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AN ATLAS OF POSTURAL PATTERNS
OF COLLEGE WOMEN

Thesis for the Degree of M. A.
MICHIGAN STATE UNIVERSITY

Marie J. Faulkner

1966

THESIS



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AN ATLAS OF POSTURAL PATTERNS
OF COLLEGE WOMEN

By

Marie J. Faulkner

AN ABSTRACT OF
A THESIS

Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of

MASTER OF ARTS

Department of Health, Physical Education and Recreation

1966

Approved _____

ABSTRACT

AN ATLAS OF POSTURAL PATTERNS OF COLLEGE WOMEN

by Marie J. Faulkner

Statement of the Problem

It was the purpose of this study to construct a picture atlas depicting postural patterns of young adult women.

Procedure

The Massey Technique was employed to assess body alignment in the anteroposterior plane of one hundred twenty college women.

The range, mean, median and standard deviation was calculated for each of the postural measurements. The χ^2 (Chi-square) test was calculated for testing goodness of fit. Percentile tables were constructed and photographs of the subjects grouped into percentile categories (100-75, 75-50, 50-25, 25-0). Representative photographs were then selected as standards for each group and the atlas assembled.

Conclusions

Within the limits of this study the following conclusions are made:

1. This procedure used to determine postural normalcy has merit.
2. Statistical normalcy may be established for any age group or used for a follow through on a longitudinal study.
3. The statistical normalcy established may be used for students personal evaluation of posture.
4. The χ^2 (Chi-square) test for goodness of fit calculated indicates that the distributions of postural measurements do not approach the normal shape. (This is with the exception of Angle I).

Recommendations

1. A similar study of a random sample of young adult women should be conducted to present statistical normalcy as standards of postural patterns. -
 2. A study of this kind may be of value in determining the relationship and relative importance of posture to medical conditions and general health and physical well-being.
 3. A longitudinal study of this type would provide evidence of the progression of postural patterns with age.
- 

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TABLE OF CONTENTS

	Page
ACKNOWLEDGMENT	ii
LIST OF TABLES	iv
LIST OF FIGURES	v
Chapter	
I INTRODUCTION	1
Statement of the Problem	3
Definition of Terms	3
Limitations of the Study	4
II REVIEW OF LITERATURE	5
Good Posture	5
Normal Posture of Children	6
Normal Postural Standards for Children	7
Normal Posture of Adults	8
Normal Postural Standards for Adults	9
Test Used	10
III METHODOLOGY	11
Subjects	11
Procedures of Posture Measurement	11
Treatment of Data	14
IV ANALYSIS OF DATA	16
Description of Postural Measurements	16
V SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS	25
Summary	25
Conclusions	25
Recommendations	26
BIBLIOGRAPHY	27
APPENDIX	31

LIST OF TABLES

Table	Page
I. Means, Standard Deviations, Medians, and Ranges for Postural Measurements . . .	16
II. Percentile Tables of Postural Measurements .	19
III. Raw Data for Measurements by Kalenda . . .	32
IV. Raw Data for Postural Measurements by Molot	34
V. Raw Scores and Percentile Ranks of Photographs Comprising the Atlas	35

LIST OF FIGURES

Figure	Page
I. Method of Measuring Angles for Massey Technique	15
II. Chi-square Test for Goodness of Fit . .	17
III. Percentile Standards for Rating the Posture Angles	20
IV. Percentile Standards for Rating Posture Descriptively	22
V. Percentile Standards for Rating Total Posture of Four Somatotypes	24

CHAPTER I

INTRODUCTION

Evaluating posture has been of interest to many investigators. The wealth of material concerning posture evaluation in the literature attests to this. When examining posture authorities generally assess one "correct" or "good" posture. Massey, in his doctoral dissertation submitted in the Department of Physical Education, in the Graduate College of the State University of Iowa, surveyed the standards of good posture proposed by various authorities. There is general agreement among authorities in the choice of criteria used to describe the conditions for "good" posture. Two categories are generally used in describing posture, descriptive and anatomical. Massey summerized both: (15)

Descriptively, the essentials of an erect posture may be summarized as follows:

The principal segments of the body should be balanced evenly over the base of support. The feet are slightly separated, the toes point straight forward or slightly outward, the weight of the body is borne mainly over the middle of the foot. There is easy extension of the knees and hips. There should be such position of the pelvis bones as will balance the weight directly over the acetabula, the spine functioning as a poised column with the weight distributed about it. This involves the preservation of a moderate curve in the lumbar region and an easy backward position of the shoulders, to bring the weight upon the spine rather than upon the chest. In

this position the shoulder blades are approximately flat, the chest is carried moderately high but not thrust forward and there is normal tonus of the abdominal muscles. The head erect also balances easily without backward tension or forward stretch. The position is alert and capable of movement in any direction. It is not an artificial, arbitrary, or complex combination of postural adjustments, but the most natural and comfortable and perfectly poised position which the body can assume in erect standing.

Anatomically, the definition of normal posture is characteristically described in terms of the relationships of the body and its parts to the line of gravity.

Anatomically, the standards for normal posture have been summarized as follows:

As viewed from the side, beginning approximately at the atlanto-occipital articulation or externally behind the ear at the mastoid process the line of gravity passes downward posteriorly to the vertebrae of the neck, intersecting the spine near the seventh cervical vertebrae, passes anteriorly to the dorsal vertebrae, touches the spine again at the lumbo-sacral junction, passes behind the lumbar spine, passes in front of the sacro-iliac junction to the center of the hip joint, then passes in front of the knee joint and drops to the base of support at the feet directly in front of the ankle joint.

Balanced in this way, with the shoulders retracted, minimum moments of force are said to be in effect for bending the body segments out of the line of balance.

Although "good" posture is generally described and measured in posture evaluations, it is believed by the writer that there is no one "correct" posture. It is felt that there is a range or zone of "normal" posture or a variation of normal postural variables. Postural patterns falling within this zone may be considered "normal" while those outside the zone "not

normal." The normal postural patterns will not necessarily conform exactly to the definitions of "good" posture. Individual differences play an important part in the posture of any one person. If posture is an individual matter we must set standards for these normal zones rather than accept the one ideal upright postural pattern measured by present postural evaluation techniques.

Statement of the Problem

It is the purpose of this study to construct a picture atlas depicting postural patterns of young adult women.

Definition of Terms

"Good" Posture. The body segments balanced over the base of support. In the side view a vertical line passes approximately through the ear lobe, center of the shoulder, hip joint, front of the knee joint, and in front of the ankle bone.

Massey Technique. A test devised to measure antero-posterior posture by measurement of four angles of the body.

Angle I head-neck-trunk alignment

Angle II trunk-hip alignment

Angle III hip-thigh-knee alignment

Angle IV thigh-leg-ankle alignment

Total Posture equals the sum of the four angles.

"Normal" Posture. Average posture or some other measure of central tendency of a given population.

Limitations of the Study

Sample. The subjects used for this study were not randomly selected. Forty of the subjects were selected on the basis of exhibiting good and poor posture. Eighty subjects were subjectively selected on the basis of extreme body types as determined by their physical education instructor. The data used was not collected by the author. Two previous posture studies by Michigan State University graduate students provided the necessary data.

Technique. The usual limitations regarding posture measurement from pictures are applicable to this study. The effect of body sway was not considered. Whether the subject was standing in her "best" posture or "habitual" posture was not revealed. Kalenda (22) found the body landmarks employed in the Massey Technique proved difficult to locate accurately; especially was this true with the trochanter.

