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Effects of Diet and Exercise on Body Weight and Girth Measurement

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EFFECTS OF DIET AND EXERCISE ON BODY WEIGHT AND GIRTH MEASUREMENT

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CHAPTER I

INTRODUCTION AND STATEMENT OF THE PROBLEM

I. INTRODUCTION

Reason for study. In this age of increasing automation, everyday tasks demand less energy expenditure. Technology has produced many contrivances that may call for changed nutritional patterns and physical requirements. Almost every phase of work, on the farm, at home, or in the office can be accomplished with less effort, exertion, and physical stress (13:46).

Sometimes physical educators become so involved in classwork and program that they neglect to keep up with current newspaper, magazine, and television material on diet, exercise, and "The Fat American" (8).

The general public is being informed of the incidence of heart disease and its relationship to overweight (7). The introduction of modern weight reducing drugs and the concept of the "Slender American" portrayed by national advertising has helped the public take notice of one of our leading health problems: "overweight" (10:Ch.1).

Because of the national interest and the large amount of material being distributed currently, "overweight"

seemed a worthwhile study.

Just how successful are efforts to gain or loss weight or experience girth measurement change via a "will power" program? Such a program depends upon the individual regulating his diet and following a pattern of excercise. By testing such a plan, insight might be gained concerning the success of "will power" theories.

Statement of the problem. This study included the combined factors of diet and exercise in weight and girth measurement change in a control group of women students at Wenatchee Valley College, Wenatchee, Washington. The students, regularly enrolled in the college program, ranged in age from 18-20 years.

The study made no attempt to establish which of the factors, diet or exercise, contributes most to change. Further research might furnish information regarding programs using one or the other and the degree of success or failure experienced.

CHAPTER II

REVIEW OF LITERATURE

I. DIET

National magazines, newspapers, and nutrition and health texts have informed the average individual about diet, caloric intake, and energy output.

"Calorie" and the act of "calorie counting" are now as common to the general public as "coffee and cigarettes." Further evidence of national weight-consciousness can be seen by noting the increasing numbers of miracle reducing or dietary substitute products in any drug store or super market and by reading the multitude of fad reducing diets in popular publications.

The public now is aware that weight is gained or lost by an increase or decrease of caloric intake (13:94). The use of dietary aids or fad diets may result in loss of the nutrients the body needs to maintain good health. In some instances the health of the individual has actually been damaged because of inadequate knowledge in this area (4:113).

That obesity is a habit and a dangerous one has been clearly established (4:114). This is further exempli-

fied by a report in the New York Times that in New York City 6 out of every 10 girls between the ages of thirteen and nineteen are malnourished. This is in part due to their efforts to maintain a pleasing, neat appearance. There is also some evidence of psychological problems connected with the discomfort and anguish over caloric restrictions (1:23).

Therefore, it seems imperative that the general public be made more fully aware of the direct relationship between diet and a state of over-all good health and well-being.

II. EXERCISE AND BODY WEIGHT

Dangers of weight reduction alone have been indicated. The body may utilize caloric energy (after it has been carried to the cells) in three possible ways:

1. "oxidized" (combined with oxygen) to supply energy of motion and heat,
2. used to replace worn out or injured tissues,
3. used to build new tissues during growth.

The balance between energy supplied and energy needed is important to growth and weight (5:11). When more calories are taken in than the body needs for energy, the excess calories are for the most part stored in the tissues as fat. If the reverse of the process is true, the stored fat

is used by the body to make up the energy output difference.

This expenditure is commonly referred to as basal metabolism. With increased activity and subsequent increased energy need, the basal metabolism rate must accelerate to keep pace with the energy demand of the body. A balance between energy output and caloric intake should result in stabilizing body weight, while excess intake of calories will increase body weight, and reduced intake and increased expenditure should result in weight decrease (13:95).

The main means of using caloric energy is through physical exertion--activity that causes an increase of the body metabolism over the individual's normal rate. The overweight individual tends to become so engrossed in control of diet that he oftentimes forgets that physical exercise exists and all but disregards this as a means of controlling or establishing a caloric intake-output basis or balance (1:24).

The studies of Green, Mayer, and Guyton illustrate activity does have a role in preventing obesity and reducing weight (1:24).

The public needs to be re-educated and informed concerning caloric expenditure tables. When interpreted incorrectly these may discourage the dieter from attempting exercise as an aid to weight control or encourage the

more inactive person to remain so. Burt and Blyth provide an example of this in the following illustration.

It is said, "You must walk thirty-five miles to lose one pound of fat." The point that needs to be made is, "You need not walk the thirty-five miles all at one time." For instance, if you walk one mile per day, every day of the year, you would walk enough to lose at least ten pounds in a year. Or if you were to play a vigorous thirty minute game of squash each day, the equivalent of sixteen pounds of fat a year would be utilized (1:24-25). Just how few times is this aspect of recreation and exercise given proper emphasis in current popular literature?

Health and Physical Education people must recognize that exercise <u>is</u> important and that national authorities strongly feel it is as valuable as diet in weight control (1:24-25). The laws of "conservation of energy" help to enforce this theory.

1. Body weight can be maintained or reduced by a considerable reduction in caloric intake.
2. Body weight can be maintained or reduced by vigorous daily exercise, with no reduction in caloric intake.
3. Body weight can be maintained or reduced by only a small reduction in caloric intake and a corre-

sponding amount of daily exercise (1:24).

III. BODY WEIGHT AND MEASUREMENT

In any study of this topic it is advisable that a means of determining body weight and measurement be investigated. These factors must be considered with regard to apportionment of weight as related to physical appearance. In studies of diet and exercise most participants are concerned with their appearance and desire to attain certain goals reflected by possible changes in girth measurement and body weight.

Body weight is most commonly determined by the use of a standard weight scale such as that of the Continental Scale Works, Chicago. As body weight is considered, body frame also enters the study. In order to determine whether the individual falls within the recommended range of body weight for his given age, it is necessary that his body frame classification be known. Among authorities there seems to be some variance of opinion in methods of classifying body frame.

