

## AN ABSTRACT OF THE THESIS OF

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Date Thesis presented--July 29, 1938--

Title--"Heights For High School Clothing Laboratory Tables---  
Based on Measurements of 100 Girls"-----  
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Abstract Approved:-----  
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This study was carried on with 100 high school girls at the Analy Union High School, Sebastopol, California, in order to formulate dimension standards for the tables and chairs used in clothing laboratories. The girls ranged in age from 14 to 21 years. The selection of data to be obtained was based on the work of Wilson and included the heights chosen by the girls as well as certain body measures.

This study should be of value to commercial designers of school equipment and to directors when equipping clothing laboratories, as well as to teachers and supervisors of high school clothing courses.

### Variation in Heights of Tables

The results of this study support the statement of Bennett that the same table cannot be used satisfactorily for cutting out garments, and for basting, pinning, and hand-hemming.

### Height of Cutting Table

The most generally useful height for a cutting table is 39 inches, judging from the results of this study. Almost a third of the girls chose this height, while half of them chose only an inch or two less. A single cutting table height, therefore would appear to be satisfactory for a high school clothing laboratory, especially when a box 3 inches high is provided for the shorter girls.

### Tables and Chairs for Work Done While Seated

It was found that a table height of 28 inches suited the largest per cent of the girls for work done while seated on a chair 16 inches high. If, however, the majority of

girls are to have comfortable working surfaces it will be necessary to have several different table heights for sitting and working. Desirable variations in table heights, when all laboratory chairs are 16 inches high, are as follows:

- If 2 heights--27.5 inches and 28.5 inches.
- If 3 heights--27 inches, 28 inches, and 29 inches.
- If 4 heights--27.5 inches, 28.5 inches, 28.5 inches, and 29.5 inches.
- If 5 heights--27 inches, 27.5 inches, 28 inches, 28.5 inches, and 29.5 inches.
- If 6 heights--27 inches, 27.5 inches, 28 inches, 28.5 inches, 29 inches, and 29.5 inches.

The foregoing recommendations for heights of sewing tables are made on the assumption that all chairs in the laboratory would be 16 inches high. A frequency distribution of under-knee measures showed that when the Bennett standard for chair height is used (one inch less than under-knee height), a 15 inch chair would be preferable to a 16-inch, when chairs of only one height are provided. If all chairs in the laboratory are 15 inches high, each of the foregoing table heights should be reduced each by one inch.

It was found that at least three chair heights in the laboratory would be desirable. If three are provided, they should be proportioned as nearly as possible as follows:

- 14-inch chairs--11 per cent
- 15-inch chairs--55 per cent
- 16-inch chairs--34 per cent

If four heights are provided, desirable heights and the proportion of each would be:

- 13.5-inch chairs-- 8 per cent
- 14.5-inch chairs--28 per cent
- 15.5-inch chairs--48 per cent
- 16.5-inch chairs--16 per cent

The variations in table heights previously listed are recommended for the situations in which laboratory chairs are of uniform height. For the situation in which chairs are adjustable in height or where their heights are suited to the estimated needs of groups of girls, the foregoing recommendations for table heights will need to be altered.



A frequency distribution was made of sewing-table heights after the individual choices made by girls seated on 16-inch chairs were altered to represent choices in the event that each was seated on a chair one inch less in height than her under-knee measure. The average altered table height was found to be 27.2 inches. Analysis of this data shows that desirable variations in sewing-table heights for the laboratory which provides seating arrangements suited to individual girls are identical with the variations recommended for the laboratory equipped entirely with 15-inch chairs.

#### Width of Apron plus Thickness of Top

In order to prevent discomfort while sitting and working at a sewing table, it is necessary to consider the thickness of the top and the construction below it. To accommodate 99 per cent of the girls included in this study construction no wider than 5 inches should be used. This limitation will insure a clearance of at least 2 inches above the thighs in 93 per cent of the cases.

#### Remodelling of Equipment in Clothing Laboratories

The results of this study may be used in altering tables and chairs in clothing laboratories already equipped. In order to make the tables higher, neat wooden blocks may be used under the legs; for making them shorter the legs may be cut to the desired length, or adjustment may be made by raising the height of the chairs and providing foot rests for the students. If the aprons on the tables are too wide, they can be made narrower.

#### A Unit Table for a Clothing Laboratory

A laboratory table was designed which supplies the correct heights for both standing and sitting activities. The table is intended to accommodate four students, two on a side. The top is 42 inches wide and 72 inches long. The top is intended as a cutting surface and is 39 inches high. Dropleaves are provided for work done while seated. One is 27 inches high and the other is 28 inches.

#### Use of Results of This Study

In using the results of this study consideration should be given to the fact that the girls whose physical measures were used as the basis for recommendations averaged a little shorter in stature than the Iowa City group used for comparison.

HEIGHTS FOR HIGH SCHOOL CLOTHING  
LABORATORY TABLES BASED ON  
MEASUREMENTS OF 100 GIRLS

By

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A THESIS

submitted to the  
OREGON STATE COLLEGE

in partial fulfillment of  
the requirements for the  
degree of

MASTER OF SCIENCE

July 1938



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### ACKNOWLEDGMENT

I wish to express my sincere appreciation to Mr. Arthur L. Shull, principal, and to the girls of Analay Union High School who so kindly made it possible for me to carry out this study; also to Dr. Vera Brandon, Professor of Household Administration, and Miss Maud Wilson, Professor in Charge of Home Economics Research for their inspiration and helpful assistance during the period of this study.

## TABLE OF CONTENTS

	Page
Purpose of Study . . . . .	1
Source of Data and Method of Procedure . . . . .	3
Physical Measurements of Girls . . . . .	9
Preferred Table Heights. . . . .	15
Distance From Eyes to Work . . . . .	19
Relation of Preferred Heights to Selected Physical Measures . . . . .	23
Dimensions of Clothing Laboratory Tables and Chairs. .	29
Variation in Heights of Tables. . . . .	29
Height of Cutting Table . . . . .	29
Tables and Chairs for Work Done While Seated. . .	29
Width of Apron plus Thickness of Top. . . . .	34
Recommendations. . . . .	37
Remodeling of Equipment in Clothing Laboratories.	37
A unit Table for a Clothing Laboratory. . . . .	37
Use of Results of This Study. . . . .	37
Bibliography	
Appendix	
Part I. Data Sheet Used in Study. . . . .	i
Part II. Frequency Distributions of Preferred Heights and Physical Measures . . . . .	ii
Part III. Chosen Heights and Physical Measures of Individual Girls. . . . .	vii
Part IV. Directions for Taking Physical Measurements . . . . .	xix



## LIST OF TABLES

Table		Page
1	Physical Measures of 100 High School Girls in Sebastopol, California, Including Averages, and Range in Values. Average age of girls was 16.1 years. . . . .	9
2	Stature of Girls Included in This Study in Relation to Age, and Comparison with Stature Noted in the Boynton Study. . . . .	11
3	Heights Chosen for Sewing Activities by 100 High School Girls in Sebastopol, California, Including Averages, and Range in Values . . . .	15
4	Distance of Eyes to Work (While Engaged in Sewing Operations) of 100 High School Girls in Sebastopol, California, Including Averages, and Range in Values . . . . .	19
5	Relationship of Preferred Height for Sitting and Basting to Measured Sitting Height. . . . .	25
6	Relationship of Preferred Height for Sitting and Basting to Measured Elbow Height . . . . .	26
7	Relationship of Preferred Height for Standing and Cutting to Measured Hip Height. . . . .	27
8	Relationship of Preferred Height for Standing and Cutting to Measured Wrist Height. . . . .	28
9	Relationship of Preferred Height for Standing and Cutting to Measured Elbow Height. . . . .	28A
10	Frequency Distribution of Under-knee Heights. .	32
11	Frequency Distribution of Chosen Sewing Table Heights (Average of the Measures for Sitting and Basting, Sitting and Pinning, and Sitting and Hand-hemming) altered to fit the Situation in Which Laboratory Chair Heights are Suited to the Needs of the Individual . . . . .	33
12	Frequency Distribution of Distances Between Top of Sewing Table and Top of Thigh When the Girl is Seated in a Chair that is One Inch Less Than Her Under-knee Height . . . . .	35

# LIST OF FIGURES

Figure		Page
1	Healthful Posture . . . . .	6
2	Percentage Distribution of Cooperators With Respect to Various Body Measures Taken With Subject Standing. . . . .	13
3	Percentage Distribution of Cooperators With Respect to Various Body Measures Taken With Subject Sitting . . . . .	14
4	Percentage Distribution of Cooperators With Respect to Heights of Tables Preferred For Standing and Cutting. . . . .	17
5	Percentage Distribution of Cooperators With Respect to Heights of Tables Preferred For Sitting and Basting, Sitting and Pinning, and Sitting and Hand-hemming. . . . .	18
6	Percentage Distribution of Cooperators With Respect to Distance From Eyes to Work While Standing and Cutting. . . . .	21
7	Percentage Distribution of Cooperators With Respect to Distance From Eyes to Work While Sitting and Basting, Pinning, and Hand-hem- ming. . . . .	22
8	Design For Clothing Laboratory Table. . . . .	38

HEIGHTS FOR HIGH SCHOOL CLOTHING  
LABORATORY TABLES BASED ON  
MEASUREMENTS OF 100 GIRLS

Purpose of Study

A study to scientifically determine standards for high-school clothing laboratory tables was undertaken because correct table heights are essential for the high school girl (who spends from one to one and a half hours a day for most of the school year in clothing construction work), and because no previous studies known to the writer have dealt with this problem. It appears that the only available material dealing with working-surface heights in high-school clothing laboratories is Vocational Education Bulletin No. 181, "Space and Equipment for Homemaking Instruction". (5) The basis for the standards contained in this bulletin are the opinions of several instructors in high-school clothing.\* Although some schools have used this information, many have given no special consideration to the matter of working-surface heights.

There is no question about the importance of correctly designed laboratory tables as an aid to the maintenance of healthful posture and as a preventive of fatigue. Bennett (1) says "Observation indicates that posture and eyestrain

\* Confirmed by a personal letter from the Office of Education, Division for Vocational Education, Washington, D.C.



are worst in sewing classes. This is particularly unfortunate, both because postural defects are most frequent and most serious among women and because this particular work is more nearly identical with later occupational conditions than is any other school work. Habits formed in these classes are more likely to be carried over into life. The most usual equipment appears to be chance combination of cheap tables and chairs.....Almost universally the writer has observed a majority of the girls in these classes sitting on seats too high for their feet to rest on the floor, and many of them unable to get their knees under the tables on which they were working. Relief is sought by sitting on the feet and by every variety of stoop and twisting..... Low tables should be provided with no drawers, racks, cupboards, or structural obstructions in the way of the knees or limbs.....A high cutting-table may be provided for the class, but it should not be used for sewing."

### Source of Data and Method of Procedure

This study was carried on at the Analy Union High School, Sebastopol, California, where 100 ninth-to-twelfth-grade girls ranging in age from fourteen to twenty-one years\* were measured. Eighty-seven of these girls were scheduled for a one-hour clothing period each school day. The remaining thirteen students had had experience in sewing although they were not enrolled in clothing classes at the time of this study.

The measurements included table heights chosen by the girls for four sewing activities, namely, cutting out garments, pinning pieces together, basting, and hand-hemming. Cutting was done while standing, the other three processes, while seated. Also certain physical measurements were recorded which were useful in testing the application of the results of this study and in determining other standards than table heights.