CHAPTER II

REVIEW OF LITERATURE

Good Posture

The ideal antero-posterior posture summarized previously by Massey (15) is accepted by many today as the ideal postural standard. Kendall (3) explains it as a plump line extending through the lobe of the ear, shoulder joint, approximately midway between the front and back of the chest, approximately midway between the back and the abdomen, approximately through the greater trochanter of the femur, slightly anterior to a midline through the knee, and slightly anterior to the lateral malleolus.

This vertical line was described by Braune and Fischer in 1890 as a convenient, standardized position from which to measure normal deviations since all reference points of posture lie along a single line. The line was developed as a statistical point of departure with no relation to desirable posture (17). Since that time many researchers have adopted this line to represent an ideal posture that should be attained by all.

Most postural standards are established by measuring the deviations from this vertical line and assigning a posture grade of A, B, C, D, or "excellent," "good," or

"poor," etc., for various degrees of variation. This method of grading posture assumes that this ideal posture is the correct posture for everyone and deviations from this vertical line exhibit poor posture characteristics. Postural grading of this type ignores the occurrence of individual differences. There is evidence that differences in body type, boney structure, and stage of growth and development may affect the posture of any one person.

Normal Posture of Children

It is generally recognized that children are not expected to conform to the adult standard of ideal posture. The deviations from the adult standard are termed developmental deviations and recognized as "normal" for various ages. Normal in this context means average or some other measure of central tendency. When these normal deviations are extreme or persist beyond the normal developmental phase they may be considered postural defects. Postural patterns of children have mainly been presented by word discriptions of developmental differences from the adult standard of ideal posture (3, 5, 18, 19, 21).

Postural differences within a specific age range have been recognized by some. Loewendahl (14) emphasizes that individual differences of growth and development affect the postural patterns for any range. "Children

vary with respect to their body type and anatomical build to a degree which makes it unlikely that all of them should conform to the same pattern and maintain exactly the same position in order to have good posture." (11)

Normal Postural Standards for Children

Few actual studies establish normal postural standards for children. Klein and Thomas (12) established standards for children in relation to body build. A different posture standard is offered for the stocky type boy and girl, thin type, and intermediate type.

Crook (7) established a scale for children ages two to five from a random group of 100 silhouettes of preschool children. The silhouettes were evaluated separately by competent judges. Relative values were determined from the scores of the judges and a scale was based on the gross scores of the sample. Statistical methods were used to obtain a linear scale and samples were chosen and placed on a large chart. Using the scale a comparison was made with the standards. Fifty judges then ranked the silhouettes on a quality scale ranging from poor to good posture. The opinions of the judges were averaged. The silhouettes were then scored from 1-100 depending on what rank it had been given. Thirteen silhouettes were used as a final sample. Percentile grades

were assigned to each one. In using the final chart a silhouette need only be compared with the standards and assigned a score of the standard most nearly representing the silhouette.

Robinson and others (16) developed rating scales for five postural variables of children's posture. The points of the scale are illustrated by photographs. The scales were used on approximately 1400 photographs of children between the ages of two years to twelve years. The mean posture of apparently normal children was found for the various ages. There are substantial deviations from what is commonly considered good posture. From the picture standards the mean ratings for the variables were plotted on an age chart.

Normal Posture of Adults

Few recognize the occurrence of a normal posture range for adults. As previously mentioned most posture grades are established by measuring deviation from the ideal postural standard.

Wells (20) recognized the variation in human structure does not permit everyone to assume the ideal posture. Two spinal differences have been classified as anthropoid and humanoid types (concave and convex spine). These spinal deviations were frequently assumed to be postural or functional defects. Because these two types failed to respond to corrective measures Wells undertook a study

which supports the theory that the differences were structural. People with these types of spines could not be expected to assume the ideal posture standard.

Hansson (10) states that since the human body cannot be standardized individuals therefore cannot be made to conform to any definite preconceived standard. Goldthwait (2) believes "that there is not and cannot be one posture which is normal for all individuals and to which all individuals should conform."

A few studies indicate different posture patterns for different body types. Goff (9) found mean posture patterns for four types of men. By superimposition of posture tracings upon one another he established one composite or mean tracing for each of the four types. Brown (6) found no significant relation between somatotype and body alignment of women whereas Kalenda (22) found statistically significant but low correlations between posture and body build components.

Normal Posture Standards for Adults

Cuerton (8) presented norms for Springfield College men placing scores for objective measurements on silhouettes along the normal curve. Aside from this no studies could be located establishing normal postural patterns for adults.

Test Used

Of the objective antero-posterior posture tests the Massey Technique was selected by both authors whose data are utilized in this study. After a study of posture tests Kalenda (22) concluded the Massey Technique was the simplest and quickest to use. This method measures the relationship of body segments as well as total body alignment. The technique has been validated by the subjective judgement of selected experts. Fox (1) states that it has been difficult to duplicate the results of Massey's study using other groups, however, no studies which dispute the test could be found in the literature.

CHAPTER III

METHODOLOGY

The following methods were used to construct a picture atlas of postural patterns of young adult women.

Subjects

The data for this study was taken from two previous graduate studies completed at Michigan State University. The work of Lenore May Kalenda, Relationships of Body Alignment with Somatotype and Center of Gravity in College Women: A Pilot Study, 1964; and Gail S. Molot, A Pilot Study: To Investigate the Relationship Between Personality and Posture, 1962, was used. The one hundred twenty subjects were college women enrolled in the physical education program of Michigan State University and ranging in ages eighteen to twenty one. Eighty of the subjects were selected by their physical education instructor on the basis of possessing a predominance of endomorphy, mesomorphy, ectomorphy, and average build. The remaining forty subjects were subjectively selected on the basis of exhibiting good and poor posture.

Procedures of Posture Measurement

Posture was measured by taking a side view photograph of the subjects. A Zeiss 35 mm camera was

used with a setting of F/4 on 1/30. The camera was placed eleven feet from the center of a turntable upon which each subject stood. Kodak Plus X, black and white film was used. Fluorescent lights were set at a 45-degree angle to the subject and at a distance of 6 feet, 8 inches. A meter stick was included in each photograph along side the subject for scaling purposes. A celluloid protractor, millimeter ruler, and vernier scale were used to accurately measure the angles from the slides for the Massey Technique.

The Massey Technique (15) measures four angles: angle I, head-neck-trunk alignment; angle II, trunk-hip; angle III, hip-thigh-knee alignment; and angle IV, thigh-leg-ankle alignment. These four angles are measured and recorded in terms of deviations from a straight line. If an angle is 170 degrees, it would lack 10 degrees of being a straight line. Therefore, the 10 degrees is recorded. Total posture is the sum of all four angles.

The procedure was as follows: The following points were marked on the left side of the subject with pointed pieces of tape: (1) the tragus, (2) the greater trochanter, (3) the styloid process of the fibula (center of the knee joint), and (4) the external malleolus. With aluminum pointers 9.20 centimeters in length the following points were marked: (1) the suprasternal notch, (2) a point on the longitudinal midline of the back and at the level of the suprasternal notch, and (3) the spinous process of the fourth lumbar vertebrae.

A side-view photograph was then taken and negative slides made of each subject. With a slide projector, the picture of each subject was projected on paper approximately one-half life size (.461). (Actual distance between two points on the meter stick was 10 centimeters. The projector was adjusted until this distance measured 4.46 centimeters on the screen). Marks were made on the paper at the: (1) tragus; (2) top of the sternum (screen size of the pointers was 4.102 centimeters; measuring in from the end of the pointers 4.102 centimeters with a vernier scale, a mark was placed at this point); (3) a point on the longitudinal midline of the back (procedure no. 2 repeated); (4) the point of the greatest abdominal protruberance; (5) the fourth lumbar (procedure no. 2 repeated); (6) the trochanter; (7) the center of the knee; and (8) the external malleolus.