Skerlj and others point out that "body build and body frame are two aspects of a broader concept of constitution." Unfortunately, there is no general agreement on the biological definition or usage of "constitution" al-

though most authors employ it with some reference to body form or structure (12:577).

One important aspect of physical constitution is variability of skeletal frame, especially the width of the body in relation to its length or height. This ratio remains fairly constant in adults from about 20-60 years. This factor needs to be considered in evaluating information expressed in current height-weight charts.

It is necessary that this factor be determined as objectively as possible. Some scientific means of establishing body frame are photogammetry (4), somatotyping (11), or by roentgenograms (x-ray) (6).

Photogammetry is used often in anthropometry to determine body type by measurements taken from a series of photographs of a given individual. Though quite accurate, there are variances in measurements, and it is thought to be wiser to consider each subject separately and individually, if possible by direct measrement (4:113).

Somatotyping, as practiced and studied by Sheldon, compares individual body types on the basis of a comparative scale of anthroposcopic measurements. The areas measured here are:

1. head-neck
2. thoracic trunk

3. arms-hands

4. abdominal trunk

5. legs and feet

Sheldon finds no direct relation between the various somatotypes and body frame. However, the impression is given that in a pure classification of ectomorphism the body skeleton would be slight. Therefore, pure classifications of mesomorphism and endomorphism would exemplify medium and large frames.

The greatest portion of somatotyping has been done with male subjects; somatotyping of women up to this time has rested on anthroposcopic techniques alone, with little claim to scientific reliability. Likewise there has not been sufficient material obtained or an adequate number of cases studied to conclude that this assumed relationship between body type and body frame is borne out in studies of women (11:66).

Roentenogrames (x-ray) involve a comparative study of x-ray photographs of human skeletal structure. In validity and financial expense this method compares to photogammetry. One of the skeletal areas most commonly compared is the skeletal breadth of the thoracic cavity. Dr. Gardner (6), who described this method, allowed that occasionally these are not absolute gauges of total body

frame as they are sometimes as varied from individual to individual as are pelvic measurements in the total classification process.

Still another technique is described by Janet Wessel in Movement Fundamentals. This technique, quite easily handled, depends upon individual wrist-girth measurements. The bone size or wrist-girth is compared to a scale, as follows:

Large frame = 6.3" - 6.8"

Medium frame = 5.6" - 6.2"

Small frame = 4.6" - 5.5" (13:275).

Once body frame is determined, the individual can accurately establish his correct position on a height-weight table based upon variances in body frame. (See the Metropolitan Life Insurance Desirable Weight Chart for Women).

Each of the methods described is to some degree a valid, objective means for establishing body frame. The most suitable method would, of course, depend upon the type of study under consideration.

Since this study is concerned with changes in girth measurement, it is well to measure areas most likely to express such a change. Skerlj and others, in their report on changes in body build and form in women, state that

"areas in which there is appearance of fat are trunk, breast, upper arms, chest, limbs (though deposits here are not likely to be large)" (12:599).

Therefore, the areas of measurement that can be expected to reflect variances are those in which fat deposits are most commonly found.

CHAPTER III

PROCEDURE

I. PRELIMINARIES

Girth measurement technique. The areas of girth measurements used in this study are based on recommendtions of Skerlj and Fogarty. The exact directions prescribed for obtaining each measurement are described by Fogarty in Your Figure Ladies (3:83-84):

1. Chest: Tape should be placed under the arms and across the breasts in a natural line.

2. Bosom: Lower the tape until drawn lightly across the breasts at the tips. (Measurements should generally read approximately 2½" to 3" more than the chest reading.)

3. Waist: Surround the smallest part of your waistline with tape (without undue tightening) and measure. You may wish to take additional sample measurements to be certain you have the smallest measurement. (The ideal waistline is 9-11 inches smaller than the bust measurement.)

4. Hips: Put tape over the largest hip circumference. Sample measurements might also be of value in determining correct measurement point in this instance. (Your hips should measure not over two inches more than the bust.)

5. Thigh: Measure the largest part of the upper leg. (Using same procedure as for hip; the ideal measurement should be somewhere between eighteen and twenty-two inches.)

6. Calf and Ankle: Small-boned women generally have small ankles. Measurement taken at smallest point

just above the ankle bone. (Ankle measurements of from seven to nine inches are considered ideal provided the calf measures five inches more than the ankle.) The calf is measured at its largest point.

7. Wrist: Like the ankle measurement it should be taken at the smallest point just above the wrist bone. The measurement will reflect general bone girth and little variance throughout the study.

Measurements 6 and 7 were included in the study to provide a constant that might be of value in the total comparison of girth measurements with each individual subject.

Diet plan. As noted in the review of literature, the general public is aware that weight is gained or lost by an increase or decrease of caloric consumption. There are almost unlimited dietary programs available for general use.

The diet plan used in this study was based on a program devised and recommended by Ruth M. Leverton, Ph. D. James R. Wilson, M.D., called it scientifically sound and reliable for distribution by the National Dairy Council (5:2). The plan provided each subject with a formula by which to determine the caloric need to maintain her current body weight. It also included a complete calorie chart (See appendix A) to enable the subject to compute daily food intake and compare this with daily caloric need.

Such a program appeared to be a satisfactory choice

in that it allowed for the determination of a constant, (daily caloric need) against which to attempt a balance of caloric intake and energy output.

Exercise plan. Observation and investigation reveal as many recommended exercise plans for trimming girth measurements as there are diets for cutting caloric intake. Several plans were not suitable for the study as they could not truly be substantiated as sound for the physical well-being of the subjects. Therefore, a set of exercises was chosen that would not only have a possible effect on girth measurement but would also be physically safe for average subjects possessing an average degree of good health and physical fitness. Furthermore, the exercise pattern chosen was simple to follow and did not require the development of additional physical skills prior to the program.

The series of nine exercises involved activities that effect the muscular fitness of the body, especially girth measurement. The exercises were selected from an illustrated circular of conditioning and posture exercises formulated by the Physical Education Department of Central Washington State College, 1954-1955. These in turn are based upon exercises described in Lee, Mabel, and Wagner, Fundamentals of Body Mechanics and Conditioning, W.B.