While determining the heights she preferred for each of the four activities, the student wore clothing that did not prevent freedom of movement, and shoes with heels not over one and one-half inches high. Each student was maintaining her best possible posture, judged by the following

\* Appendix, Part II, Table 12.

criteria\* for evaluating good posture:

I. Standing in erect position.

1. Head straight above chest, hips, and feet.
2. Chest up and forward.
3. Abdomen in or flat.
4. Back with usual curves not exaggerated.
5. Toes straight ahead.
6. Body relaxed.

II. Standing and bending.

1. Trunk straight.
2. Motion coming from the hip joint.

III. Sitting.

1. Trunk straight.
2. Chin up.
3. Chest up and forward.
4. Abdomen in or flat.
5. Back quite flat (usual curves not exaggerated)
6. Lower back touching chair.
7. Body relaxed.

All the measures were made in the clothing laboratory with the following standard equipment:

1. Stadiometer--base 18 inches square and 15 inches high. Rod made of maple, graduated to inches and tenths.

\* Compiled from information given in references 1,3,6,and 7.



2. Shoulder caliper--maple, graduated to inches and tenths, with sliding arm.
3. Steel tape.
4. Boxes--12 inches x 18 inches, made in each even-inch height from one to six inches.
5. Chair--height 16 inches; length from front to back 15.5 inches; with two horizontal bars supporting body at lumbar section and above.
6. Table--34 inches high.
7. Scissors--Wiss No. 28 (condition good).
8. Pattern--Long sleeve pattern, size 36.
9. Cloth--for pinning, 12 x 24 inches; for hand-hemming, 6 x 12 inches.

The stadiometer and the boxes were made by the industrial arts classes of the high school. Anthropometric tape (made by the Naragansett Co.) was used on the rod of the stadiometer.

Before starting the experiments, one hour was spent with the sewing class in discussing and demonstrating the criteria set forth for judging good posture. On the next day, in order that each girl would thoroughly understand the experimental process before starting to work on it, thirty minutes were used in the discussion and demonstration of the procedure in selecting a suitable height for each sewing activity. The individual experiments were

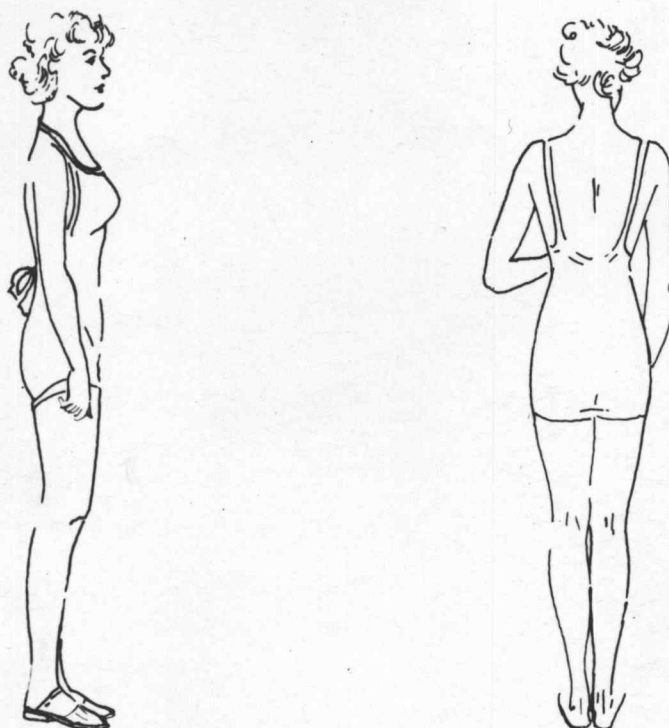


Figure 1. Healthful Posture.

scattered over a period of three weeks, during which time the criteria for judging posture were left on the black-board. Although parts of the instructions were repeated before the individual experiments, no further comments were made after the activity had started. Each student was given unlimited time. For each activity, the girl was required to try various heights, at one-inch gradations, until she had gone both too high and too low to be comfortable. Variations in table heights were obtained by placing boxes on the table, or under the feet or chair of the student. During the tests of table heights suited to work done while seated, all the girls used the same chair, and its height was not raised or lowered. After the height at which she preferred to work had been definitely ascertained, the measurement was taken of the distance from her eyes to the work she was doing.

Each activity test was repeated after an interval of ten minutes or more. The student was asked not to try to recall what her previous decisions had been. If the height selected in the second test varied more than one inch from that selected in the first test, the student was required to repeat the process using greater discrimination. If the two tests varied no more than one inch, the two measures were recorded and their average used in the computations.



After the student had determined the heights which appeared to be most comfortable for the four selected sewing processes, physical measures were taken, as follows:\*

Measures taken with subject standing---height of top of head, of shoulder, of elbow, of wrist, of thumb, of fingertip, and of hip. Measures taken with subject sitting---height above seat of top of head and of thigh; distance from floor to point under knee; length of thigh.

\* Directions followed in taking measures are included in the Appendix, Part IV.

Physical Measurements of Girls

The statures of the high school girls measured averaged 63.8 inches with a range of 10 inches; elbow heights, 40.7 inches, range 8 inches; wrist heights, 31.4 inches, range 8 inches; hip heights, 39.2 inches, range 10 inches; sitting heights, 33.1 inches, range 6 inches; thigh heights, 4.4 inches, range 4 inches; and under knee heights, 16.2 inches, range 6 inches. (Table 1.)

TABLE 1

PHYSICAL MEASURES OF 100 HIGH SCHOOL GIRLS IN  
SEBASTOPOL, CALIFORNIA, INCLUDING AVERAGES  
AND RANGE IN VALUES. AVERAGE AGE OF  
GIRLS WAS 16.1 YEARS.

Measures	Average	Range in Values	
		Lowest--Highest	
	Inches	Inches	Inches
Stature	63.8	58.8	-- 68.8
Shoulder	52.9	48.1	-- 57.5
Elbow	40.7	37.3	-- 45.0
Wrist	31.4	26.5	-- 34.3
Thumb	27.0	24.1	-- 30.5
Fingertip	24.8	21.7	-- 28.0
Hip	39.2	35.0	-- 44.6
Sitting Height	33.1	29.7	-- 36.0
Height Thigh Over Seat	4.4	2.6	-- 6.4
Under Knee	16.2	12.3	-- 18.6
Length Thigh	21.9	18.8	-- 24.7

In Table 2 the statures of the girls measured in this study have been compared with statures of girls of comparable age measured by Boynton. (2) This study, published in 1936, included 1,241 Iowa City white girls. "In view of the adequate sampling for most ages, these values may be considered as normative for American Children whose parents are somewhat selected with respect to socio-economic level....Individuals included in the sampling are homogeneous as to sex and geographic location, but slightly diverse in regard to ethnic stock and rather superior in cultural and socio-economic stature." Boynton's measurements were taken without shoes.

Allowing for the fact that the Sebastopol group were measured with shoes, it appears that they average slightly less in stature than the Iowa City group. This may be accounted for by the presence in the group of six Japanese and a number of Italians and Portuguese.



TABLE 2

STATURE OF GIRLS INCLUDED IN THIS STUDY IN RELATION TO AGE, AND  
COMPARISON WITH STATURE NOTED IN THE BOYNTON STUDY. (2)

Age of Girl	This Study <sup>1</sup>			Boynton's Study <sup>2</sup>		
	No. of Cases	Arithmetic Mean	Range Lowest--Highest	No. of Cases	Arithmetic Mean	Range Lowest--Highest
		Inches	Inches   Inches		Inches	Inches   Inches
14	14	63.2	59.8 -- 67.2	188	62.8	55.2 -- 71.6
15	23	64.2	61.8 -- 67.5	206	63.3	58.2 -- 68.8
16	24	63.4	58.8 -- 68.8	183	63.5	55.9 -- 67.8
17	21	64.1	61.2 -- 68.0	166	63.5	56.4 -- 69.6
18	15	64.1	60.8 -- 66.2	111	63.4	56.3 -- 69.5
19	2	64.4	63.2 -- 65.5			
20	0					
21	1	64.0	64.0			

1. Subjects measured while wearing sports shoes.

2. Subjects measured without shoes.

The distribution of girls with reference to specific measures is indicated in Figure 2, which shows the distribution of measures taken with the subject standing, and Figure 3, which gives those taken while seated. These graphs reveal that 78 per cent of the measurements for stature range from 61 to 65 inches. Comparable amounts for other measures are as follows:

Shoulder height, 81 per cent between 51 and 55 inches.

Elbow height, 85 per cent between 39 and 42 inches.

Wrist height, 78 per cent between 30 and 32 inches.

Thumb height, 90 per cent between 25 and 28 inches.

Fingertip height, 92 per cent between 23 and 26 inches.

Hip height, 82 per cent between 37 and 40 inches.

Sitting height, 83 per cent between 32 and 34 inches.

Height thigh over seat, 97 per cent between 3 and 5 inches.

Under knee height, 90 per cent between 15 and 17 inches.

Length thigh, 95 per cent between 20 and 23 inches.

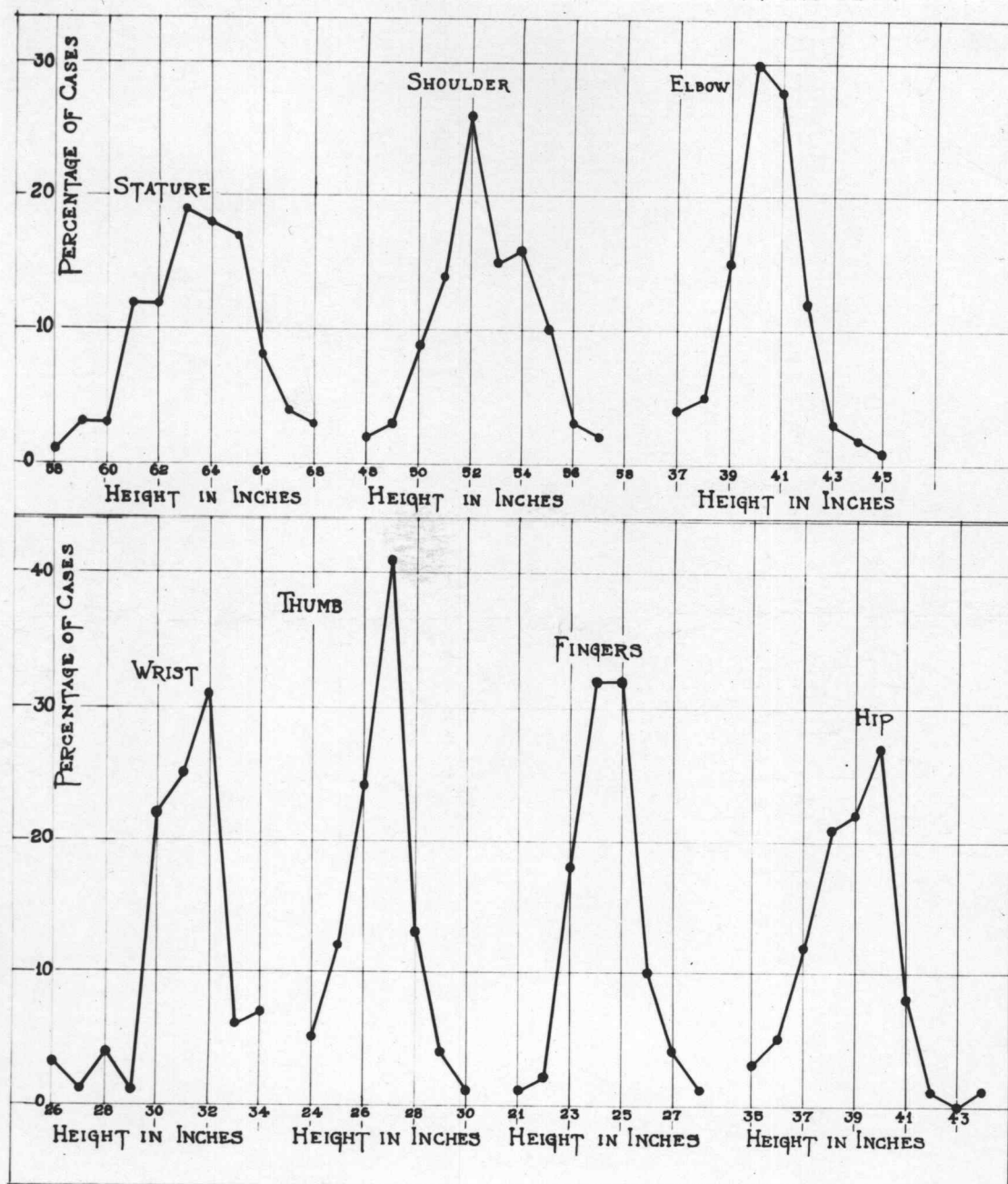


Figure 2. Percentage Distribution of Cooperators With Respect to Various Body Measures Taken With Subject Standing.