A line was drawn connecting the suprasternal notch with the point on the back. Another line was drawn connecting the fourth lumbar with the greatest abdominal protruberance. The above two lines were then bisected and perforations made at these midpoints.

Lines were drawn from: (1) the tragus to the midpoint of the suprasternal notch and the spine, (2) the midpoint of the suprasternal to the midpoint of the fourth lumbar, (3) the midpoint of the fourth lumbar to

the trochanter, (4) the trochanter to the center of the knee, and (5) the center of the knee to the malleolus.

Each line was extended at least twelve inches and a protractor laid down at various points to measure the angles (See Figure 1).

Treatment of Data

The mean, standard deviation, range, and median were calculated for each of the postural measurements. The χ^2 (Chi-square) was calculated for testing goodness of fit between observed and theoretical (normal) distributions of the 120 scores for the four angles and total posture measurements. Percentile tables of the postural measurements used in this study were constructed. Photographs were grouped into the following percentile categories: $P_{100}-P_{75}$, $P_{75}-P_{50}$, $P_{50}-P_{25}$, $P_{25}-P_0$. Representative photographs were then selected as standards for the group. No effort was made to use the same number of photographs for each angle. The number of standards was chosen according to the slightest difference which could be seen with relative ease by the author. More experienced raters can often make finer distinctions.

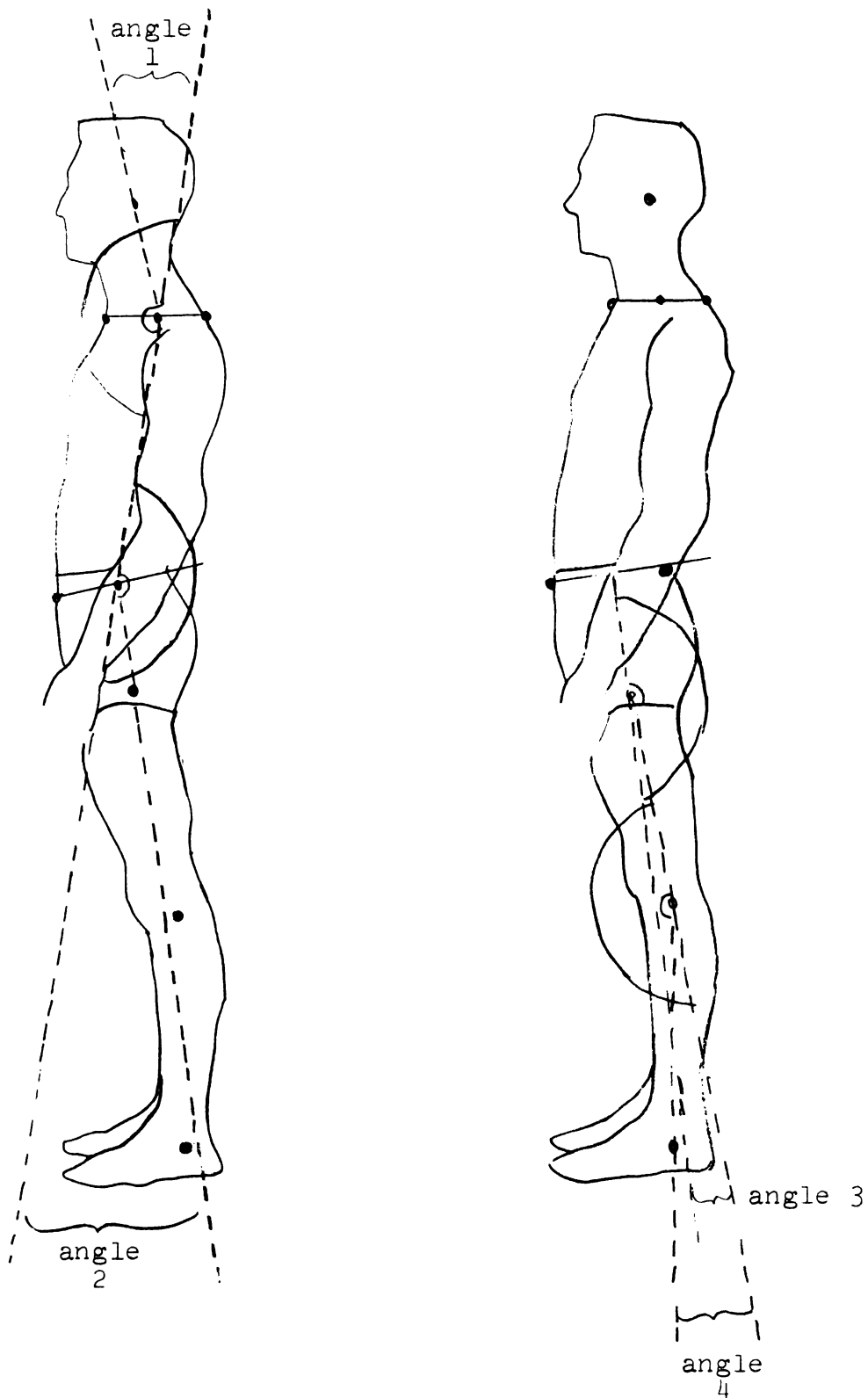


Figure 1.--Method of Measuring Angles for Massey Technique.

CHAPTER IV

ANALYSIS OF DATA

Description of Postural Measurements

The means, standard deviations, medians, and ranges for each postural measurement are presented in Table I.

Table 1.--Means, standard deviations, medians, ranges for postural measurements.

	Range	Mean	Median	Standard Deviation
Angle I	11.0-33.0	20.90	20.80	4.44
Angle II	0.0-39.5	14.41	14.10	8.10
Angle III	0.0-26.0	8.03	6.68	5.48
Angle IV	0.0-12.0	4.17	3.56	2.88
Total Angles	22.0-88.5	46.04	43.75	14.10

The results of the χ^2 (Chi-square) test for goodness of fit are presented in Figure II. (In interpreting the χ^2 (Chi-square) value of P of less than .10 constituted ground for rejection of the hypothesis that that data were normally distributed). The frequency distribution found to compare favorably with the theoretical distribution was Angle I. There is no reason why all distribution should approach the normal shape. The true shape of the curve may not resemble