Saunders, Co., 1949.

Each exercise was selected to develop or tax a given area. An attempt was made to include exercises that counteract each other, to prevent overdevelopment of any one muscle group. For example (See appendix B) exercises 4, 8, and 9 would tend to prevent overdevelopment that might arise from exercises 1, 2, and 3.

The program utilized a fifteen minute activity period daily. Repetitions and rate were such that the normal subject would feel exercised but not unduly fatigued.

II. THE STUDY

Selection of subjects. Subjects for this study, women students enrolled at Wenatchee Valley College, were

1. affirmed as being in good health, having submitted the necessary proof of valid physical examination to the college Registrar prior to college entry,
2. enrolled in the course, Women's Fundamentals and Skills, at the time of participation in the study,
3. between the ages of 18 and 20 years,
4. regularly enrolled for the minimum number of quarter hours required for students on a full time basis.

The number of students participating in the study was limited by

1. numbers of students enrolled in the Women's Fundamental and Skills classes, Fall and Winter Quarters, 1961-1962, at Wenatchee Valley College,
2. pairing of class members by height, weight, general body frame, and girth measurement similarities, and
3. general standards of class attendance and participation in the program.

Selection of study groups. Once the subjects were selected according to these criteria, it was necessary to establish the study groups. Group "A" was established as a control group and group "B" the experimental group. In this study 28 subjects were considered. The subjects were paired as closely as possible according to

1. height,
2. weight,
3. body frame classification, and
4. general similarity of the following body girth measurements:
   a. chest
   b. bosom

c. waist

d. hips

e. thigh

f. calf

g. ankle

h. wrist.

Following this pairing the two partners were given the opportunity to decide between them which would participated in group "A" and which in group "B." Group "A," the control group, composed of 14 subjects, engaged in the regular exercise derived from participation in the college's Women's Fundamentals and Skills course in addition to the normal college routine. Their diet program was not controlled and each individual allowed to maintain her own diet pattern and caloric intake rate.

Group "B," the experimental group, also composed of 14 subjects, was actively engaged in experimentation with the elements of diet control and physical activity. They engaged in the regular exercise program included in the aforementioned Fundamentals and Skills course, as did group "A." In addition, they participated in a fifteen minute period of prescribed exercises daily (See appendix B).

This group considered caloric intake, and its reg-

ulation in their attempt to either gain or lose weight.

Collection of data. 1. Diet: Since this study depended upon individual desire or "will power" for success, actual control of the diet was left in the hands of the participant. However, each participant followed the general plan given by Doctor Leverton in her booklet "A Girl and Her Figure" (5). Using this program, each participant in experimental group "B" calculated the caloric intake needed to maintain her current body weight. (This was the body weight recorded during the first check prior to beginning the experimental period).

The formula for determining caloric need, taken from the "calorie guide for people 16-20 years" (5:11) was computed at the rate of 20 calories per pound per day. A girl 19 years old weighing 115 pounds would calculate her needed intake as follows: 20 calories X 115 pounds = a total 2300 calories, the needed daily caloric intake for this girl to maintain her weight at this level.

2. Weight and measurement considerations. The participant checked her current height and weight against a standard height-weight chart to determine whether she was underweight, overweight, or within the recommended weight limit for her height and stature. This information enabled

her to determine whether it was weight reduction or weight increase she was primarily interested in.

The Metropolitan Life Insurance Company Height-Weight Chart of Desirable Weights for Women was used for this purpose. This chart was chosen because it is easily attainable and commonly referred to in similar studies. (13:275). (See appendix C).

To use this particular chart it was necessary to determine body frame. The method chosen in this study was the wrist measurement and comparative scale recommended by Wessel, described earlier in this paper and in Appendix C.

Once each girl had established her body frame, her height and weight were ascertained. Considering these three factors, the next step was to locate herself on the height-weight chart to establish whether or not she was within the recommended weight range for her over-all body structure and age. Using Appendix C, a student 19 years old whose wrist-girth measurement is 5.8" would be classified as having a medium frame. If she is 5.5" tall, weighs 140 pounds, and has a medium frame, her recommended weight range would be between 121 and 129 pounds. Therefore, at most she is 19 pounds and at the least 11 pounds overweight. This indicates that her energies would be best directed toward weight and girth measurement reduction.

3. Recording girth measurements. The initial set of girth measurements was taken on each girl after her recommended weight range has been determined. Each girl was given a progress report chart to use for this purpose. (See appendix D). Initially on this chart the student recorded her name, course section (designating hour of Physical Education Fundamentals and Skills course and college quarter), age, height, wrist measurement, body frame, and group classification (whether she was overweight or underweight).

The recording of girth measurements was based upon the following procedure:

1. All measurement and weight checks were taken once every two weeks for a twelve week period.
2. Girth measurements were taken at exactly the same location each time. For specific measurement areas refer to Chapter III, pages 12-13.
3. The same amount of tension was applied to the tape measure. (It should be firm but not tight) (10:116).
4. The tape measure was the seamstress type. (This measuring tape is recommended as it will not expand or contract or be affected by heat, cold, wetness or dryness (10:116-117).

5. Students must be in college regulation physical education apparel when measured. This consists of white, short sleeve cotton blouse and a black cotton twill bermuda length short.

Correspondingly, the girth measurements taken were somewhat larger than might be recorded if the subjects were unclothed. However, since the subjects were fitted with standard apparel, girth measurement variances should be equal. Facility, time, and control made this the most effective means of obtaining these measurements.

Plan schedule: During the first two weeks the students were engaged in orientation which involved a study of calories, diet, and the selection and equating of groups "A" and "B." Both groups studied the effects of caloric intake and output. They kept a record of their individual calorie consumption and averaged it on a weekly seven day basis. (See appendix A for calorie guide used in study).