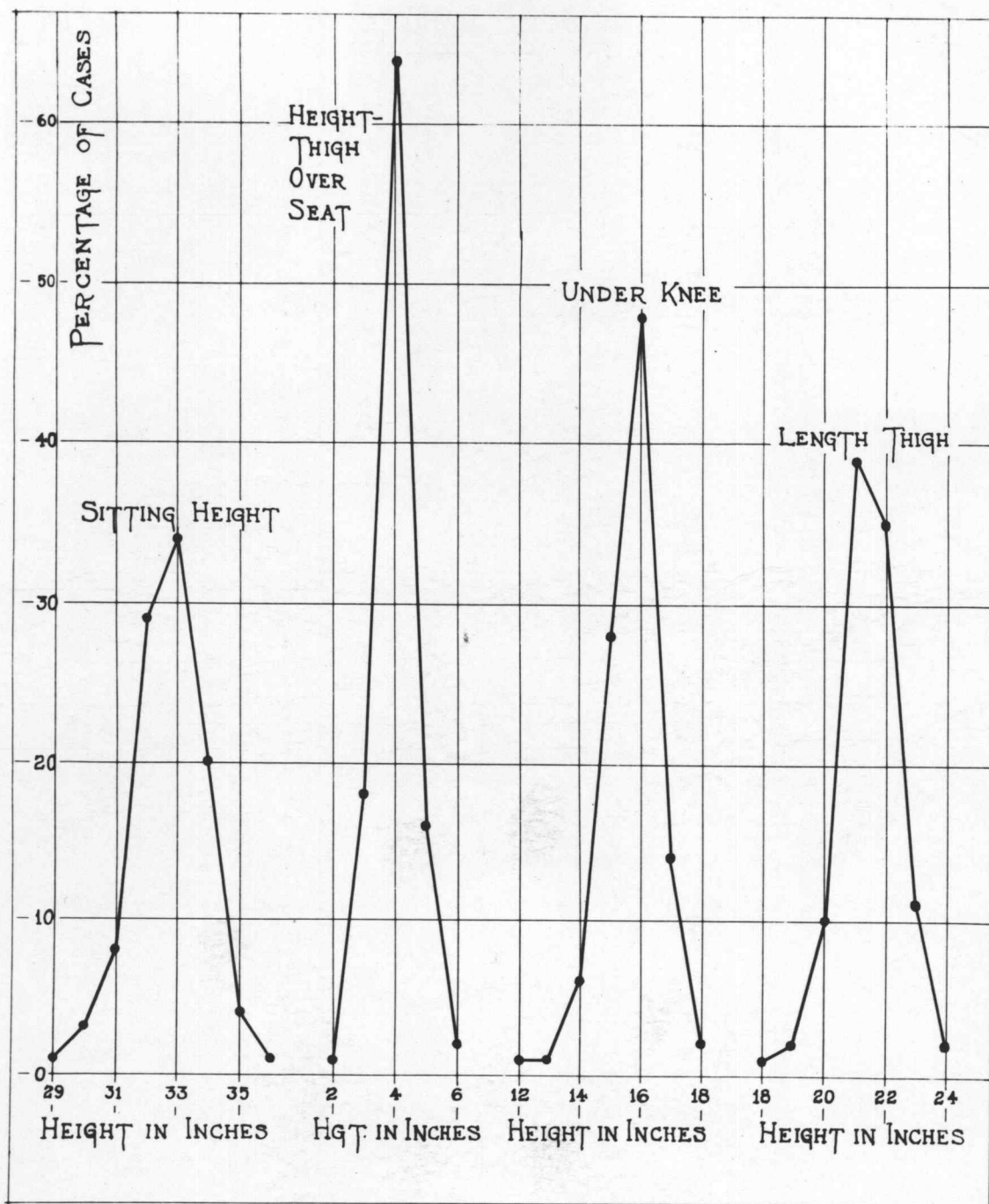


Figure 3. Percentage Distribution of Cooperators With Respect to Various Body Measures Taken With Subject Sitting.

Preferred Table Heights

The average height chosen by the girls for standing and cutting was 38 inches, with a difference of 7.5 inches in the range. The three activities performed while seated, basting, pinning, and hand-hemming, each averages 28 inches, with a difference of only 4 inches in the range for each activity. These values are shown in Table 3.

TABLE 3

HEIGHTS CHOSEN FOR SEWING ACTIVITIES BY 100  
HIGH SCHOOL GIRLS IN SEBASTOPOL, CALIFORNIA  
INCLUDING AVERAGES AND RANGE IN VALUES

Activities	Average Height	Range in Values	
		Lowest--Highest	
	Inches	Inches	Inches
Standing and cutting	37.8	34.5	-- 42.0
Sitting and basting	28.0	26.0	-- 30.0
Sitting and pinning	28.0	26.0	-- 30.0
Sitting and hand-hemming	28.1	26.5	-- 30.5

The distribution of the preferred heights for specific activities is indicated in Figures 4 and 5. Figure 4 shows a pronounced preference for a 39 inch cutting table, 28 girls having chosen this measure. 77 per cent of the preferred heights for standing and cutting are included in

a range of 37 to 39 inches. Only a few girls chose heights greater than 39 inches. Figure 5 shows that the distribution of the three measures taken while seated are almost identical, and that there was a decided preference for a table height of 28 inches. A 16-inch chair was used in all determinations of heights suitable for work done while seated.

It is of interest to compare this data with that found in Wilson's\* study. 77 per cent of the choices of adult women measured for standing and cutting heights were included in a range of 33 to 36 inches. This noticeably lower preferred-height range might well be expected since older women are usually accustomed to cutting on lower surfaces. Wilson's statistics, consequently, do not discredit the writer's conclusions that the average high school girl should have a 39 inch table for cutting and a 28 inch table for seated activities.

\* Reference 8, Table 20, page 32.



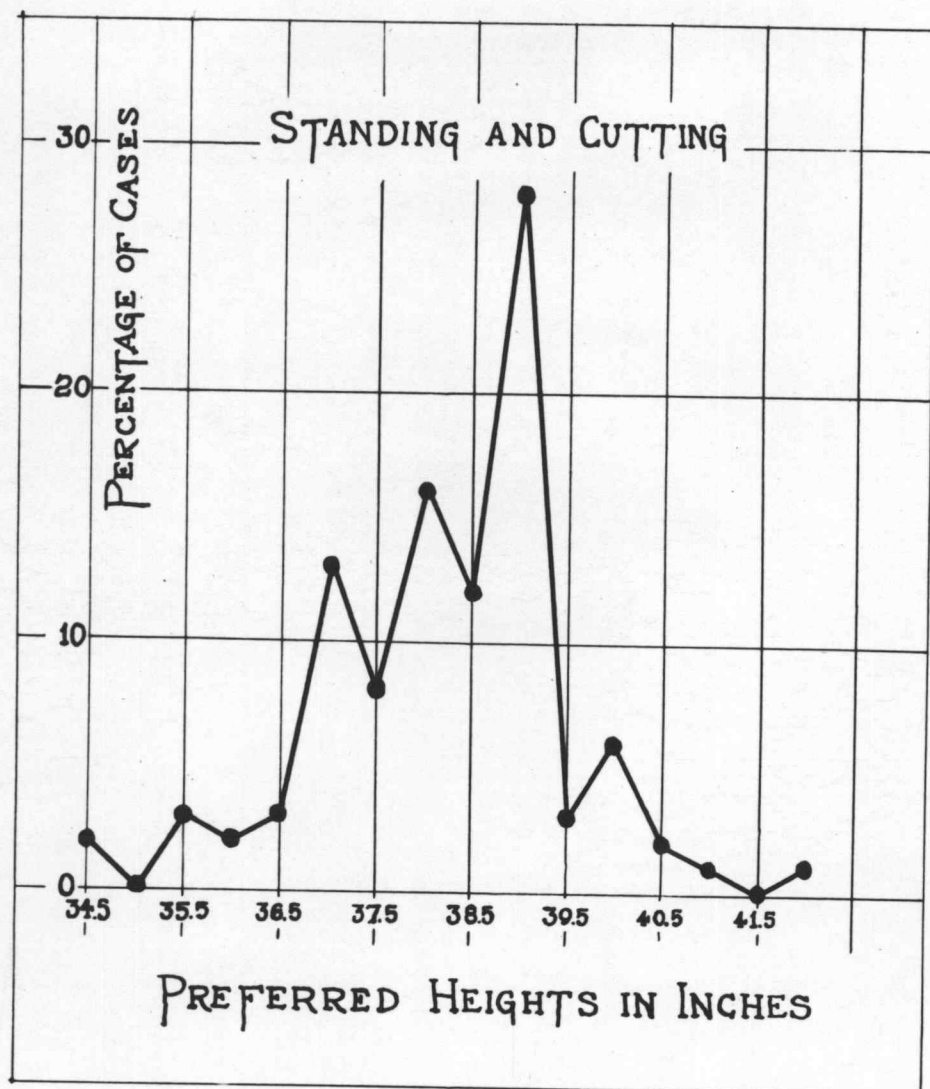


Figure 4. Percentage Distribution of Cooperators With Respect to Heights of Tables Preferred For Standing and Cutting.

