greatest relationship exists, for this group, between the circumference of the upper arm and the length of the sleeve cap, as indicated by the coefficient of correlation of $\pm .456$ $\pm .046$.

SUMMARY

Certain measurements of 132 mature women varying from 62 to 68 inches in height, 120 to 160 pounds in weight, and 34 to 42.9 bust measure indicate that:

1. Little relationship appears to exist between the measurements of the French dart line and the vertical depth of the armseye as shown by a coefficient correlation of $\pm .253 \pm .055$.

2. A relationship of some significance appears to exist between the measurement of the drop of the front shoulder line and that of the back shoulder line as indicated by a coefficient of correlation of $\pm .405 \pm .046$.

3. The relationship of greatest significance apparently exists between the circumference of the upper arm and the length of the sleeve cap as indicated by a coefficient of correlation of $\pm .456 \pm .049$.

4. The law of probable error indicates that these correlations would be fairly constant through repeated sampling.

5. These limited data cannot be regarded as conclusive evidence that constant relationships exist between the measurement of lines compared.

ACKNOWLEDGMENT

The writer wishes to express her appreciation to Miss Alpha Latzke, Head of the Clothing and Textiles Department, for her assistance in the directing of this investigation; to Mrs. Katharine Hess, Associate Professor of Clothing and Textiles, for her constructive criticism; to Dr. W. H. Andrews of the Department of Education, and to all others who assisted in any way to make the investigation possible.

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