After two weeks the students were measured as to height, weight, and body frame. They were then compared and paired with a partner of relatively equal age, weight, and body frame. Selection of group membership was carried out next (as described earlier in this chapter under "selection of study groups"). Students for whom there no comparison partners were allowed to participate in the program on an

independent basis. Their results are not included in this study.

The students in experimental group "B" next calculated their caloric need on the basis of formulas presented earlier, compared it to the results of the caloric average they had tabulated for the two week period, and determined their program goal (weight reduction, weight increase, measurement reduction, measurement increase).

All members of both were then measured with regard to girth. A description of areas measured and the procedure has been previously discussed. These measurements were recorded on the individual's progress chart (See appendix D) for the first two weeks.

Remaining plan period: At the start of the third week, group "B" initiated the experimentation with diet control and added the fifteen minute period of exercise per day. (See appendix B for exercises). Group "A," the control group, continued normal activity and normal diet. They also continued to chart caloric intake and averaged their daily caloric totals for the duration of the study, solely to determine whether or not their diets normally fluctuated from week to week. This information was not included in the study but proved to be a valuable motivational aid for this group.

For the remainder of the study period both groups continued on this basis. At the conclusion of each two week period, members of both groups were measured as to weight and girth, their average daily caloric intake for the period was calculated, and all information recorded on the progress chart.

At the conclusion of the twelve week period the record appearing on each student's chart was summarized. (See appendix E). This summary was reached by calculating the differences or changes between the set of measurements taken during the initial two weeks and those at the final week check. These summaries are indicated by the amount of over-all gain or loss. The intermediate checks recorded at the four, six, eight, and ten week periods were not directly calculated in the summary but served to reflect fluctuations and possible trends in addition to lending further motivation to the program.

A summary of the data of both groups was made. These summaries appear in chapter IV and appendix F. Each member of the experimental group was compared to her control group partner. A key to necessary guides for interpreting these charts is noted at the bottom of each chart. For example, using either table I, chapter IV or appendix F, and comparing case #1, the experimental group member recorded a

2.00 pound loss while her comparison mate in the control group recorded a 2.75 pound gain. Other random comparisons of their measurements showed hips, no change for either subject; thigh, a 2.00" loss for the experimental subject and a 2.00 " gain for the control subject. All other measurements were compared by the same technique.

CHAPTER IV

ANALYSIS OF DATA

A total of 28 participants formed the 14 paired cases from which the data was collected. Reports of individuals having no paired partners, of students with poor attendance records, or students dropping from the Fundamentals and Skills course were not included in the study.

Data were processed by statistical analysis to determine differences in weight and girth measurements which may have occurred during the twelve week period the program of controlled diet and exercise was in effect. The significances of differences in weight and girth measurements between the study groups were determined by calculation of the Fisher "t". A percentage representation of persons changing in girth and weight measurements was calculated for each group to establish the frequency of change.

Complete untreated data collected during the study are included in the appendixes.

Fourteen is a very small sampling upon which to base any reasonably valid conclusions. However, the results may reflect or communicate certain patterns or trends with regard to body changes of weight and girth measurement. These trends though determined upon the operation of a very

loose control group program, are perhaps worthy of further study under a more strict laboratory control situation where the information and statistics can be processed and limited on a more scientific basis.

From the trial program described in this thesis, the following facts are noted:

When comparing the changes which occurred during the experimental period in the control group and experimental group "B" reducers, a survey of Table I shows:

1. Weight changes: The reducers reported a combined total loss of 10 pounds to a reported combined gain of 2.75 pounds by the control group.
2. Chest girth: The reducers reported a combined loss of 8.25 inches compared to a total 1.0" gain for the control group.
3. Bosom girth: The reducers reported a combined loss of 3.25" compared to a total loss of 4.0" for the control group.
4. Waist girth: The reducers reported a total gain of 0.25" compared to a total loss of 3.75" for the control group.
5. Hip girth: The reducers reported a total gain of 2.70" compared with a total increase of 2.25" for the control group.

6. Thigh girth: The reducers reported a combined loss of 3.75" compared to a total gain for the control group of 0.25".
7. Calf girth: The reducers reported a combined loss of 3.75" compared to a total gain of 1.25" for the control group.
8. Ankle girth: The reducers reported a combined loss of 2.25" compared with a total gain of 1.0" for the control group.

Further analysis by use of the formulas appearing on Table I was carried out to determine the significance of the differences by the use of the "t". A 0.05 level of confidence was selected as indicating real differences between the two groups. On the basis of this analysis, Table I shows that none of the weight and girth measurement changes recorded were great enough to be considered significant.

Observation of Table I showed the greatest areas of loss among the experimental group "B" occurred in weight and chest measurements. Losses in thigh, calf, and bosom measurements were next to reflect changes by this group. The hip measurement was the only measurement that did not reflect a loss by either group "A" or "B".