TESTS OF NORMALITY

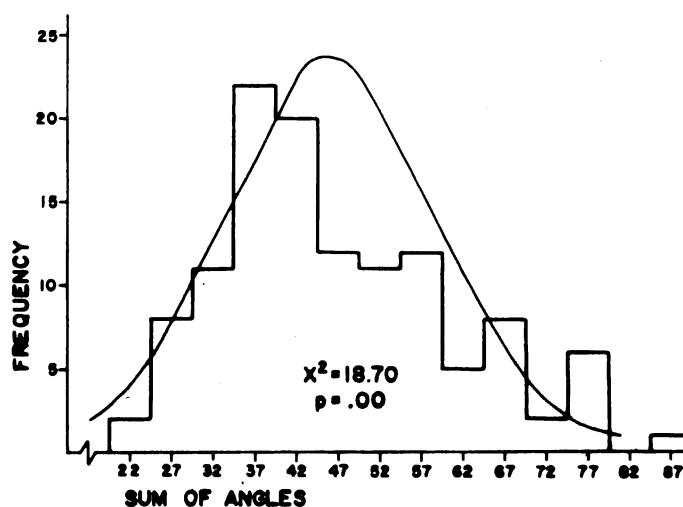
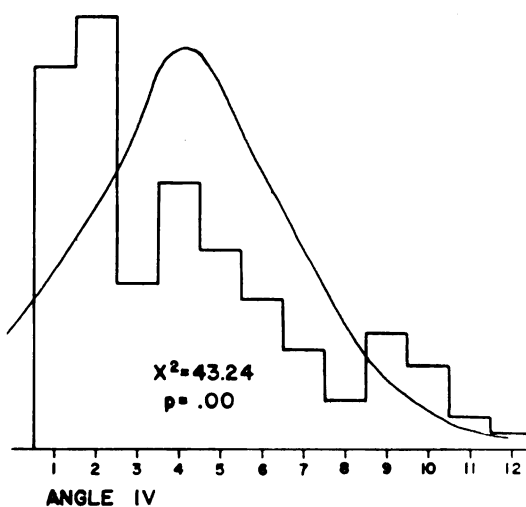
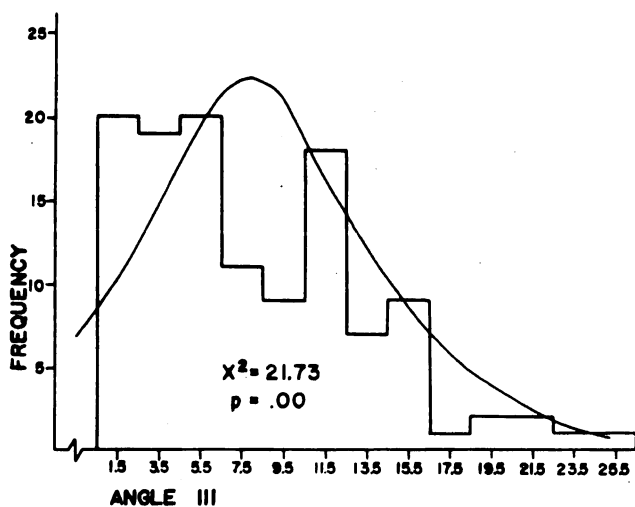
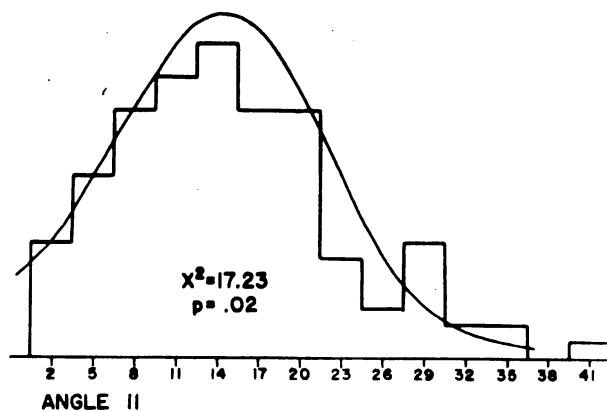
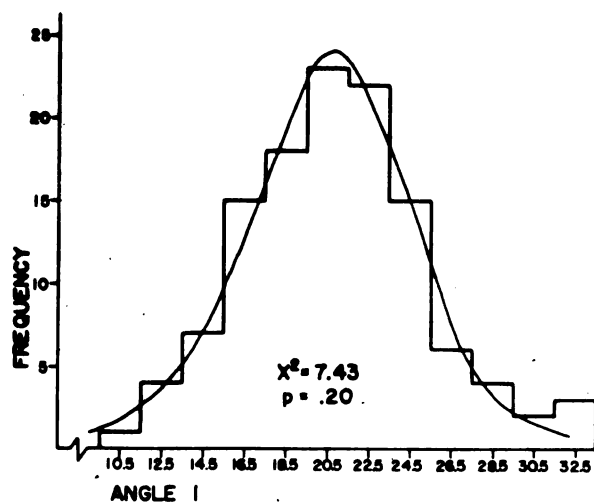


FIGURE III

the normal and particularly the sample selection of this study would influence the outcome. It was not the purpose of this study to determine the type of curve which best fitted the data. It was the purpose, however, to determine if the normal curve plotted fits the obtained distribution of the data collected in this study to warrant treating the data as normal.

The percentile tables of postural measurements used in this study for college women are presented in Table II. The percentile standards were constructed because of the non-normal distribution of the measurements and the ease with which ranks may be explained to the students.

The percentile standards for rating the four postural angles and total posture record are presented in Figure III. The photograph standards were selected by the author. The negative slides were placed into groups on the basis of their percentile score for each of the four angles and total angles. The percentile categories were 100-95, 95-75, 75-50, 50-25, 25-5, 5-0. The negative slides were then ranked within each category on the basis of the raw score from the Massey posture test. Ranking was from low score to high score within each category. The slides were then examined beginning with the highest percentile (lowest raw score) within each group. Slides were retained as standards when a visual difference could be detected in the



Table II. --- Percentile Table of Postural Measurements

Percentile	Angle I	Angle II	Angle III	Angle IV	Total Angles
100	11.5	1.0	.5	.5	22.0
95	14.0	3.0	1.0	.5	27.0
90	15.5	5.0	1.5	1.0	31.0
85	16.5	6.5	2.5	1.5	33.0
80	17.0	7.5	3.0	1.5	35.0
75	18.0	9.0	3.5	2.0	36.5
70	18.5	10.0	4.0	2.0	38.0
65	19.0	11.0	5.0	2.0	39.0
60	19.5	12.0	5.5	2.5	40.5
55	20.5	13.0	6.0	3.0	42.0
50	21.0	14.0	6.5	3.5	43.5
45	21.5	15.0	8.0	4.0	45.5
40	22.0	16.0	9.0	4.5	48.0
35	23.0	17.5	10.0	4.5	51.0
30	23.0	18.5	11.0	5.0	53.5
25	23.5	19.5	11.5	6.0	56.0
20	24.5	21.0	12.5	6.5	58.5
15	25.0	23.0	14.0	7.5	63.5
10	26.5	27.5	15.5	9.0	67.5
5	29.0	30.0	18.5	10.0	75.5
0	33.0	39.5	24.5	11.5	84.5