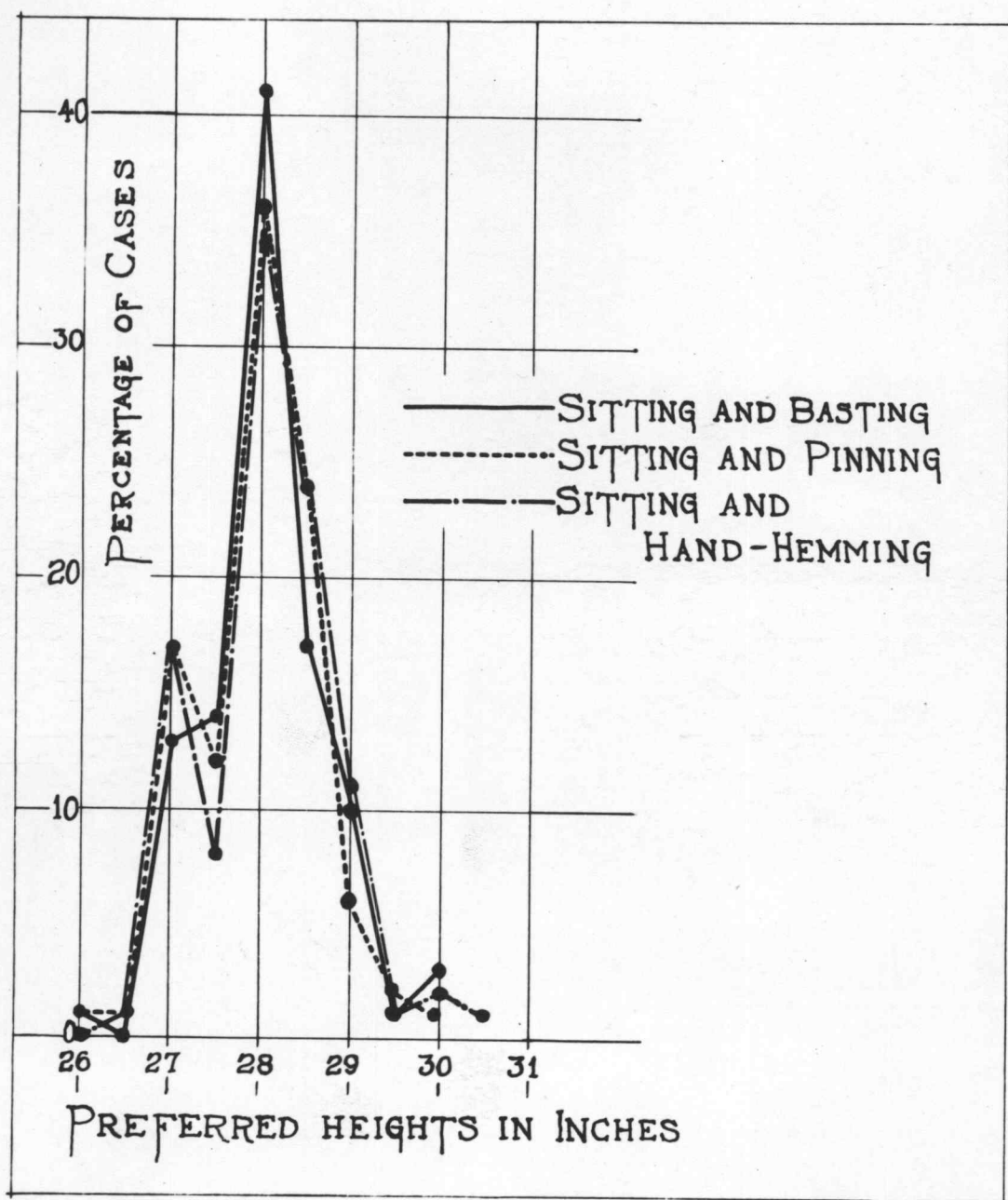


Figure 5. Percentage Distribution of Cooperators With Respect to Heights of Tables Preferred for Sitting and Basting, Sitting and Pinning, and Sitting and Hand-hemming. A 16-inch chair was used for all of these tests.

Distance From Eyes To Work

The average distance from eyes to activity while standing and cutting was 18 inches, with a difference of 10 inches in the range. The average distance from eyes to work for each of the three activities performed while seated--basting, pinning, and hand hemming--was 12 inches, with a difference of 6.5, 5.9, and 7.2 inches in the range respectively. (Table 4)

TABLE 4

DISTANCE OF EYES TO WORK (WHILE ENGAGED IN SEWING OPERATIONS) OF 100 HIGH SCHOOL GIRLS IN SEBASTOPOL, CALIFORNIA, INCLUDING AVERAGES, AND RANGE IN VALUES

Activities	Average	Range in Values	
		Lowest--Highest	
	Inches	Inches	Inches
Standing and cutting	17.7	12.7	-- 22.5
Sitting and basting	12.5	9.0	-- 15.5
Sitting and pinning	12.6	9.7	-- 16.6
Sitting and hand-hemming	12.1	8.0	-- 15.2

Figure 6, shows the distribution of girls with respect to distance from eyes to work while standing and cutting and, Figure 7 gives those taken while seated. 84 per cent



of the measurements taken while standing and cutting are included in a range of 15.0 to 19.5 inches. Comparable amounts for the three activities done while seated are as follows:

Sitting and basting, 84 per cent between 11.0 and 13.5 inches.

Sitting and pinning, 76 per cent between 11.0 and 13.5 inches.

Sitting and hand-hemming, 78 per cent between 11.0 and 13.5 inches.

The fact that the distributions of measures taken while seated are so much the same indicates that the girls maintained constant posture during the tests.

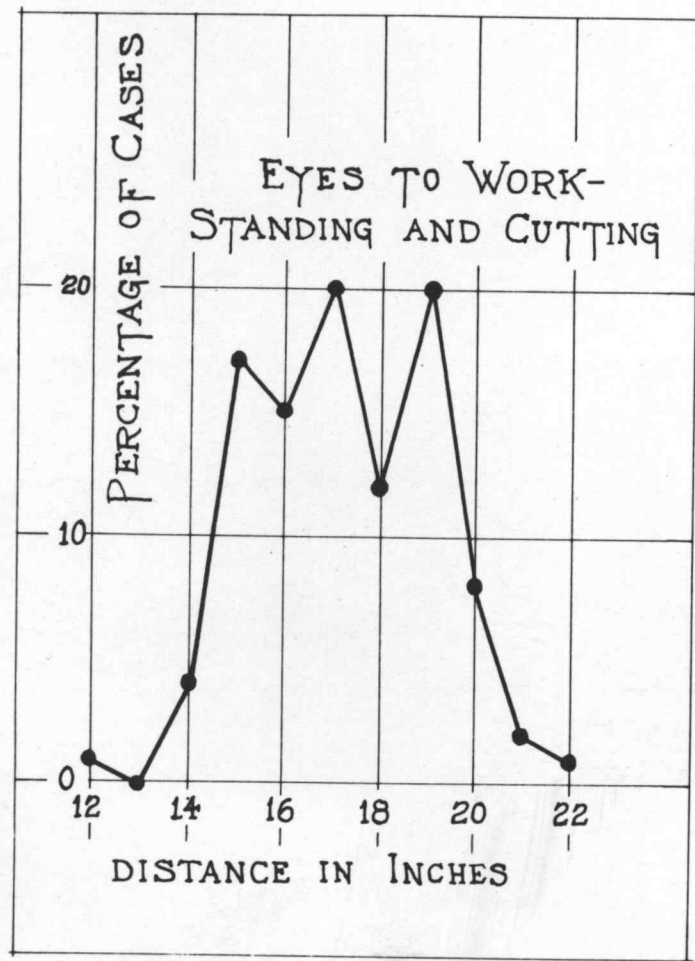


Figure 6. Percentage Distribution of Cooperators With Respect to Distance From Eyes to Work While Standing and Cutting.

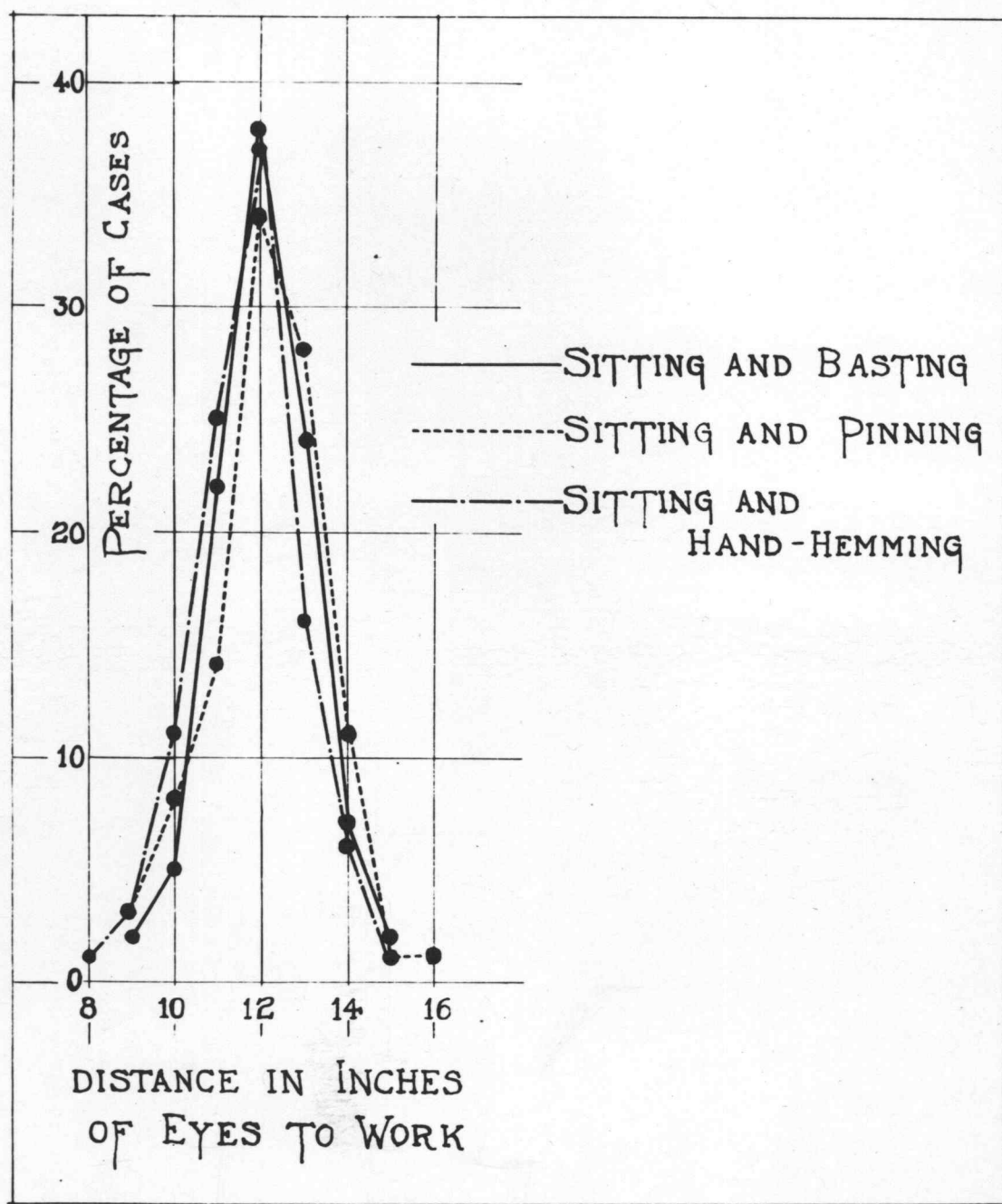


Figure 7. Percentage Distribution of Cooperators With Respect to Distance From Eyes to Work While Sitting and Basting, Pinning, and Hand-hemming.



Relation of Preferred Heights  
to Selected Physical Measures

In Tables 5 to 9 inclusive, preferred heights for standing and cutting and for sitting and basting are shown in relation to selected physical measures. Figure 5 showed that measures for the three seated activities are much the same, hence only one was used in this analysis.

Table 5 shows that the most common difference between the sitting height of the individual girl and her preferred table height for sitting and basting was 5 inches, and that 4, 5, and 6 inches constituted 79 per cent of all the differences. Table 6 shows that the most common difference between the table height chosen for basting and height of elbow (taken while standing) was 13 inches, and that 12, 13, and 14 inches comprised 73 per cent of all differences. A comparison of the two correlations shows that there is a closer relation shown in the former than in the latter.