In a similar comparison of the changes between the

APPENDIX F: SUMMARY CHART

Case	Study Group	Diet Intent	Girth Changes								Age
			Weight Change	Chest	Bosom	Waist	Hips	Thigh	Calf	Ankle	
1	A		+2.75 LB	-2.0"	-1.25"	-.50"	0	+2.0"	0	+2.0"	18
	B	Red.	-2.0 LB	-1.0"	-1.0"	-1.0"	0	-2.0"	-1.0"	0	19
2	A		+2.5 LB	-1.0"	-.50"	+.50"	+.50"	-1.0"	-.50"	-1.5"	18
	B	Red.	-1.0 LB	0	0	0	-.50"	-1.0"	-1.0"	-.25	18
3	A		+3.0 LB	-.50	0	-1.5"	+3.5"	-.50"	+.50"	+.75	18
	B	Red.	0	+2.0"	0	+2.0"	+1.0"	-1.25"	+1.00"	+.50"	18
4	A		0	+.50"	+.50	0	-.75	0	+.50	0	19
	B	Red.	+1.5 LB	-3.0"	0	0	+.50"	+.50"	0	-1.25"	20
5	A		-.50 LB	+1.0"	0	0	+.50"	+.50"	+.75"	-.50	18
	B	Inc.	+.50 LB	-1.0"	-1.5"	-1.0"	-.50"	-.50"	-1.0"	-.25	18
6	A		-3.0 LB	-1.0"	0	-.50"	0	0	-.50"	-.50"	18
	B	Inc.	-4.0 LB	-1.0"	-1.0"	0	-1.75"	-1.25"	-1.25"	-.25"	18
7	A		+1.5 LB	-.50"	-.50"	0	-.50"	-.50"	0	0	18
	B	Inc.	+2.0 LB	-.50"	-.50"	+.50"	+.50"	-2.0"	-1.0"	-.50"	18
8	A		+2.5 LB	-.75"	-.50"	+.75"	+.25"	+.75"	-.25"	0	19
	B	Inc.	+3.0 LB	0	+.50"	+.50"	+.50"	+1.0"	+.25"	0	19
9	A		+.50 LB	+2.5"	-1.0"	+.50	0	-1.5"	+.25	0	18
	B	Red.	+3.0 LB	-1.75"	0	0	0	+1.0"	0	0	18
10	A		-2.0 LB	+.50"	+.50"	-.50"	-.50"	-.50"	-.50	0	18
	B	Inc.	+1.0 LB	0	+1.0"	+1.0"	+1.0"	-.50"	0	0	18
11	A		-6.0 LB	-3.5"	-1.0"	-2.0"	0	+1.75"	-.50"	-.50"	18
	B	Red.	-5.0 LB	-1.5"	-1.5"	-1.0"	+.25	-1.5"	-.50	-.25	18
12	A		+2.0 LB	+.50"	-.50"	-.50"	-.50"	0	+.25	0	18
	B	Red.	-.50 LB	-.50"	-.25"	+1.0"	0	+1.5"	+.50"	-.25"	18
13	A		0	-1.0"	-.75"	-1.5"	-.75"	-.75"	0	0	19
	B	Inc.	+.25 LB	-3.0"	-.50"	-1.0"	+.50"	+2.0"	+1.0"	0	19
14	A		-2.0 LB	+.50	-.25"	-.25"	-.50"	-.50"	-.25"	+.25	20
	B	Red.	-7.0 LB	-2.5"	-.50"	-.75"	+1.0"	-1.0"	-.75	-.75	18

Terms/Symbols

Red. - Reduction
Inc. - Increase

+ = Gain
− = Loss
0 = No change

A = Control Group
B = Experimental Group

TABLE I

SIGNIFICANCE OF CHANGES BETWEEN CONTROL AND EXPERIMENTAL GROUP REDUCERS AFTER PROGRAM

	WEIGHT CHANGE		GIRTH MEASUREMENT CHANGES													
			CHEST		BOSOM		WAIST		HIPS		THIGH		CALF		ANKLE	
CASE	R.	C.	R.	C.	R.	C.	R.	C.	R.	C.	R.	C.	R.	C.	R.	C.
1	-2.00	+2.75	-1.00	+2.00	-1.00	-1.25	-1.00	-0.50	0	0	-2.00	+2.00	-1.00	0	0	+2.00
2	-1.00	+2.50	0	-1.00	0	-0.50	0	+0.50	-0.50	+0.50	-1.00	-1.00	-1.00	+0.50	-0.25	-1.50
3	0	+3.00	+2.00	-0.50	0	0	+2.00	-1.50	+1.00	+3.50	-1.25	-0.50	-1.00	+0.50	+0.50	+0.75
4	+1.50	0	-3.00	+0.50	0	+0.50	0	0	+0.50	-0.75	+0.50	0	0	+0.50	-1.25	0
5	+3.00	+0.50	-1.75	+2.50	0	-1.00	0	+0.50	0	0	+1.00	-1.50	0	+0.25	0	0
6	-5.00	-6.00	-1.50	-3.50	-1.50	-1.00	-1.00	-2.00	+0.25	0	-1.50	+1.75	-0.50	-0.50	-0.25	-0.50
7	-0.50	+2.00	-0.50	+0.50	-0.25	-0.50	+1.00	-0.50	0	-0.50	+1.50	0	+0.50	+0.25	-0.25	0
8	-7.00	-2.00	-2.50	+0.50	-0.50	-0.25	-0.75	-0.25	+1.00	-0.50	-1.00	-0.60	-0.75	-0.25	-0.75	+0.25
SUM TOTALS	-10.00	+2.75	-8.25	+1.0	-3.25	-4.0	+0.25	-3.75	+2.70	+2.25	-3.75	+0.25	-3.75	+1.25	-2.25	+1.0
MEAN	-1.25	+0.34	-1.03	+0.12	-0.41	-0.50	+0.03	-0.47	+0.34	+0.28	-0.47	+0.03	-0.47	+0.16	-0.28	+0.12
STANDARD DEVIATION	3.56	3.07	1.27	1.86	0.58	0.61	1.03	0.91	0.53	1.36	1.30	1.24	0.60	0.39	0.53	1.00
STANDARD ERROR OF MEAN	1.26	1.08	0.45	0.66	0.21	0.22	0.37	0.32	0.19	0.48	0.46	0.44	0.21	0.14	0.19	0.35
STANDARD ERROR OF DIFFERENCE	1.65		0.79		0.30		0.48		0.51		0.63		0.24		0.38	
ACTUAL DIFFERENCE "t"	-0.96		-1.48		0.09		1.04		0.12		-0.79		-1.34		-1.05	

FOR SIGNIFICANT DIFFERENCE TO BE ESTABLISHED AT 7 DEGREES of freedom at .050 (1.895)

*FORMULAS USED FOR TABLES I & II

MEAN $= \frac{\Sigma X}{N}$

STANDARD DEVIATION $\sigma = \sqrt{\frac{\Sigma X^2}{(N-1)} - M^2}$

STANDARD ERROR OF MEAN $\sigma_m = \frac{\sigma}{\sqrt{N}}$

STANDARD ERROR OF DIFFERENCE $\sigma_D = \sqrt{(\sigma_{m_1})^2 - (\sigma_{m_2})^2}$

ACTUAL DIFFERENCE $= \frac{M_1 - M_2}{\sigma_D} = (t)$

control group and experimental group "B" gainers, examination of Table II shows:

1. Weight changes: The gainers reported a weight increase total of 2.75 pounds compared to a total weight loss of 1.50 pounds for the control group.
2. Chest girth: The gainers reported a loss total of 5.5" compared to a total loss of 1.75" for the control group.
3. Bosom girth: The gainers reported a total loss of 2.0" compared to a total loss of 1.25" for the control group.
4. Waist girth: The gainers showed no change in this area compared to a total loss of 1.75" for the control group.
5. Hip girth: The gainers reported a total gain of 0.25" compared to a total loss of 1.0" for the control group.
6. Thigh girth: The gainers reported a total loss of 1.25" compared to a total loss of 0.50" for the control group.
7. Calf girth: The gainers reported a total loss of 2.0" compared to a total loss of 0.50" for the control group.