Percentile
Range

ANGLE I

Percentile
Range

ANGLE II

Percentile
Range

ANGLE III

Percentile
Range

ANGLE IV

Percentile
Range

TOTAL ANGLE

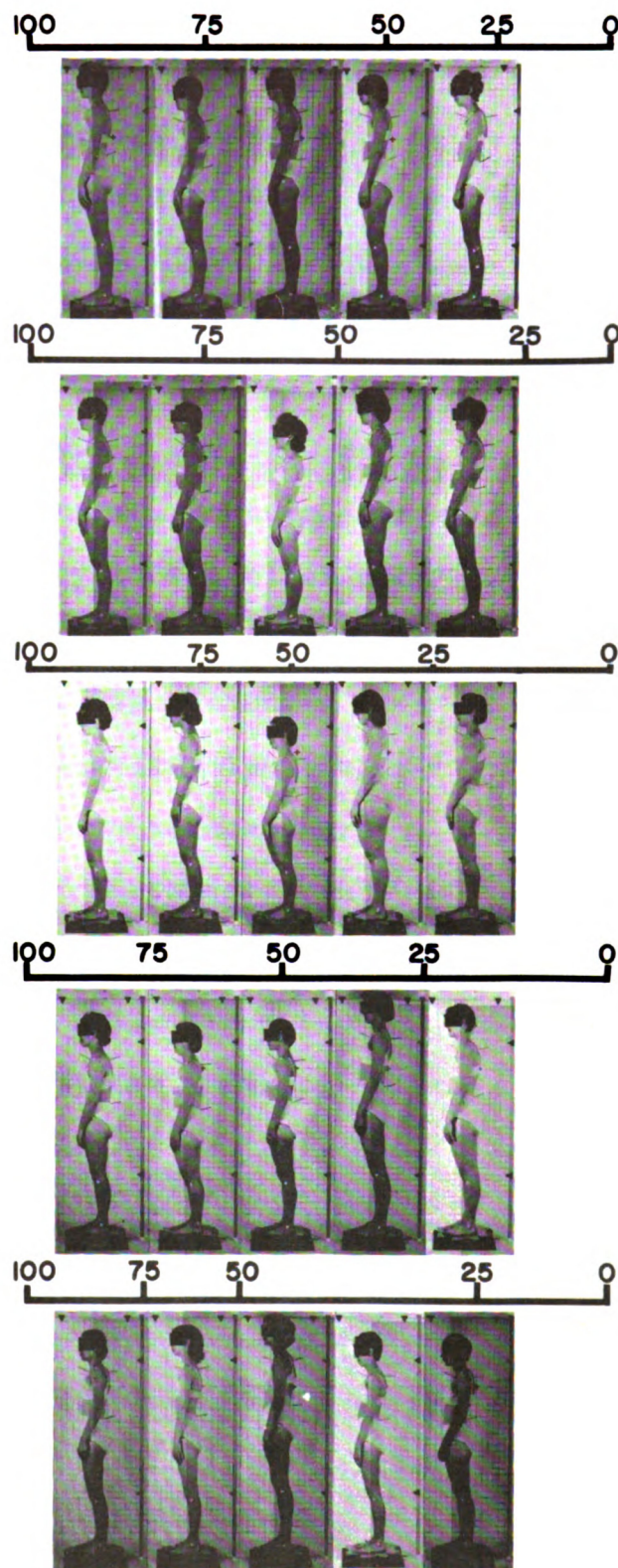


FIGURE III

PERCENTILE STANDARDS FOR RATING POSTURE ANGLES

postural pattern. The percentile categories 100-95 and 5-0 were merged with categories 95-75 and 25-5 respectively because of lack of visual difference between the postural patterns of these groups.

The photograph standards falling within the percentile range 75-25 are considered falling within the normal postural range. The photographs falling within the percentile categories 100-75 and 25-0 are considered as falling outside the normal postural range. It was not the purpose of this study to establish good posture or poor posture. The purpose was, however, to depict the average posture of college women.

For ease in students personal evaluation the standards for rating three key posture segments are presented in Figure IV. Angle I of the Massey test represents the posture segment the head and Angle II the trunk. The photograph standards for these two segments are identical to the standards in Figure III for the corresponding angle. The posture segment, the legs, is represented by Angles III and IV. The raw scores for these two angles were averaged and a percentile score established. The photograph standards were then selected by the same method employed to select standards for Figure III. The sum of the angles in Figure III corresponds with the Total Posture pattern in Figure IV. The student may compare her posture photograph with the standards presented in Figure IV

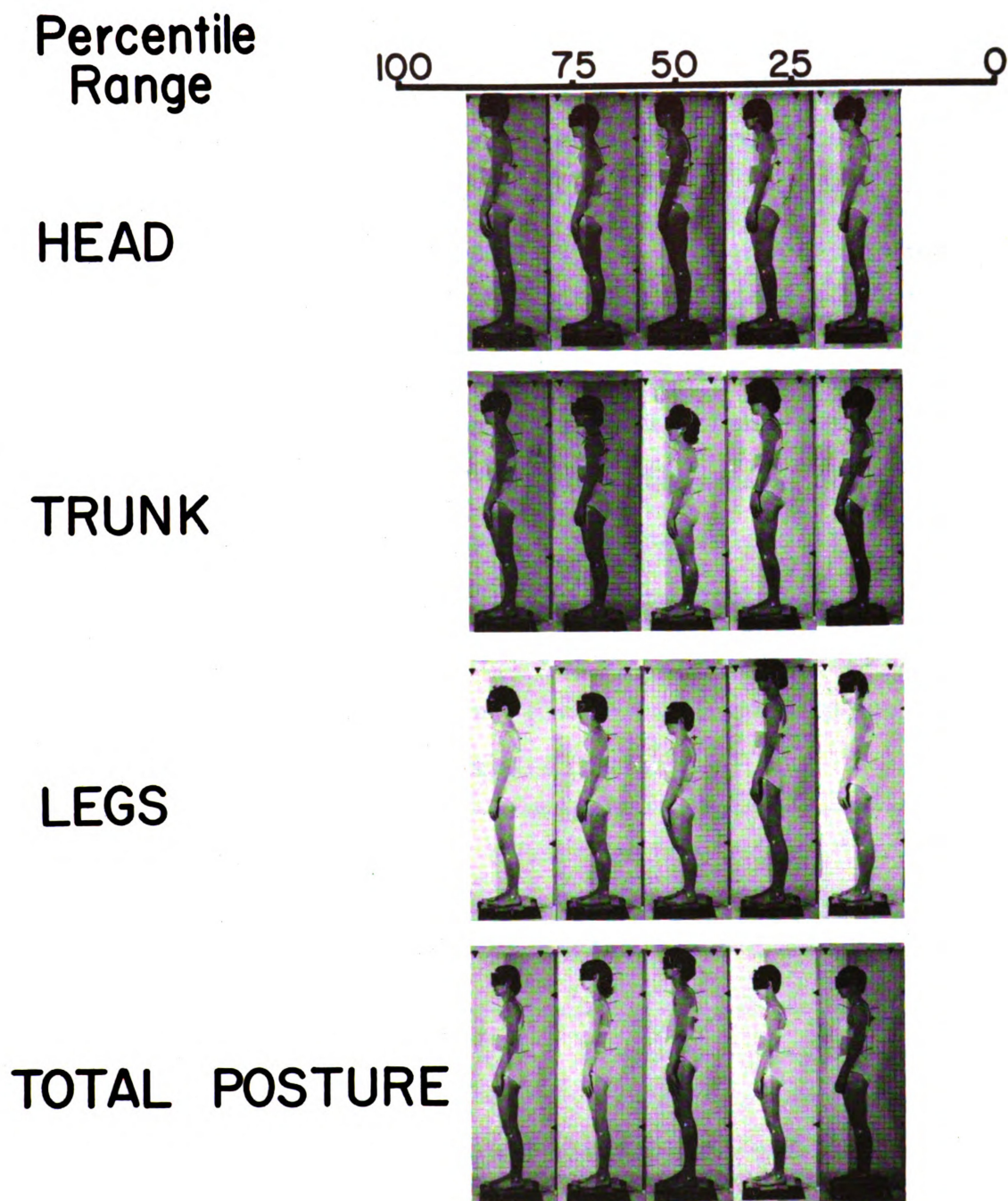


FIGURE IV

PERCENTILE STANDARDS FOR RATING
POSTURE DESCRIPTIVELY

to determine her rank in relation to other young women of the same age.

Scores for individual body components from Parnell's Technique of Somatotyping were available for eighty of the subjects of this study. Figure V represents percentile standards for total posture for the various Somatotypes.* Strong Endomorphic types are characterized by a body component score of six or seven for the endomorphic component, Strong Mesomorphic a six or seven for the mesomorphic component, and Strong Ectomorphic a six or seven score for the ectomorphic component. The Balanced body type is characterized by an approximate four for each of the three components. The subjects were placed in the appropriate somatotype group. Posture standards were selected for each group by the same method used for Figure III.