In Tables 7, 8, and 9 the individual choices for height of cutting table are correlated with height of hip, wrist, and elbow, respectively. A comparison of the three correlations shows that the relationship is quite similar. The most common difference between the hip height of the individual girl and her preferred cutting-table height was 1 inch; 77 per cent of the individual differences were

0, 1, or 2 inches. The most common difference between cutting-table height and wrist height was 7 inches; 75 per cent of the individual differences were 6, 7, or 8 inches. The differences between cutting-table height and elbow height were about equally divided between 2 inches and 3 inches. 78 per cent of these differences were 1, 2, or 3 inches.

TABLE 5

RELATIONSHIP OF PREFERRED HEIGHT FOR SITTING  
AND BASTING TO MEASURED SITTING HEIGHT

Preferred Height in Inches for Sitting and Basting	Measured Sitting Height in Inches								Total No.
	29	30	31	32	33	34	35	36	
26				1					1
27		3	3	10	5	6			27
28	1		4	17	24	9	3		58
29			1	1	4	4		1	11
30					1	1	1		3
Total	1	3	8	29	34	20	4	1	100



TABLE 6

RELATIONSHIP OF PREFERRED HEIGHT FOR SITTING  
AND BASTING TO MEASURED ELBOW HEIGHT

Preferred Height in Inches for Sitting and Basting	Measured Elbow Height in Inches									Total No.
	37	38	39	40	41	42	43	44	45	
26			1							1
27	1	2	5	8	10				1	27
28	3	3	6	20	15	8	2	1		58
29			3	1	1	4	1	1		11
30				1	2					3
Totals	4	5	15	30	28	12	3	2		100

TABLE 7

RELATIONSHIP OF PREFERRED HEIGHT FOR STANDING  
AND CUTTING TO MEASURED HIP HEIGHT

Preferred Height in Inches for Standing and Cutting	Measured Hip Height in Inches										Total No.
	35	36	37	38	39	40	41	42	43	44	
34	1		1								2
35	1		2								3
36			4	1							5
37		3	2	8	5	3					21
38	1		3	7	8	9					28
39		2		4	6	11	7	1			31
40				1	3	3	1				8
41						1					1
42										1	1
Totals	3	5	12	21	22	27	8	1	0	1	100

TABLE 8

RELATIONSHIP OF PREFERRED HEIGHT FOR STANDING  
AND CUTTING TO MEASURED WRIST HEIGHT

Preferred Height in Inches for Standing and Cutting	Measured Wrist Height in Inches									Total No.
	26	27	28	29	30	31	32	33	34	
34			1		1					2
35		1	1			1				3
36	1		1		2	1				5
37	1		1		10	4	5			21
38	1			1	7	8	10	1		28
39					2	8	12	4	5	31
40						3	3	1	1	8
41							1			1
42									1	1
Totals	3	1	4	1	22	25	31	6	7	100



TABLE 9

RELATIONSHIP OF PREFERRED HEIGHT FOR STANDING  
AND CUTTING TO MEASURED ELBOW HEIGHT

Preferred Height in Inches for Standing and Cutting	Measured Elbow Height in Inches									Total No.
	37	38	39	40	41	42	43	44	45	
34	1		1							2
35	1			1	1					3
36	1		3	1						5
37	1	3	6	8	2	1				21
38		2	2	11	12	1				28
39			2	7	10	7	3	2		31
40			1	2	2	3				8
41					1					1
42									1	1
Totals	4	5	15	30	28	12	3	2	1	100

## Dimensions of Clothing Laboratory Tables and Chairs

### Variation in Heights of Tables

The results of this study support the statement of Bennett (cited on page 1) that the same table cannot be used satisfactorily for cutting out garments, and for basting, pinning, and hand-hemming.

### Height of Cutting Table

The most generally useful height for a cutting table is 39 inches, judging from the results of this study. Almost a third of the girls chose this height, while half of them chose only an inch or two less. A single cutting table height, therefore, would appear to be satisfactory for a high school clothing laboratory, especially when a box 3 inches high is provided for the shorter girls.

### Tables and Chairs for Work Done While Seated

It was found that a table height of 28 inches suited the largest per cent of the girls for work done while seated on a chair 16 inches high. If, however, the majority of girls are to have comfortable working surfaces, it will be necessary to have several different table heights for sitting and working. Desirable variations in table heights, when all laboratory chairs are 16 inches high, are as follows:

If 2 heights--27.5 inches and 28.5 inches.

If 3 heights--27 inches, 28 inches, and 29 inches.

If 4 heights--27.5 inches, 28.5 inches, 28.5 inches, and 29.5 inches.

If 5 heights--27 inches, 27.5 inches, 28 inches, 28.5 inches, and 29.5 inches.

If 6 heights--27 inches, 27.5 inches, 28 inches, 28.5 inches, 29 inches, and 29.5 inches.

The foregoing recommendations for heights of sewing tables are made on the assumption that all chairs in the laboratory would be 16 inches high. A frequency distribution of under-knee measures (Table 10) showed that when the Bennett Standard\* for chair height is used (one inch less than under-knee height), a 15-inch chair would be preferable to a 16-inch, when chairs of only one height are provided. If all chairs in the laboratory are 15 inches high, each of the foregoing table heights should be reduced by one inch.

\*"In comfortable and hygienic sitting the weight of the body is carried mainly from the seat bones (ischial tuberosities), upon which the weight is perfectly poised without muscular strain when one sits erect. The thick pads of muscle under the thighs are also well adapted for supplementary support----pressure from the seat in this area behind the knees (the poplital area)----becomes a cause of discomfort and restlessness, causing the feet to 'go to sleep', to become cold and possibly contributing to varicose veins and other permanent injury. The feet should rest squarely on the floor and carry the weight of the lower legs. There is little if any objection to its (the seat) being as much as two or three inches lower than this (maximum height which does not cause pressure behind the knees) provided there is space to move his (the pupil's) feet freely.... The best seat-height for each individual would probably be an inch or more lower than the recorded measure, varying with the form and slope of the seat." (1)



Table 10 shows the desirability of at least three chair heights in the laboratory. If three are provided, they should be proportioned as nearly as possible as follows:

14-inch chair--11 per cent

15-inch chair--55 per cent

16-inch chairs--34 per cent

If four heights are provided, desirable heights and the proportion of each would be:

13.5-inch chairs-- 8 per cent

14.5-inch chairs--28 per cent

15.5-inch chairs--48 per cent

16.5-inch chairs--16 per cent

The variations in table heights previously listed are recommended for the situations in which laboratory chairs are of uniform height. For the situation in which chairs are adjustable in height or where their heights are suited to the estimated needs of groups of girls, the foregoing recommendations for table heights will need to be altered.

Table 11 shows the frequency distribution made of sewing table heights after the individual choices made by girls seated on 16-inch chairs were altered to represent choices in the event that each was seated on a chair one inch less in height than her under-knee measure. The average altered table height was found to be 27.2 inches. A study of the data in Table 11 shows that desirable

variations in sewing table heights for the laboratory which provides seating arrangements suited to individual girls are identical with the variations recommended for the laboratory equipped entirely with 15-inch chairs.

TABLE 10  
FREQUENCY DISTRIBUTION OF UNDER-KNEE HEIGHTS

Interval	Per Cent
12.0-12.4	1
12.5-12.9	0
13.0-13.4	1
13.5-13.9	0
14.0-14.4	3
14.5-14.9	3
15.0-15.4	3
15.5-15.9	25
16.0-16.4	30
16.5-16.9	18
17.0-17.4	12
17.5-17.9	2
18.0-18.4	1
18.5-18.9	1
Total	100

TABLE 11

FREQUENCY DISTRIBUTION OF CHOSEN SEWING-TABLE HEIGHTS  
(AVERAGE OF THE MEASURES FOR SITTING AND BASTING,  
SITTING AND PINNING, AND SITTING AND HAND-HEMMING)  
ALTERED TO FIT THE SITUATION IN WHICH LABORATORY  
CHAIR HEIGHTS ARE SUITED TO THE NEEDS OF THE  
INDIVIDUAL

Chosen Sewing Table Heights	Per Cent
22.5	1
23.0	0
23.5	1
24.0	1
24.5	1
25.0	1
25.5	5
26.0	10
26.5	23
27.0	16
27.5	16
28.0	12
28.5	9
29.0	3
29.5	1
Total	100



Width of Apron plus Thickness of Top

In order to prevent discomfort while sitting and working at a sewing table it is necessary to consider the thickness of the top and the construction below it. In Table 12, the 100 cases included in this study are distributed with respect to the distance between top of sewing table (average of the three chosen measures) and distance from top of thigh to floor, when the girl is seated in a chair that is one inch lower than her under-knee height. To accommodate 99 per cent of the girls included in this study, construction no wider than 5 inches should be used. This limitation will insure a clearance of at least 2 inches above the thighs in 93 per cent of the cases.

TABLE 12

FREQUENCY DISTRIBUTION OF DISTANCES BETWEEN TOP OF  
SEWING TABLE AND TOP OF THIGH WHEN THE GIRL IS  
SEATED IN A CHAIR THAT IS ONE INCH LESS THAN  
HER UNDER-KNEE HEIGHT.\*

Interval	Per Cent
Inches	
3.5 to 3.9	1
4.0 to 4.4	0
4.5 to 4.9	0
5.0 to 5.4	0
5.5 to 5.9	1
6.0 to 6.4	1
6.5 to 6.9	4
7.0 to 7.4	12
7.5 to 7.9	10
8.0 to 8.4	23
8.5 to 8.9	16
9.0 to 9.4	13
9.5 to 9.9	9
10.0 to 10.4	6
10.5 to 10.9	2
11.0 to 11.4	2
Total	100

\* Individual values were determined as follows:

1. Average was obtained of the three table heights for work done while seated.
2. Height of thighs from floor was obtained by adding height of thigh above seat to under-knee measure, and subtracting one inch.
3. Values from (2) were subtracted from (1).



## Recommendations

### Remodelling of Equipment in Clothing Laboratories

The results of this study may be used in altering tables and chairs in clothing laboratories already equipped. In order to make the tables higher neat wooden blocks may be used under the legs; for making them shorter the legs may be cut to the desired length, or adjustment may be made by raising the height of the chairs and providing foot rests for the students. If the aprons on the tables are too wide, they can be made narrower.

### A Unit Table for a Clothing Laboratory

The accompanying sketch illustrates a laboratory table which supplies the correct heights for both standing and sitting activities. The table is intended to accommodate four students, two on a side. The top is 42 inches wide and 72 inches long. The top is intended as a cutting surface and is 39 inches high. Dropleaves are provided for work done while seated. One is 27 inches high and the other is 28 inches.

### Use of Results of This Study

In using the results of this study consideration should be given to the fact that the girls whose physical measures were used as the basis for recommendations averaged a little shorter in stature than the Iowa City group used for comparison.