TABLE II

SIGNIFICANCE OF CHANGES BETWEEN CONTROL AND EXPERIMENTAL GROUPS
GAINERS AFTER PROGRAM

			GIRTH MEASUREMENT CHANGES													
	WEIGHT CHANGE		CHEST		BOSOM		WAIST		HIPS		THIGH		CALF		ANKLE	
CASE	G.	C.	G.	C.	G.	C.	G.	C.	G.	C.	G.	C.	G.	C.	G.	C.
1	+0.50	-0.50	-1.00	+1.00	-1.50	0	-1.0	0	-0.50	+0.50	-0.50	+0.50	-1.00	+0.75	-0.25	-0.50
2	-4.00	-3.00	-1.00	-1.00	-1.00	0	0	-0.50	-1.75	0	-1.25	0	-1.25	-0.50	-0.25	-0.50
3	+2.00	+1.50	-0.50	-0.50	-0.50	-0.50	+0.50	0	+0.50	-0.50	-2.00	-0.50	-1.00	0	-0.50	0
4	+3.00	+2.50	0	-0.75	+0.50	-0.50	+0.50	+0.75	+0.50	+0.25	+1.00	+0.75	+0.25	-0.25	0	0
5	+1.00	-2.00	0	+0.50	+1.00	+0.50	+1.00	-0.50	+1.00	-0.50	-0.50	-0.50	0	-0.25	0	0
6	+0.50	0	-3.00	-1.00	-0.50	-0.75	-1.00	-1.50	+0.50	-0.75	+2.00	-0.75	+1.00	0	0	0
SUM TOTALS	+2.75	-1.50	-5.50	-1.75	-2.0	-1.25	0	-1.75	+0.25	-1.00	-1.25	-0.50	-2.0	-.50	-1.0	-1.0
MEAN	+0.46	-0.25	-0.91	-0.29	-0.33	-0.21	0	-0.29	+.04	-0.16	-0.21	-0.08	-0.33	-0.08	-0.16	-0.16
STANDARD DEVIATION	+2.41	+2.07	+1.19	+0.85	+0.95	+0.46	+0.81	+0.76	+1.00	+0.50	+1.47	+0.61	+1.00	+0.64	+0.22	+0.28
STANDARD ERROR OF MEAN	0.99	0.85	0.49	0.35	0.39	0.19	0.33	0.31	0.41	0.20	0.60	0.25	0.41	0.26	0.09	0.11
STANDARD ERROR OF DIFFERENCE	1.37		0.91		0.42		0.43		0.44		0.64		0.47		0.14	
ACTUAL DIFFERENCE "t"	0.51		-0.68		-0.31		0.67		0.45		-0.20		-0.53		0	

FOR SIGNIFICANT DIFFERENCE TO BE ESTABLISHED AT 5 DEGREES OF freedom at .050 (2.015)

8. Ankle girth: Both groups recorded identical total losses of 1.0".

The statistical calculation employed for Table I was used with Table II. Again it was found that none of the changes recorded in weight and girth measurement were great enough to be considered significant "t" differences. However, it was noted:

1. The girth measurement of the chest reflected the greatest amount of change in both groups.
2. The ankle measurement reflected the least amount of change in both groups.
3. Losses were recorded by both groups in all measurement areas except weight, where the gainers increased by a total of 2.75 pounds, and hip measurement, where the gainers increased by a total of 0.25".
4. The control group did not record a weight or girth measurement increase in any of the measurement areas.

Analysis of Tables I and II by percentages of cases (individual subjects) experiencing weight and girth measurement changes provided information in Tables III, IV, V, and VI. A comparison of these tables reveals the following information:

TABLE III

PERCENTAGE OF SUBJECTS EXPERIENCING GIRTH MEASUREMENT CHANGES--GROUP "B" REDUCERS

Measurement	per cent	per cent	per cent
Number of cases...8	Subjects increasing	Subjects decreasing	Subjects no change
a) Chest...	12.5	75	12.5
b) Bosom...	0	50	50
c) Waist...	25	37.5	37.5
d) Hips....	50	12.5	37.5
e) Thigh...	37.5	62.5	0
f) Calf....	12.5	62.5	25
g) Ankle...	12.5	62.5	25
h) Weight..	25	62.5	12.5

TABLE IV

PERCENTAGE OF SUBJECTS EXPERIENCING GIRTH MEASUREMENT CHANGES--GROUP "B" GAINERS

Measurement	per cent	per cent	per cent
Number of cases...6	Subjects increasing	Subjects decreasing	Subjects no change
a) Chest...	0	66.66	33.33
b) Bosom...	33.33	66.66	0
c) Waist...	50	33.33	16.66
d) Hips....	66.66	33.33	0
e) Thigh...	33.33	66.66	0
f) Calf....	33.33	50	16.66
g) Ankle...	0	50	50
h) Weight..	83.33	16.66	0

TABLE V

PERCENTAGE OF SUBJECTS EXPERIENCING GIRTH MEASUREMENT CHANGES--GROUP "A" CONTROL

Measurement	per cent	per cent	per cent
Number of cases..14	Subjects increasing	Subjects decreasing	Subjects no change
a) Chest...	42.8	57.2	0
b) Bosom...	14.2	64.7	21.4
c) Waist...	21.4	57.2	21.4
d) Hips....	28.6	42.8	28.6
e) Thigh...	28.6	50	21.4
f) Calf....	35.7	42.8	21.4
g) Ankle...	21.4	50	28.6
h) Weight..	50	35.7	14.2