*Of the eighty subjects seventeen are classified as Strong Endomorphic, two Strong Mesomorphic, twelve Strong Ectomorphic, and twenty-one Balanced body type. Total Posture percentile distribution for each type is as follows:

Percentile Range	100-75	75-50	50-25	25-0
Strong Endomorphic	2	2	3	10
Strong Mesomorphic	1	1		
Strong Ectomorphic	2	5	4	1
Balanced	3	8	7	3

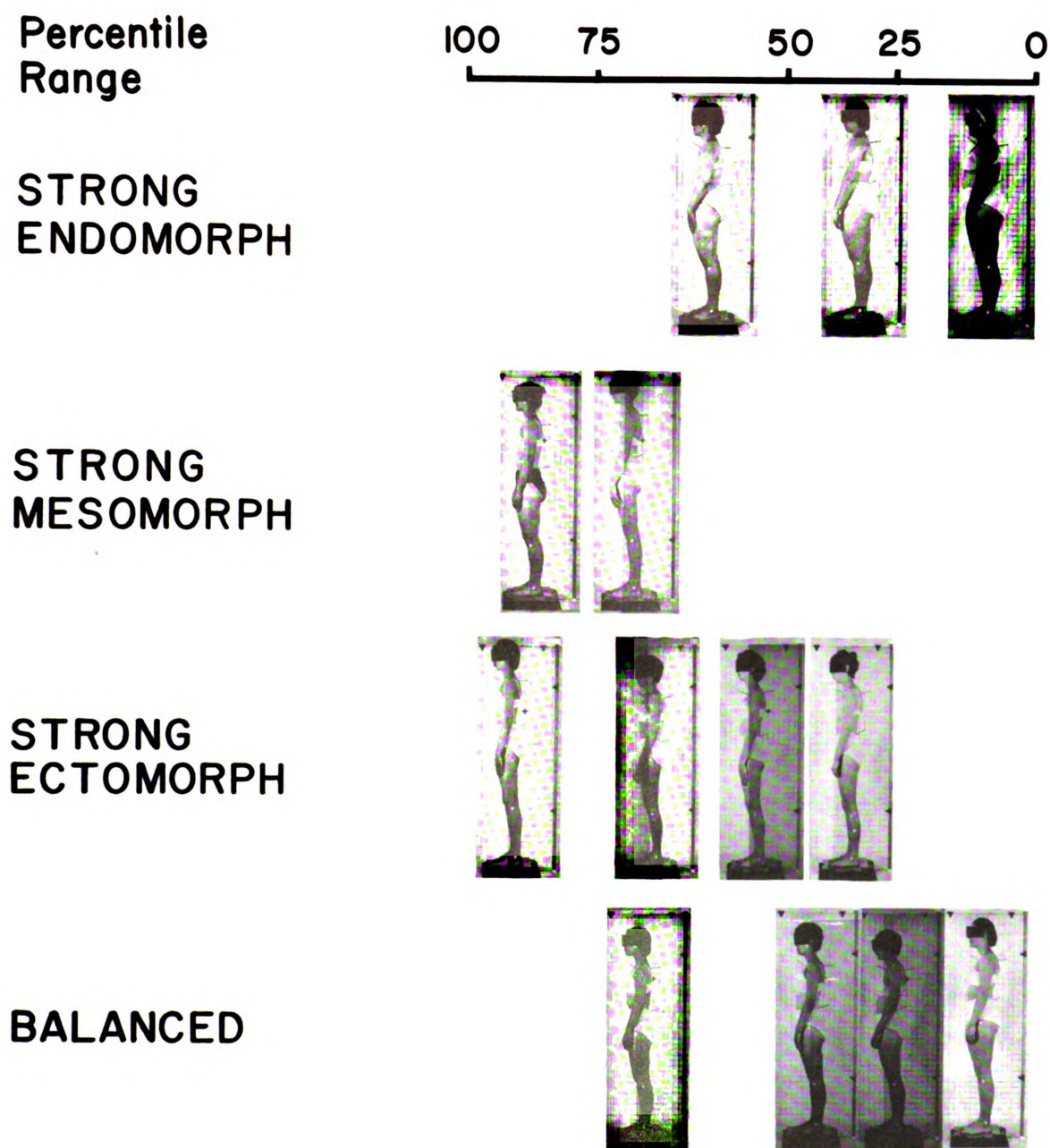


FIGURE V

PERCENTILE STANDARDS FOR RATING TOTAL
POSTURE OF FOUR SOMATOTYPES

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

It was the purpose of this study to construct a picture atlas depicting postural patterns of young adult women. The Massey Technique was employed to assess body alignment in the anteroposterior plane of one hundred twenty college women.

The range, mean, median and standard deviation was calculated for each of the postural measurements. The χ^2 (Chi-square) test was calculated for testing goodness of fit. Percentile tables were constructed and photographs of the subjects grouped into percentile categories (110-75, 75-50, 5-25, 25-0). Representative photographs were then selected as standards for each group and the atlas assembled.

Conclusions

Within the limits of this study the following conclusions are made:

1. This procedure used to determine postural normalcy has merit.
2. Statistical normalcy may be established for any age group or used for a follow through on a long range study.

3. The statistical normalcy established may be used for students personal evaluation of posture.

4. The X^2 (Chi-square) test for goodness of fit calculated indicates that the distributions of postural measurements do not approach the normal shape. (This is with the exception of Angle I).

Recommendations

1. A similar study of a random sample of young adult women should be conducted to present statistical normalcy as standards of postural patterns.

2. A study of this kind may be of value in determining the relationship and relative importance of posture to medical conditions and general health and physical well-being.

3. A longitudinal study of this type would provide evidence of the progression of postural patterns with age.

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APPENDIX
RAW DATA ON MEASUREMENTS

Table III.--Raw Data of Measurements by Kalenda (22)