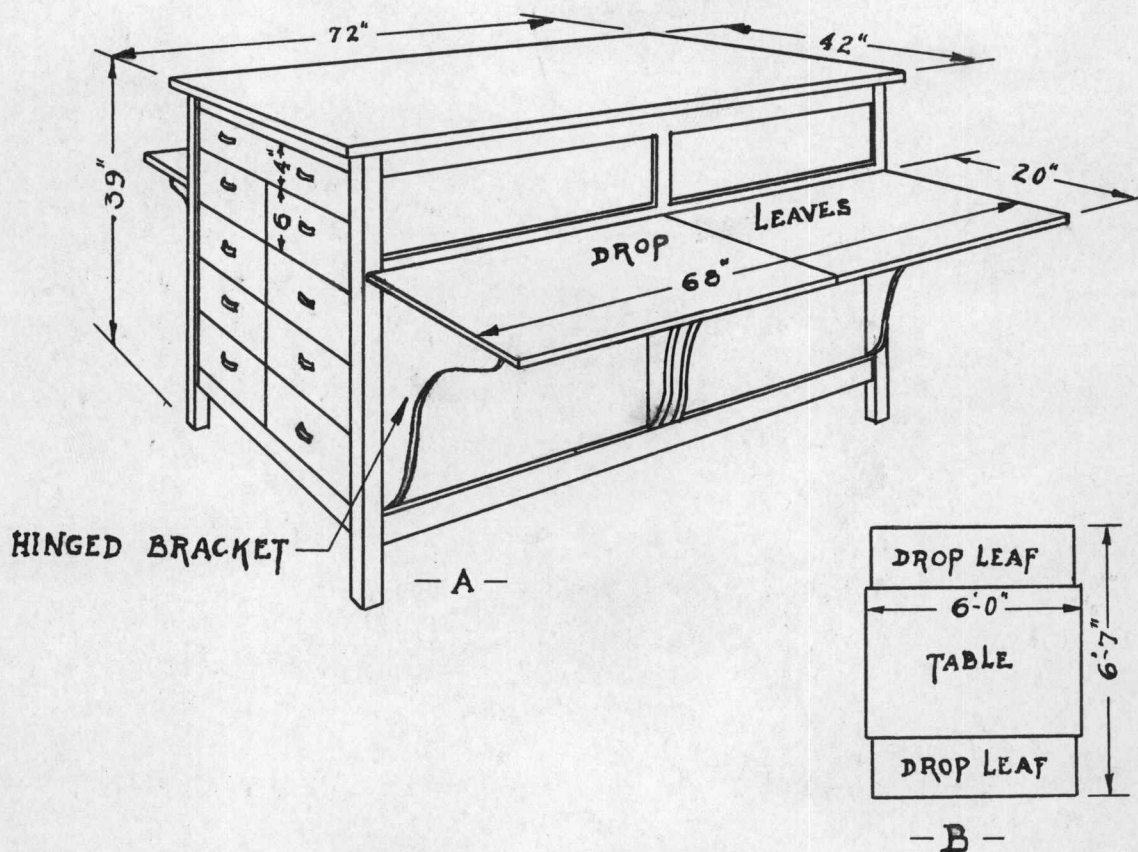


Figure 8.

- A. Design for clothing laboratory table. For four students.  
 Table top 42" x 72" is intended for work done while standing.  
 4 drop leaves each 20" x 34" for work done while seated. The top of two drop leaves is 27" from the floor, the others 28".  
 2 drawers (one on each end) each 4" deep by 35" wide, outside measure.  
 16 drawers (eight on each end) each 6" deep by 17 1/2" wide, outside measure.
- B. Floor space required when both drop leaves are in use.

## BIBLIOGRAPHY

1. Bennett, Henry Eastman, Ph.D. School and posture seating. Ginn and Co., 1928.
2. Boynton, Bernice, Ph.D. A study of the rythm of physical growth from anthropometric measurements on girls between birth and 18 years. Studies in Child Welfare. Vol XII, No. 4. Published by the University of Iowa, Iowa City, Iowa, 1936.
3. Howland, Ivalclare Sprow. The teaching of body mechanics in elementary and secondary schools. Prepared and issued by the Department of Hygiene and Physical Education, Harvard University, Cambridge, Massachusetts. 1936.
4. Rowe, Bess M. Good posture. Published by The Farmer's Wife Magazine, St. Paul, Minn.
5. Space and Equipment for Homemaking Instruction. U.S. Department of the Interior Office of Education Division for Vocational Education, Bulletin No. 181. Home Economics Series No. 18. Washington, D.C. 1936.
6. The Children's Bureau, United States Department of Labor, Washington, D.C., 1926. Publication No. 164. Posture Clinics.
7. Thomas, Leah C., and Goldthwaite, J.E. Body Mechanics and Health. Boston, Houghton Mifflin Co. 1922.
8. Wilson, Maud, Roberts, Evelyn H., and Thayer, Ruth. Standards for working surface heights and other space units of the dwelling. Washington Agriculture Experiment Station Bulletin 345, and Oregon Agriculture Experiment Station Bulletin 348. Washington and Oregon Agricultural Experiment Stations. June, 1937.



## APPENDIX

PART I  
DATA SHEET

1. Name \_\_\_\_\_ 4. Glasses \_\_\_\_\_ Yes \_\_\_\_\_ No  
2. Age \_\_\_\_\_ 5. Date \_\_\_\_\_  
3. Type \_\_\_\_\_ 6. Time of day \_\_\_\_\_

Activity First Sec. Ave.

A. HEIGHT OF  
TABLE

7. Standing  
and  
cutting \_\_\_\_\_  
8. Sitting  
and  
basting \_\_\_\_\_  
9. Sitting  
and  
pinning \_\_\_\_\_  
10. Sitting  
and  
hand  
hemming \_\_\_\_\_

B. EYES TO  
WORK

11. Eyes to  
work for  
seven \_\_\_\_\_  
12. Eyes to  
work for  
eight \_\_\_\_\_  
13. Eyes to  
work for  
nine \_\_\_\_\_  
14. Eyes to  
work for  
ten \_\_\_\_\_

C. BODY MEASURES \*

15. Weight \_\_\_\_\_  
16. Stature \_\_\_\_\_  
17. Shoulder \_\_\_\_\_  
18. Elbow \_\_\_\_\_  
19. Wrist \_\_\_\_\_  
20. Thumb \_\_\_\_\_  
21. Fingertip \_\_\_\_\_  
22. Hip \_\_\_\_\_  
23. Sitting ht. \_\_\_\_\_  
24. Height thigh over  
seat \_\_\_\_\_  
25. Under knee \_\_\_\_\_  
26. Length thigh \_\_\_\_\_

\*All measurements taken  
from floor up.

## PART II

FREQUENCY DISTRIBUTIONS OF PREFERRED HEIGHTS  
AND PHYSICAL MEASURES

## 1. Stature

Range	Percentage of cases
Inches	Per Cent
58*	1
59	3
60	3
61	12
62	12
63	19
64	18
65	17
66	8
67	4
68	<u>3</u>
Total	100

## 2. Shoulder

Range	Percentage of cases
Inches	Per Cent
48	2
49	3
50	9
51	14
52	26
53	15
54	16
55	10
56	3
57	<u>2</u>
Total	100

## 3. Elbow

Range	Percentage of cases
Inches	Per Cent
37	4
38	5
39	15
40	30
41	28
42	12
43	3
44	2
45	<u>1</u>
Total	100

## 4. Wrist

Range	Percentage of cases
Inches	Per Cent
26	3
27	1
28	4
29	1
30	22
31	25
32	31
33	6
34	<u>7</u>
Total	100

\*58.0 inches and less than 59.0 inches. Subsequent groups are similarly defined.



## 5. Thumb

Range	Percentage of cases
Inches	Per Cent
24	5
25	12
26	24
27	41
28	13
29	4
30	1
	<hr/>
Total	100

## 6. Fingertip

Range	Percentage of cases
Inches	Per Cent
21	1
22	2
23	18
24	32
25	32
26	10
27	4
28	1
	<hr/>
Total	100

## 7. Hip

Range	Percentage of cases
Inches	Per Cent
35	3
36	5
37	12
38	21
39	22
40	27
41	8
42	1
43	0
44	1
	<hr/>
Total	100

## 8. Sitting Height

Range	Percentage of cases
Inches	Per Cent
29	1
30	3
31	8
32	29
33	34
34	20
35	4
36	1
	<hr/>
Total	100

## 9. Height Thigh Over Seat

Range	Percentage of cases
Inches	Per Cent
2	1
3	18
4	63
5	16
6	2
	<hr/>
Total	100

## 10. Under Knee

Range	Percentage of cases
Inches	Per Cent
12	1
13	1
14	6
15	28
16	48
17	14
18	2
	<hr/>
Total	100

## 11. Length Thigh

Range	Percentage of cases
Inches	Per Cent
18	1
19	2
20	10
21	39
22	35
23	11
24	2
	<hr/>
Total	100

## 12. Age

Range	Percentage of cases
Ages	Per Cent
14	14
15	23
16	24
17	21
18	15
19	2
20	0
21	1
	<hr/>
Total	100

## 13. Eyes for Standing Cutting

Range	Percentage of cases
Inches	Per Cent
12	1
13	0
14	4
15	17
16	15
17	20
18	12
19	20
20	8
21	2
22	<u>1</u>
Total	100

## 14.

Eyes for Sitting  
and Basting

Range	Percentage of cases
Inches	Per Cent
9	2
10	5
11	22
12	38
13	24
14	7
15	<u>2</u>
Total	100

## 15.

Eyes for Sitting  
and Pinning

Range	Percentage of cases
Inches	Per Cent
9	3
10	8
11	14
12	34
13	28
14	11
15	1
16	<u>1</u>
Total	100

## 16.

Eyes for Sitting  
and Hemming

Range	Percentage of cases
Inches	Per Cent
8	1
9	3
10	11
11	25
12	37
13	16
14	6
15	<u>1</u>
Total	100



## 17. Standing and Cutting

Range	Percentage of cases
Inches	Per Cent
34.5	2
35.0	0
35.5	3
36.0	2
36.5	3
37.0	13
37.5	8
38.0	16
38.5	12
39.0	28
39.5	3
40.0	6
40.5	2
41.0	1
41.5	0
42.0	<u>1</u>
Total	100

## 18.

Sitting and  
Basting

Range	Percentage of cases
Inches	Per Cent
26.0	1
26.5	0
27.0	13
27.5	14
28.0	41
28.5	17
29.0	10
29.5	1
30.0	3
Total	<u>100</u>

## 19.

Sitting and  
Pinning

Range	Percentage of cases
Inches	Per Cent
26.0	1
26.5	1
27.0	17
27.5	12
28.0	36
28.5	24
29.0	6
29.5	2
30.0	1
Total	<u>100</u>

## 20.

Sitting and  
Hemming

Range	Percentage of cases
Inches	Per Cent
26.5	1
27.0	17
27.5	8
28.0	35
28.5	24
29.0	11
29.5	1
30.0	2
30.5	<u>1</u>
Total	100