TABLE VI*

COMPARISON OF PERCENTAGES OF SUBJECTS EXPERIENCING GIRTH MEASUREMENT CHANGES--ALL GROUPS

Measurement	Group	per cent Subjects increasing	per cent Subjects decreasing	per cent Subjects no change
a) Chest...	"B" reducers	12.5	75	12.5
	"B" gainers	0	66.66	33.33
	"A" control	42.8	57.2	0
b) Bosom...	"B" reducers	0	50	50
	"B" gainers	33.33	66.66	0
	"A" control	14.2	64.7	21.4
c) Waist...	"B" reducers	25	37.5	37.5
	"B" gainers	50	33.33	16.66
	"A" control	21.4	57.2	21.4
d) Hips....	"B" reducers	50	12.5	37.5
	"B" gainers	66.66	33.33	0
	"A" control	28.6	42.8	28.6
e) Thigh...	"B" reducers	37.5	62.5	0
	"B" gainers	33.33	66.66	0
	"A" control	28.6	50	21.4
f) Calf....	"B" reducers	12.5	62.5	25
	"B" gainers	33.33	50	16.66
	"A" control	35.7	42.8	21.4
g) Ankle...	"B" reducers	12.5	62.5	25
	"B" gainers	0	50	50
	"A" control	21.4	50	28.6
h) Weight..	"B" reducers	25	62.5	12.5
	"B" gainers	83.33	16.66	0
	"A" control	50	35.7	14.2

* A composite table of the information presented separately in Tables III, IV, and V.

Experimental Study Group "B" Reducers.

1. A weight loss was noted by more than 50 per cent of the subjects.
2. All of the cases indicated a girth measurement change by 50 per cent or more of the subjects in all areas except hips and waist.
3. More than 50 per cent of the subjects showed a decrease in girth measurement except for the hip area. (Table I).

Experimental Study Group "B" Gainers.

1. A weight increase was reported by more than 50 per cent of the subjects.
2. Girth measurement increases by 50 per cent or more of the subjects were noted in waist and hip areas only.
3. All other girth measurement changes for this group reflect decreases by 50 per cent or more of the subjects.
4. The only area that reflected no change by 50 per cent of the subjects was the ankle measurement.

Control Study Group "A".

1. Weight increases were recorded by 50 per cent of the subjects in this group.

2. Girth measurement decreases by 50 per cent of subjects were noted in all areas except hips and calf of leg.
3. There were no areas of measurement in which more than 50 per cent of the subjects indicated no change.
4. Less than 50 per cent of the cases showed girth measurement increases in any given area. (Table II).

CHAPTER V

SUMMARY AND CONCLUSIONS

I. SUMMARY

It was the intent of this project to determine whether a program of diet and exercise would have any effect upon body weight and girth measurements.

The study involved participation by two groups, group "A", the control group, and group "B," the experimental group. A program of regular exercise and diet control was formulated for use by the experimental group. For a period of twelve weeks the members of group "B" followed this plan, while members of the control group continued normal activity. At the end of the twelve week period the differences in weight and girth measurements between the two groups were compared by Fisher "t" scores and were given in percentages showing frequencies of change.

II. CONCLUSIONS

Calculations based on the significant differences established by "t" tables, as presented in the "analysis of data," present a reasonably accurate picture of the specific amount of change to be noted in a study of this size in-

volving only twenty-eight subjects.

The data seems to substantiate the following conclusion: no significant differences between experimental and control groups in weight and girth measurement were noted as a result of the application of a program of diet and exercise introduced into the daily living routines of healthy college women students, ages 18-20.

The above conclusion might be questioned to some extent on the basis of the following factors:

1. Calculations of the mean and differences in terms of the Fisher "t" might be distorted to some degree as the result of the small number of cases involved in the study. A greater continuum of scores taken from a larger sampling of cases might provide more data that would lend itself more readily to this type of interpretation.
2. The small amount of difference recorded between the reported changes of the two groups may have been effected by independent efforts toward weight reduction on the part of some members of control "A." It is noted that these subjects participated in the study on a totally voluntary basis and received regular exercise as a part of

their program in the Fundamentals and Skills course. It could be that a dietary consciousness might have led some members of this group to restrict their caloric intake, bringing about changes in weight and girth measurements which also may have distorted the significant differences reported by the "t" calculations.

The percentages calculated in the "analysis of data" suggest the following:

1. That diet and exercise does have some effect on changes involving weight and girth measurement. A comparison of study group "B" reducers and gainers indicate some change possible (Tables III and IV).
2. That a regular period of exercise can contribute to changes in weight and girth measurement. A review of information reported by group "A" seems to indicate this view. (Tables V and VI).
3. That the same general type of weight and girth measurement change plan does not necessarily bring about the same degree of change in all subjects participating. The varying degrees of change recorded in Tables I-VI substantiate this as a reasonable assumption.

III. RECOMMENDATIONS

The combined factors of diet and exercise do have some effect on body weight and girth measurement change. A parallel study involving comparisons of four study groups using the elements of diet, exercise, and diet and exercise combined, compared against a pure control, might produce information that would indicate which element most contributes to body weight and girth measurement changes.

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APPENDIXES

APPENDIX A: CALORIE CATALOG

This calorie chart has been prepared by the National Dairy Council, Chicago 6, Illinois.

To calculate the number of calories needed per day to maintain your present body weight, multiply the pounds you weigh by 20.