Subject	Age	Height	Weight	Ponder. Index	Foot Measure		Sheldon Body Type		Line of Gravity	Total Posture	Angle I	Angle II	Angle III	Angle IV	Parnell's Body Type-- Individ. Body Components		
					Left	Right	End Ect.	Mes Ect.									
1	18	62.0	210	10.4	06.00	06.25	741	3.4	4	57.0	30.0	10.5	14.0	02.5	6.5	4.0	1.0
2	18	66.0	168	12.0	08.75	09.00	531	0.9	73.0	24.0	24.0	33.0	15.0	01.0	5.0	3.0	1.0
3	18	65.0	132	12.8	07.75	07.50	543	3.8	27.0	16.0	16.0	10.0	00.0	01.0	5.5	3.5	3.0
4	18	63.0	108	13.3	07.50	07.50	354	1.3	32.0	17.0	17.0	07.0	02.0	06.0	3.0	5.0	4.0
5	19	68.0	119	13.8	10.00	09.50	416	2.4	50.5	15.0	15.0	19.5	14.5	01.5	4.0	1.0	5.5
6	18	68.0	134	13.3	07.25	07.25	444	3.2	40.0	18.5	18.5	11.0	05.0	05.5	3.5	3.5	4.0
7	19	65.0	124	13.1	07.50	08.25	433	4.8	49.0	22.5	22.5	16.0	05.0	05.5	4.0	3.0	3.5
8	18	67.0	146	12.8	09.50	09.50	533	2.0	67.5	25.0	25.0	28.5	12.0	02.0	4.5	3.0	3.0
9	18	61.0	140	11.8	06.00	06.00	551	1.3	32.5	18.5	18.5	09.5	03.0	01.5	5.0	5.0	1.0
10	18	67.5	156	12.6	07.25	07.25	632	3.9	36.5	20.0	20.0	06.5	08.5	01.5	5.5	2.5	2.5
11	18	66.5	119	13.5	08.75	09.25	445	5.3	48.5	22.0	22.0	17.5	03.5	05.5	3.5	4.0	4.5
12	18	65.0	106	13.7	07.00	06.50	425	3.3	40.5	19.5	19.5	12.5	05.5	03.0	3.5	1.5	5.0
13	18	67.5	136	13.2	09.25	09.00	514	3.1	74.0	26.0	26.0	27.0	18.5	02.5	5.0	1.0	4.0
14	18	64.5	098	14.0	07.00	06.75	326	2.2	41.0	21.0	21.0	14.0	04.5	01.5	2.5	2.0	6.0
15	17	63.0	142	12.1	07.50	06.75	541	1.0	76.0	15.5	15.5	33.0	26.0	01.5	5.0	4.0	1.0
16	19	61.0	124	12.3	05.75	06.00	641	2.3	66.5	25.0	25.0	25.0	11.0	05.5	5.5	4.0	1.5
17	18	66.5	156	12.4	10.00	10.25	452	2.3	68.0	21.5	21.5	21.0	13.5	12.0	4.5	5.0	2.0
18	19	68.5	142	13.2	09.00	09.25	434	3.0	70.0	17.0	17.0	07.5	10.5	05.0	3.5	3.0	4.0
19	19	65.0	104	13.8	07.00	07.00	426	4.0	39.0	24.0	24.0	07.5	05.5	02.0	3.5	2.0	5.5
20	18	63.0	170	13.3	07.25	07.75	644	0.9	76.5	20.5	20.5	33.0	20.5	02.5	5.5	4.0	4.0
21	18	67.5	144	12.9	08.50	09.00	523	2.9	61.5	27.5	27.5	17.0	08.5	08.5	5.5	2.0	3.0
22	19	65.0	123	13.1	07.75	07.50	534	1.7	44.5	22.0	22.0	17.0	04.0	01.5	4.5	2.5	3.5
23	18	62.0	113	12.8	07.50	08.00	333	3.1	39.5	22.0	22.0	12.5	01.5	03.5	3.0	3.0	3.0
24	18	65.0	132	12.8	08.00	08.00	543	2.1	38.0	17.0	17.0	03.0	16.0	02.0	5.0	4.0	3.0
25	19	63.0	127	12.6	07.00	07.75	442	2.2	36.5	20.0	20.0	04.5	12.0	00.0	4.5	4.0	2.5
26	18	66.0	136	12.9	08.00	08.75	543	4.1	1.0	22.0	22.0	20.5	08.0	01.5	4.5	4.0	3.0
27	19	66.5	178	11.8	09.50	09.00	641	1.2	1.5	28.0	28.0	13.0	02.0	08.5	5.5	4.0	1.0
28	21	62.0	112	12.9	08.00	07.75	433	2.5	41.0	21.0	21.0	03.0	15.0	10.0	4.0	3.0	3.0
29	18	69.5	136	13.5	10.75	10.75	515	5.7	37.0	23.0	23.0	00.0	11.0	03.0	5.0	1.0	4.5
30	18	61.5	114	12.7	06.00	06.50	443	1.2	32.0	12.0	12.0	13.0	04.0	03.0	3.5	4.0	2.5
31	19	64.0	101	13.8	06.50	06.75	325	2.8	41.0	22.5	22.5	11.5	05.0	02.0	3.0	2.0	5.5
32	18	64.0	125	12.8	07.75	08.25	533	2.3	34.5	18.5	18.5	14.5	01.0	00.5	5.0	2.5	3.0
33	18	65.0	145	12.4	09.50	09.25	642	2.4	30.0	19.0	19.0	08.0	02.0	01.0	5.5	4.0	2.0
34	19	61.5	118	12.6	06.00	06.25	542	2.1	45.5	21.5	21.5	05.0	-12.0	-07.0	4.5	4.0	2.5

35	19	58.5	128	11.6	07.00	07.75	561	3.3	49.5	15.0	23.0	06.5	05.0	5.0	5.5	1.0
36	18	64.0	137	12.8	07.25	07.50	553	2.0	39.5	22.5	13.5	02.0	01.5	4.5	4.5	3.0
37	19	65.0	125	13.0	07.00	07.75	443	3.4	52.0	19.0	21.5	08.0	03.5	4.0	3.5	3.5
38	19	60.0	107	12.7	05.25	05.75	452	2.6	44.0	17.0	12.0	05.5	09.5	5.0	5.0	2.5
39	19	65.5	148	12.4	10.50	10.00	552	3.4	32.5	13.0	15.0	01.0	03.5	5.0	4.5	2.0
40	19	67.5	196	11.6	10.50	11.00	641	1.4	56.5	22.0	23.5	07.5	03.5	6.0	3.5	1.0
41	18	67.0	129	13.3	08.00	07.50	434	0.5	30.5	19.5	06.0	04.0	01.0	4.0	2.5	4.0
42	19	66.5	109	14.0	08.50	08.00	426	2.6	46.0	23.5	06.5	09.0	07.0	3.5	2.0	6.0
43	18	63.5	102	13.6	08.50	08.00	425	2.1	35.5	17.0	14.5	02.0	02.0	3.5	2.0	5.0
44	18	65.0	115	13.4	06.50	06.50	424	1.5	27.0	15.0	10.0	11.5	00.0	4.0	2.0	4.0
45	18	66.0	103	14.1	08.75	08.75	426	2.7	39.5	18.0	03.0	11.5	07.0	4.0	2.0	6.5
46	18	63.0	148	11.9	09.00	09.25	551	1.9	66.0	18.0	28.5	18.5	01.0	4.5	4.5	1.0
47	19	62.0	164	11.3	07.00	06.50	641	1.7	43.5	20.0	19.0	00.5	04.0	5.5	4.5	1.0
48	19	59.5	115	12.3	05.50	05.25	541	1.8	54.5	13.5	23.0	15.0	03.5	5.0	3.5	1.0
49	18	66.5	098	14.5	08.75	09.00	417	2.5	35.5	17.0	20.5	09.0	00.0	3.5	1.0	7.0
50	20	70.5	123	14.2	11.00	10.75	327	4.5	46.5	19.5	12.0	03.0	01.0	3.5	2.0	6.5
51	18	61.5	144	11.7	05.50	04.75	661	2.2	68.0	25.5	27.5	13.0	02.0	5.5	5.5	1.0
52	19	65.5	172	11.8	09.50	09.75	541	2.0	48.0	22.5	08.5	10.0	07.0	5.0	3.5	1.0
53	18	66.5	210	11.2	07.75	07.75	651	1.5	78.0	21.0	33.5	16.0	07.5	6.5	4.5	1.0
54	20	69.0	133	13.5	11.00	11.25	335	3.2	41.0	22.0	11.0	03.0	05.0	3.0	3.0	4.5
55	18	62.5	105	13.3	07.75	07.75	444	3.4	37.0	23.0	13.0	00.5	00.5	4.0	3.5	4.0
56	18	62.5	115	12.9	05.00	04.75	553	3.7	38.5	18.5	04.5	10.5	05.0	5.0	2.0	3.0
57	20	65.0	121	13.2	06.75	06.75	524	2.9	62.0	17.5	28.0	15.0	01.5	5.0	4.0	4.0
58	21	59.0	138	11.4	11.50	11.50	461	3.5	38.5	13.0	12.0	08.0	05.5	3.5	5.5	1.0
59	19	65.0	177	11.6	09.25	09.00	641	1.6	42.5	20.5	05.0	12.5	04.5	6.0	4.0	1.0
60	20	66.0	141	12.7	07.75	08.25	443	2.8	41.5	18.0	01.0	14.0	08.5	4.0	4.0	2.5
61	19	67.0	149	12.6	08.50	09.00	542	1.5	42.0	19.5	09.5	06.0	07.0	5.0	3.5	2.5
62	19	65.0	105	13.8	08.00	07.50	426	2.0	76.5	21.0	29.5	22.0	04.0	4.5	2.0	5.5
63	21	67.0	144	12.8	10.00	10.25	423	5.9	41.5	19.0	13.5	05.0	04.0	4.5	2.0	3.0
64	18	59.5	182	10.5	05.50	05.75	741	1.0	65.0	25.5	25.5	09.0	05.0	6.5	4.0	1.0
65	19	66.5	106	14.0	08.00	10.25	426	4.0	44.0	18.0	19.0	06.0	01.0	4.5	2.0	6.0
66	18	68.5	136	13.4	09.75	10.25	424	2.6	50.0	18.5	20.0	11.0	00.5	4.5	2.0	4.5
67	18	64.0	120	13.0	06.75	07.25	433	1.5	39.5	19.5	09.0	05.0	06.0	4.5	3.0	3.5
68	18	68.0	140	13.1	10.75	10.25	434	0.5	59.0	21.5	18.5	12.0	07.0	4.5	3.0	3.5
69	18	64.5	128	12.8	07.25	07.75	533	1.7	44.0	25.0	14.0	03.5	01.5	5.0	3.0	3.0
70	18	67.5	134	13.2	10.00	09.75	434	1.6	67.0	21.0	22.5	16.0	07.5	4.0	3.0	4.0
71	19	63.5	122	12.8	07.75	07.50	443	2.9	55.5	29.0	17.5	05.0	04.0	4.0	3.0	3.0
72	18	67.5	127	13.5	09.75	09.50	434	1.1	34.5	17.0	10.5	05.0	02.0	4.0	3.0	4.5
73	18	67.0	114	13.8	10.00	10.00	415	2.5	55.5	22.5	21.0	11.0	01.0	4.0	1.0	5.5
74	19	69.5	119	14.2	07.75	08.00	326	4.1	33.0	19.0	17.0	06.0	01.0	3.0	2.0	6.5
75	18	65.0	244	10.4	07.75	07.50	731	2.6	76.0	33.0	29.0	04.0	10.0	7.0	3.0	1.0
76	19	68.5	147	13.0	09.75	09.75	613	1.4	51.0	19.5	20.0	07.0	04.5	5.5	1.0	3.0
77	20	66.0	147	12.5	09.50	09.75	462	3.6	35.5	17.5	24.0	04.5	00.5	4.0	6.0	2.0
78	21	69.0	176	12.3	09.75	09.75	542	1.8	57.0	16.5	24.0	15.0	01.5	4.5	4.0	1.5
79	17	61.5	201	10.5	07.00	07.75	651	0.7	78.5	25.0	33.5	11.5	08.5	6.0	4.5	1.0
80	20	65.5	153	12.3	08.25	09.75	531	1.5	88.5	22.5	39.5	23.0	03.5	5.5	3.0	1.5