## PART III

CHOSEN HEIGHTS AND PHYSICAL  
MEASURES OF INDIVIDUAL GIRLS

Stature	Shoulder	Elbow	Wrist	Thumb
58.80	48.1	37.5	28.7	24.5
59.25	49.2	37.6	28.7	25.0
59.50	48.9	37.4	28.4	24.9
59.75	49.1	37.3	28.3	24.1
60.25	49.5	38.0	26.8	26.1
60.50	50.5	38.8	30.0	25.8
60.80	50.1	38.7	30.0	25.7
61.00	50.8	39.0	26.8	25.7
61.10	51.0	38.0	30.1	24.6
61.25	51.1	40.2	31.1	27.6
61.25	50.4	39.5	30.2	26.6
61.25	50.8	39.1	30.2	25.1
61.50	50.5	39.0	31.3	27.2
61.50	51.4	39.4	30.4	25.9
61.50	50.5	39.5	30.5	26.4
61.75	50.5	39.0	30.3	25.1
61.75	52.0	39.5	30.6	26.0
61.75	51.0	41.2	27.3	25.4
61.75	52.3	40.4	30.9	26.1
62.00	51.9	38.9	26.5	24.5
62.00	50.9	41.0	32.2	27.5
62.00	51.6	39.4	30.9	26.7
62.20	51.4	39.0	30.0	25.6
62.25	51.8	40.0	29.8	25.4
62.25	52.0	40.0	31.2	27.3
62.40	51.9	40.1	30.8	27.5
62.50	51.5	40.3	32.2	27.0
62.70	52.1	40.5	31.2	26.4
62.75	52.1	41.5	31.8	27.8
62.75	52.3	40.3	31.2	26.2
62.75	52.2	40.6	31.8	27.3
63.00	52.5	40.3	31.5	27.3
63.10	51.1	39.3	30.6	25.8
63.10	52.4	40.8	32.0	27.6
63.20	52.2	39.5	30.3	25.8
63.25	52.5	40.4	32.0	27.5
63.25	52.5	41.4	31.7	27.2
63.25	52.5	40.4	30.7	26.7
63.25	53.3	41.0	30.8	27.0
63.25	52.2	40.0	30.5	26.2

Stature	Shoulder	Elbow	Wrist	Thumb
63.50	52.60	40.40	31.80	27.20
63.50	51.60	40.00	30.50	26.70
63.50	52.00	40.80	31.10	26.50
63.75	52.50	40.60	31.10	26.40
63.75	52.70	41.50	30.70	27.20
63.75	52.80	41.60	32.40	27.70
63.75	53.00	41.50	32.50	27.80
63.75	52.10	41.00	32.00	27.20
63.75	52.00	40.60	31.80	27.30
63.75	53.00	40.40	32.00	27.50
64.00	51.40	40.10	31.00	26.50
64.00	52.50	40.30	31.30	27.40
64.00	52.60	41.00	32.20	28.40
64.10	52.60	40.50	31.50	26.30
64.20	54.30	42.00	32.30	27.20
64.25	53.50	41.20	31.20	26.90
64.25	53.50	41.30	32.60	27.70
64.25	52.50	39.20	30.30	26.00
64.25	53.50	40.60	31.20	27.70
64.25	52.50	40.10	30.90	27.20
64.50	51.90	40.50	31.80	27.10
64.50	54.00	42.40	33.70	26.60
64.50	54.00	40.80	31.20	27.00
64.50	53.10	40.80	31.10	26.90
64.50	53.50	41.50	32.00	27.20
64.75	53.20	40.50	32.10	28.10
64.75	53.50	41.20	32.00	28.00
64.80	54.60	39.40	32.20	27.40
65.00	53.50	41.50	32.30	28.00
65.00	54.00	39.60	34.00	27.00
65.25	53.90	41.50	32.30	28.10
65.25	54.00	42.50	32.40	27.90
65.30	54.00	41.10	32.40	27.70
65.30	54.00	41.80	32.30	28.20
65.40	53.10	40.10	31.00	26.50
65.50	54.40	41.30	31.00	26.40
65.50	53.80	42.50	34.00	29.20
65.50	54.00	41.30	32.00	27.70
65.50	55.00	42.00	32.00	28.00
65.75	55.50	43.50	34.00	26.60



Stature	Shoulder	Elbow	Wrist	Thumb
65.75	54.50	42.00	32.00	27.70
65.75	54.50	41.50	31.70	27.70
65.75	55.25	41.50	32.50	28.50
65.75	53.50	41.30	31.70	27.10
65.75	54.90	41.50	32.00	27.70
66.00	55.50	41.20	32.00	28.10
66.10	55.20	41.80	33.50	28.10
66.25	54.50	42.60	34.20	29.80
66.25	55.50	43.20	33.30	29.20
66.25	55.25	42.20	32.20	27.20
66.25	56.00	44.00	34.30	30.50
66.30	54.80	41.60	33.00	26.80
66.50	54.50	42.30	32.10	27.60
67.00	56.00	42.80	33.00	28.90
67.00	55.50	41.60	32.30	27.80
67.25	55.75	42.30	32.40	27.90
67.50	56.00	43.30	33.80	28.80
68.00	55.50	42.00	32.00	26.60
68.10	57.00	44.30	34.10	28.50
68.75	57.50	45.00	34.00	29.30
<hr/>				
6385.00	5287.95	4072.30	3142.60	2704.30

x

Fingertip	Hip	Sitting Height	Height Thigh Over Seat	Under Knee
22.50	35.50	32.00	4.1	14.2
23.20	37.40	29.70	4.8	15.4
23.10	35.00	31.20	4.3	14.3
21.70	36.70	31.30	3.4	15.0
24.30	36.60	32.00	4.4	14.7
23.90	37.70	30.80	3.9	15.8
23.10	37.60	31.00	4.0	15.6
23.00	37.90	32.00	3.7	15.7
22.60	38.40	30.00	4.7	16.6
24.40	37.60	32.60	5.4	14.9
24.70	37.70	33.50	4.4	15.2
23.00	39.10	31.20	4.8	15.6
25.10	37.80	32.00	3.2	15.8
24.00	36.90	33.60	5.7	14.2
24.00	37.30	32.40	4.1	16.3
23.40	37.20	32.70	3.8	15.5
24.20	38.50	31.50	4.5	16.0
23.60	37.50	32.30	5.3	15.7
23.90	38.60	32.10	4.3	16.0
23.00	39.70	31.50	4.7	17.1
25.20	38.50	33.20	5.7	14.7
24.60	37.90	32.30	4.6	15.9
23.30	38.60	32.50	4.3	15.8
23.80	39.80	30.50	3.8	17.3
24.70	38.70	32.00	3.7	15.9
24.30	37.20	33.00	4.0	16.2
24.90	38.20	34.00	4.4	15.6
23.80	38.50	33.10	4.1	15.7
25.60	38.50	32.80	3.4	16.1
24.70	39.20	31.90	3.8	16.2
25.50	38.80	33.90	4.7	16.0
25.00	38.50	33.80	4.2	16.4
24.20	38.60	33.00	4.6	15.9
25.70	38.80	33.00	2.6	16.2
23.30	38.50	31.50	3.7	16.3
25.50	39.30	33.00	4.3	13.0
25.20	39.20	33.00	5.2	16.1
24.60	40.20	32.30	4.3	16.7
24.40	40.00	33.40	4.4	16.0
24.00	38.50	33.20	4.0	16.3
25.00	39.20	33.00	3.7	16.3
23.80	39.00	32.00	4.0	16.2
24.70	38.60	32.90	4.3	15.4
24.40	40.00	32.40	4.0	16.4
24.00	40.20	32.50	4.2	16.5

Fingertip	Hip	Sitting Height	Height Thigh Over Seat	Under Knee
25.50	39.60	33.00	4.60	16.3
25.80	38.70	33.50	4.10	16.1
25.50	36.80	34.20	5.10	15.8
25.10	39.60	34.00	4.20	15.9
25.00	40.00	32.50	5.00	16.3
24.50	38.70	33.80	4.90	15.9
25.00	39.50	33.50	4.90	16.1
26.10	38.00	34.00	3.80	16.3
24.30	36.50	32.90	4.40	15.8
25.40	40.70	32.00	4.58	16.8
25.00	40.30	32.80	4.40	16.8
25.20	40.20	32.90	5.20	15.8
24.00	39.80	32.90	4.60	15.8
24.50	40.50	32.80	3.70	16.6
23.50	39.00	32.80	4.00	16.5
24.80	39.50	34.10	4.20	16.7
27.50	39.30	34.30	3.90	15.8
25.10	42.00	32.00	4.50	17.1
24.10	39.40	33.30	4.90	15.5
24.60	38.70	33.70	3.70	16.8
25.60	39.70	33.90	4.40	15.9
25.20	39.70	34.00	4.30	16.5
24.90	39.00	34.30	3.80	16.4
26.10	38.50	35.40	3.40	16.4
24.50	40.80	32.30	5.10	17.1
26.00	40.00	34.20	4.40	16.0
26.30	40.70	33.10	4.70	16.6
24.80	39.50	32.80	4.60	16.7
25.70	35.20	35.00	4.50	15.6
23.50	39.80	34.70	5.50	15.7
24.10	40.40	33.60	4.20	17.1
27.10	40.40	34.00	6.40	16.3
25.30	40.80	33.70	4.30	16.8
25.70	40.60	33.60	5.30	16.9
27.20	40.60	33.70	4.30	16.8
25.70	40.00	34.00	3.40	17.0
25.20	41.00	33.50	4.00	17.4
26.00	40.60	34.40	5.00	17.0
24.60	40.00	33.10	4.80	16.3
24.80	41.00	33.20	4.40	16.6
25.50	41.00	33.00	4.90	12.3
26.50	39.30	34.80	4.50	16.0
27.20	41.00	34.60	4.40	16.1
26.50	41.40	34.20	4.20	16.9
25.00	40.90	35.00	5.40	17.2



Fingertip	Hip	Sitting Height	Height Thigh Over Seat	Under Knee
28.00	40.70	33.70	4.50	17.8
24.60	40.60	33.00	4.60	17.4
25.10	40.80	33.00	4.50	17.2
26.40	40.00	36.00	4.10	16.3
25.00	40.80	33.50	5.00	18.2
25.30	40.80	35.00	4.80	16.1
26.70	41.00	34.20	4.30	17.5
23.60	41.10	34.20	6.10	16.5
25.80	41.90	34.20	5.20	17.0
26.70	44.60	34.40	5.80	18.6
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2481.60	3924.20	3307.90	439.28	1615.6

Length Thigh	Age	Eyes for Standing and Cutting	Eyes for Sitting and Basting	Eyes for Sitting and Pinning
18.8	16	14.675	9.000	9.750
21.3	16	15.370	10.750	11.000
19.3	16	15.250	11.675	12.250
19.9	14	16.500	11.000	12.000
21.3	14	15.000	11.375	11.250
20.4	14	15.250	12.250	10.750
20.4	18	15.625	11.500	10.000
20.6	16	17.000	12.675	13.175
22.3	18	17.500	12.250	10.750
21.4	17	16.750	12.700	12.620
20.1	17	20.000	13.675	12.875
21.4	17	17.125	11.675	12.125
20.6	14	16.250	9.750	10.375
21.3	16	14.870	12.500	12.000
21.1	16	16.500	12.500	11.750
20.5	16	14.875	10.125	9.675
22.1	15	15.250	11.250	11.125
22.0	15	18.875	12.375	12.375
21.8	17	15.750	11.500	12.375
21.8	15	16.375	10.375	11.875
21.7	16	15.900	12.400	12.570
21.3	15	16.000	12.675	13.175
21.4	14	19.675	14.250	14.250
21.4	17	15.750	10.500	9.875
21.6	16	15.675	12.000	11.875
21.0	18	17.250	12.625	12.625
21.5	17	19.675	13.250	13.250
20.7	18	16.625	11.375	10.500
21.3	17	15.375	11.875	10.750
21.4	14	16.370	11.870	11.000
21.7	15	15.175	12.620	12.620
20.5	15	18.000	13.000	12.250
21.3	17	18.000	12.250	12.250
21.6	17	16.500	12.500	12.750
20.5	19	15.500	11.125	11.000
21.6	16	19.000	13.125	13.250
22.3	15	18.375	12.125	12.000
22.1	14	18.500	13.000	12.750
21.9	16	17.625	12.875	12.750
21.4	15	17.500	12.000	11.000
21.2	16	17.875	12.000	12.875
22.7	14	16.875	12.250	12.250
20.9	14	15.250	11.500	10.750
22.4	14	16.500	11.675	11.375
22.2	15	16.750	12.675	12.500