Table IV.--Raw Data for Postural Measurements by
Molot (23)

Subject	Angle I	Angle II	Angle III	Angle IV	Total Angles
1	24.0	5.0	3.0	9.5	41.5
2	18.5	2.0	6.5	5.0	32.0
3	21.5	12.5	3.0	4.0	41.0
4	21.0	13.0	2.5	.5	37.0
5	16.5	3.5	6.0	.5	26.5
6	14.0	3.5	10.5	1.5	29.5
7	20.5	12.0	6.0	3.5	42.0
8	25.5	14.5	4.0	1.5	45.5
9	23.5	18.5	2.5	2.0	46.5
10	18.5	17.5	15.0	8.5	59.5
11	11.0	7.5	1.5	2.0	22.0
12	21.5	11.5	2.0	4.5	39.5
13	15.5	8.5	6.5	3.5	34.0
14	14.5	4.5	2.0	1.5	22.5
15	15.0	6.5	3.5	2.0	27.0
16	13.5	11.5	2.0	.5	27.5
17	23.5	19.5	13.5	5.0	61.5
18	21.0	13.5	1.5	3.5	39.5
19	16.5	14.5	11.5	8.5	51.0
20	15.5	8.0	1.5	.5	25.5
21					
22	22.5	15.5	4.0	3.0	45.0
23	24.5	19.5	10.5	8.0	62.5
24	31.5	17.5	3.0	3.0	55.0
25	23.5	17.0	7.0	1.0	48.5
26	22.5	3.5	14.0	10.5	50.5
27	19.5	7.5	4.0	5.0	36.0
28	22.0	21.0	8.5	2.5	54.0
29	21.0	9.0	3.5	2.0	35.5
30	28.0	20.0	8.5	2.5	59.0
31	23.5	12.0	1.5	4.0	41.0
32	24.0	13.0	4.0	9.0	50.0
33	19.5	8.5	9.0	1.0	38.0
34	31.0	17.5	3.0	3.5	55.0
35	19.0	16.0	12.0	11.0	58.0
36	31.5	15.5	7.0	6.0	60.0
37	25.5	16.0	10.5	6.0	58.0
38	27.0	17.0	11.5	9.5	65.0
39	19.0	10.0	4.5	1.5	35.0
40	26.5	2.5	7.0	5.0	41.0
41	19.5	3.5	1.5	.5	25.0

Table V.--Raw Scores and Percentile Ranks of Photographs
Comprising the Atlas

ANGLE I					
Subject Number	58	60	76	70	42
Raw Score	13.0	18.0	19.5	21.0	23.5
Percentile Rank	96	75	60	50	25
ANGLE II					
Subject Number	60	67	38	21	22
Raw Score	1.0	9.0	12.0	17.0	17.0
Percentile Rank	95	75	60	36	36
ANGLE III					
Subject Number	55	69	35	52	24
Raw Score	0.5	3.5	6.5	10.0	16.0
Percentile Rank	99	75	50	35	10
ANGLE IV					
Subject Number	25	9	23	18	61
Raw Score	0.0	1.5	3.5	5.0	7.0
Percentile Rank	100	85	50	30	15
TOTAL ANGLES					
Subject Number	44	45	66	31	71
Raw Score	27.0	39.5	50.0	41.0	55.5
Percentile Rank	95	65	35	55	25
HEAD					
Subject Number	58	60	76	70	42
Raw Score	13.0	18.0	19.5	21.0	23.5
Percentile Rank	96	75	60	50	25
TRUNK					
Subject Number	58	60	76	70	42
Raw Score	1.0	9.0	12.0	17.0	17.0
Percentile Rank	95	75	60	36	36
LEGS					
Subject Number	55	9	35	18	61
Raw Score	1.0	4.5	11.5	15.5	13.5
Percentile Rank	99	85	50	30	15
TOTAL POSTURE					
Subject Number	44	45	66	31	71
Raw Score	27.0	39.5	50.0	41.0	55.5
Percentile Rank	95	65	35	55	25
ENDOMORPHIC					
Subject Number	6-4-1	6-4-1	7-5-1		
Raw Score	59	40	53		
Raw Score	42.5	56.5	78.0		
Percentile Rank	55	25	5		
MESOMORPHIC					
Subject Number	4-6-2	4-6-1			
Raw Score	77	58			
Raw Score	35.5	38.5			
Percentile Rank	80	70			
ECTOMORPHIC					
Subject Number	3-2-7	4-2-5	5-2-6	4-2-6	
Raw Score	74	12	65	42	
Raw Score	33.0	40.5	44.0	46.0	
Percentile Rank	85	60	50	45	
BALANCED					
Subject Number	4-3-4	4-4-4	4-4-3	4-3-3	
Raw Score	67	37	71	8	
Raw Score	39.5	52.0	55.5	67.5	
Percentile Rank	65	35	25	10	

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