Length Thigh	Age	Eyes for Standing and Cutting	Eyes for Sitting and Basting	Eyes for Sitting and Pinning
22.0	15	14.750	13.000	13.000
21.3	16	19.750	13.675	13.500
22.8	16	17.875	13.750	14.000
21.9	18	16.375	12.750	13.375
22.0	15	19.750	13.370	13.500
21.4	17	17.700	11.870	12.670
22.0	21	18.370	13.250	13.750
21.0	17	17.500	11.500	13.125
22.5	16	15.500	11.000	12.250
23.2	18	20.750	12.500	12.250
21.7	15	15.450	11.250	11.250
23.2	16	19.000	12.375	14.750
23.1	16	17.000	13.750	13.620
22.1	15	19.500	12.375	12.750
21.8	17	19.250	13.175	13.250
22.2	16	15.250	12.750	12.500
22.1	18	16.000	11.125	12.250
22.7	15	18.125	11.500	16.620
21.8	18	19.750	12.125	13.500
21.7	14	17.000	13.250	13.250
21.5	14	20.500	13.375	13.375
22.3	15	17.500	14.375	13.625
21.8	18	19.750	14.750	14.375
21.2	18	17.675	13.675	14.675
22.8	18	16.750	11.250	12.500
22.6	18	18.750	13.675	13.250
22.8	15	19.700	12.450	12.750
22.5	16	17.250	10.500	10.370
21.9	18	19.000	13.250	12.125
23.0	17	19.000	13.500	12.750
22.4	15	17.500	12.675	11.875
23.2	19	19.375	13.125	14.000
22.8	15	17.000	11.000	13.000
23.8	17	18.750	13.750	13.175
22.6	17	18.500	11.500	12.600
21.7	15	18.500	12.250	13.175
22.2	17	12.670	12.250	12.620
21.8	17	20.000	13.370	14.370
22.3	18	17.250	12.700	12.250
23.0	15	18.750	12.500	13.670
22.8	17	19.750	14.250	14.250
21.8	16	21.300	12.450	12.310
22.6	16	20.375	14.500	14.625
22.6	15	17.250	12.750	13.450
22.9	15	20.500	14.250	14.375



Length Thigh	Age	Eyes for Standing and Cutting	Eyes for Sitting and Basting	Eyes for Sitting and Pinning
22.6	18	19.000	12.675	13.000
22.4	16	19.875	12.375	11.625
23.3	17	19.950	12.250	11.875
22.0	17	20.000	15.500	15.500
23.4	14	17.250	12.875	13.175
23.6	14	19.000	13.375	14.500
22.3	15	20.625	14.000	13.675
24.7	17	22.500	13.250	13.375
23.7	16	21.120	13.500	13.750
24.7	16	19.750	15.250	13.670
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2192.1	1611	1967.570	1247.950	1261.180

Eyes for Hand Hemming	Standing and Cutting	Sitting and Basting	Sitting and Pinning	Sitting and Hand Hemming
8.000	35.5	28.0	27.0	27.0
10.500	36.0	28.0	28.0	28.0
11.250	34.5	27.0	26.5	26.5
11.750	37.0	28.0	28.0	27.5
10.675	37.0	28.5	28.0	29.0
10.500	37.0	27.0	27.0	27.0
11.375	38.0	28.5	29.0	28.5
12.950	36.0	27.0	27.0	27.0
11.250	37.0	27.5	27.5	28.5
11.620	35.5	28.0	28.0	29.0
11.750	34.5	28.0	28.0	28.0
12.125	37.0	28.0	28.0	28.0
10.750	36.5	28.0	28.5	27.5
12.370	37.0	28.0	28.5	28.5
11.500	38.0	27.0	28.0	27.0
10.000	37.5	28.0	28.5	28.5
9.750	37.0	27.5	27.0	28.0
12.500	35.5	28.0	28.0	28.0
10.250	37.5	28.0	27.0	28.0
10.625	38.5	28.5	28.0	28.5
12.070	39.0	29.0	28.5	29.0
13.000	38.0	27.5	27.5	27.5
13.000	36.5	26.0	26.0	27.0
10.000	38.0	27.5	27.5	27.0
12.675	39.0	27.5	27.0	27.0
12.000	36.5	28.0	28.0	27.0
12.750	37.0	28.0	28.0	28.5
11.375	38.0	29.5	28.0	28.0
11.250	38.5	27.5	28.5	28.0
11.270	38.0	27.5	27.5	28.0
12.500	40.0	28.5	28.5	28.5
11.250	37.5	27.0	27.5	28.5
12.125	37.5	29.0	28.0	29.0
12.000	37.5	28.0	28.0	28.0
10.875	39.0	29.0	29.0	28.5
11.250	39.0	28.0	28.0	27.0
12.125	37.0	28.5	28.5	28.0
12.250	37.5	27.0	27.0	27.5
12.875	38.5	28.5	28.5	28.0
12.370	38.0	30.0	29.5	28.0
12.250	39.0	28.5	28.5	28.0
11.500	38.5	27.5	27.0	27.5
12.000	39.0	28.0	28.5	28.5
10.250	39.0	28.5	28.0	29.0
11.875	38.0	28.0	28.0	28.5

Eyes for Hand Hemming	Standing and Cutting	Sitting and Basting	Sitting and Pinning	Sitting and Hand Hemming
12.127	40.0	27.5	27.5	28.0
13.500	37.0	28.0	28.5	28.0
13.500	39.0	27.0	27.5	28.0
12.250	38.0	27.0	27.0	27.5
12.250	38.0	28.0	28.0	29.0
12.500	38.0	28.0	28.0	28.5
14.000	38.5	28.0	27.5	27.0
12.250	38.0	27.5	27.5	28.0
11.670	39.0	28.0	27.0	28.0
11.250	37.5	28.0	28.0	28.0
11.000	38.5	28.0	28.0	28.5
12.375	38.0	28.0	28.0	28.0
13.250	39.5	27.0	29.0	27.5
12.500	37.5	28.0	28.0	28.0
13.250	37.0	27.0	27.0	27.0
12.000	40.0	28.5	28.5	28.0
9.875	40.5	28.0	27.0	28.5
11.375	39.0	28.0	28.0	28.0
12.750	37.0	28.5	28.5	28.0
11.750	38.5	28.0	27.0	28.0
12.500	38.0	28.5	28.0	28.5
13.750	39.0	27.0	27.5	27.0
11.250	37.0	28.0	28.5	30.0
13.250	38.5	28.0	27.0	28.0
11.675	40.5	29.0	28.5	28.5
13.000	39.0	28.0	28.0	27.0
11.670	39.0	28.5	28.5	28.0
9.750	39.0	27.5	28.5	28.0
11.000	38.5	30.0	30.0	30.0
13.375	38.0	28.0	29.0	28.0
11.875	39.5	28.5	28.0	28.0
13.750	39.0	28.0	28.0	28.5
10.500	38.5	28.5	28.0	29.0
14.250	39.0	28.0	28.0	28.0
12.600	39.0	28.5	28.5	28.5
11.675	39.0	29.0	28.0	29.5
12.000	40.0	28.0	27.5	28.5
14.000	38.0	27.5	27.0	27.0
12.370	39.0	27.0	28.0	27.0
13.125	39.0	27.5	27.0	27.0
13.620	39.0	27.5	27.5	27.5
12.250	39.0	30.0	29.5	30.5
14.375	39.0	29.0	28.5	29.0
13.375	39.0	28.5	28.5	28.5
14.250	38.5	28.0	28.5	29.0



Eyes for Hand Hemming	Standing and Cutting	Sitting and Basting	Sitting and Pinning	Sitting and Hand Hemming
13.75	39.0	28.0	28.0	28.0
12.625	38.5	28.0	29.0	28.0
12.125	40.0	29.0	29.0	29.0
14.500	39.5	29.0	28.5	28.5
12.875	41.0	28.0	28.0	28.0
12.500	40.0	28.0	28.0	28.5
12.675	39.0	29.0	29.0	29.0
12.750	39.0	28.5	28.5	28.5
13.250	39.0	29.0	28.5	28.5
15.250	42.0	27.0	28.0	27.0
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1211.332	3785.5	2804.0	2796.5	2808.5

## PART IV

## DIRECTIONS FOR TAKING PHYSICAL MEASUREMENTS (8)

HEIGHT, STANDING. All measures were taken with subject wearing usual work shoes. The subject was directed to stand on the box of the stadiometer with heels, hips, and back of head against the bar, top of head level. She was urged to stand as tall as possible, while the operator pressed the cross-bar down hard three times. The third measure was read and recorded.

SHOULDER HEIGHT. The subject was directed to stand naturally, with the weight on both feet, looking straight ahead. With the crossbar of the stadiometer, operator measured the height of tip of the acromion of the left shoulder. For this measure and the four following, the operation was repeated. If the second measure was within .5 inch from the first, both were recorded and an average of the two was used in computation. If the second measure was not within .5 inch of the first, the operator continued measuring until two measures within .5 inch were secured.

ELBOW HEIGHT. Subject standing as for shoulder height. Operator grasped left elbow of subject lightly and located head of radius in dimple of elbow with thumb nail, then brought crossbar of stadiometer down on that point.

WRIST HEIGHT. Subject standing as in measurement of shoulder height, arm relaxed, crossbar of stadiometer between wrist and body. Operator grasped subject's left wrist lightly and located distal end of radius (on thumb side of wrist) with the thumb nail, then brought crossbar of stadiometer down on that point.

THUMB HEIGHT. Subject was directed to stand naturally, arms relaxed, as in measurement of wrist height. With the crossbar of stadiometer against inside of subject's fingers, operator brought crossbar down to tip of thumb of left hand.

FINGERTIP HEIGHT. Subject standing as for measurement of thumb, arm hanging naturally. Operator brought crossbar of stadiometer down to tip of longest finger of left hand. If fingers were curled, operator gently straightened them. Fingers were not extended rigidly.

**HIP HEIGHT.** This height was taken with the stadiometer as in previous measures. Because of the difficulty of locating the point on some subjects, the measure is more or less an approximate one. The subject was directed to put her "finger on the point where the top of the hip bone starts to curve down in front", while the operator illustrated the procedure on her own person.

**SITTING HEIGHT.** Taken with subject sitting on box of stadiometer, hips and back of head touching bar, feet flat on floor, and against box. Subject was directed to "sit up straight but don't push up." It was found that a subject could increase her sitting height as much as .3 inches by pushing up, due to contracting the muscles on the back of the thigh. This was to be avoided as the measure desired was that of the bony structure of the trunk and head.

**HEIGHT UNDER KNEE.** Measured with calipers from the board on which the feet rested to the under side of the thigh just back of the knee. This measure would be somewhat greater than the height of the chair seat, the degree of difference depending upon the conformation and length of the thigh.

**HEIGHT OF THIGH ABOVE SEAT.** With the subject seated in a chair with wood seat 15.5 inches front to back, operator placed the end of the calipers on the chair seat at the side of the thigh and brought the crossbar down gently on the thigh directly over the front edge of the chair.

**LENGTH OF THIGH.** Subject seated as in preceding measure. End of caliper was placed at a mark on the side of chair opposite the inside of the chair back. Operator measured horizontally to top of patella (small bone on front of knee).