DAIRY FOODS:	Size of portion	calories
Milk, whole,	1 glass (8oz.)	170
Milk, skim or buttermilk,	1 glass (8oz.)	85
Milk, chocolate drink,	1 glass (8oz.)	185
Cheese, American or Swiss,	1" cube or Med. slice	110
Cheese foods, cheddar type,	2 tablespoons, (1 oz.)	90
Cheese cottege,	2 tablespoons, (1 oz.)	30
Cheese, cream,	2 tablespoons, (1 oz.)	110
Butter,	1 tablespoon, (½ oz.)	100
Butter,	1 small pat, (1 tea sp.)	35
Cream, light, table,	2 tablespoons	60
Cream, heavy, whipped,	1 heaping tablespoon	50
Half-and-half,	¼ cup	80
Ice cream, vanilla,	¼ pint (½ cup)	150
Ice cream, as for a la mode,	medium scoop (1/5 pt.)	125
Ice cream, as in cone,	small scoop (1/6 pt.)	100
Sherbet,	½ cup	120

MEAT, FISH, POULTRY, EGGS, LEGUMES:		
Meat, fish, poultry, lean to medium fat, averaged	1 serving (3 oz.) cooked weight without bones	230
Liver,	1 serving (3 oz.) cooked	180
Frankfurter,	1 medium (1 3/4 oz.)	125
Luncheon meat,	2 medium slices (2 oz.)	165
Ham, boiled, or baked,	1 thin slice, 5"x4" (1 oz.)	85
Tuna, salmon, canned,	1/3 cup (2 oz.)	105
Chicken creamed,	½ cup	210
Sausage cooked,	1 link 3" long (2/3 oz.)	95
Bacon crisp,	2 long slices (½ oz.)	100
Eggs,	1 medium	75
Eggs scrambled,	1 egg, 1 tbsp. milk, 1 tbsp. butter	120
Dried beans, split peas,	3/4 c. cooked	150

Food	Size of portion	Calories
Baked beans with pork,	3/4c.	245
Peanut butter,	2 tablespoons (1 oz.)	185
Nut, shelled, roasted,	3 tbsp. chopped, 30 peanuts	150
OTHER POPULAR MAIN DISHES:		
Meat and vegetable stew,	3/4c.	190
Cheese fondue,	medium serving(1½x2x2¼")	150
Macaroni and cheese	3/4c.	350
Chicken pie, peas, potatoes, 1pie 3 3/4" diameter		460
Spagetti, Italian style, large serving with cheese		420
Soup, Navy bean,	1 cup	190
Soup, creamed types,	1 cup	200
Oyster stew, made with milk, 1 cup(6-8 oysters)		240
FRUITS:		
Fresh, unsweetened, citrus, 1 medium serving		50-100
small orange,	½ grapefruit	50
melon	½ medium cantaloup	50
peach	1 medium	50
strawberries	1 cup	55
grapes	1 small bunch	55
blackberries, raspberries, 1 cup		75
apple, banana, pear, 1 medium		85
avocado,	¼ medium	140
Cooked, lightly sweetened, ½ cup		100
Dried, ¼ cup raisins, 4 large prunes, 2 small figs, or three or four dates		90
Fruit juice,	½ cup	50
Tomato juice,	½ cup	25
VEGETABLES AND SALADS:		
Green beans	½ cup, cooked	15
Green leafy vegetables,	½ cup cooked	25
Carrots	½ cup cooked	20
Root, others as beets, onions,	½ cup, cooked,	35
Squash, winter,	½ cup cooked,	50
Legumes; green peas, baby lima beans, ½ cup cooked,		65-75
Starchy, as corn,	½ cup cooked,	70
Potatoes, white,	1 small, cooked,	80
Potatoes, mashed,	½ cup	120
Potatoes, french fried,	6 pieces, ½x½x2"	120

Food	Size of portion	Calories
Potatoes, sweet,	½ medium cooked,	90
Raw carrot, tomato,	1 small to medium,	25
Celery,	2 small stalks,	5
Lettuce,	¼ medium head,	10
Tossed salad, mixed vegetables,	3/4 cup, no dressing,	30
Coleslaw,	½ cup,	50
Waldorf salad,	3 heaping tablespoons,	140
Carrot and raisin salad,	3 heaping tablespoons,	150
Potato salad,	½ cup,	185
Chicken or tuna salad with celery,	3 heaping tbsp.	185

BREADSTUFFS AND CEREALS:

Bread, whole grained or enriched,	1 medium slice	60
Cereal, cooked, whole grain or enriched,	½ cup,	70
Cereal, ready-to-eat, whole grain or enriched,	½ cup,	50
Rice or spaghetti,	½ cup, cooked,	105
Noodles,	½ cup, cooked,	55
Corn meal muffin,	1 medium, 2 3/4" diameter,	105
Rolls, plain, enriched,	1 small, (1 oz.)	85
Rolls, sweet,	1 medium, (2 oz.)	180
Waffle,	1 medium, 4½x5½x½"	215
Pancake,	1 thin, 4" diameter	60
Crackers, plain or graham,	2 medium	50
Gingerbread,	1 piece, 2" square,	180

PASTERIES AND PUDDING:

Cookies, plain,	2 small, or 1 large,	100
Cookies, oatmeal,	2 small, or 1 large,	115
Wafers, as vanilla,	2 small, or 1 thin,	45
Cupcake, not iced,	1 medium, 1 3/4" diameter,	80
Cupcake, iced,	1 medium,	130
Brownies,	1 piece, 2x2x3/4"	140
Cake, not iced,	1 medium piece, 2x3x1½",	175-300
Cake, layer, plain icing	med. piece, 1/6 6" cake,	250-400
Cake, angel food, or sponge,	small piece, 2"sector,	115
Doughnut,	1 medium,	135
Eclair, chocolate,	1 average	250
Pie, fruit	1/7 a medium pie,	300-350
Pie, custard type,	1/7 a medium pie,	250-300
Pudding, cornstarch, vanilla,	½ cup,	140
Pudding, rice with raisins,	½ cup,	165
Fruit Betty,	½ cup,	177
Prune whip,	½ cup,	100

Food	Size of portion	Calories
Custard,	½ cup,	140
Gelatine dessert with fruit,	½ cup,	85
SAUCES:		
Cream sauce or milk gravy,	2 tablespoons, med. thick	50
Cheese sauce,	2 tablespoons, med. thick	65
Hollandaise sauce,	1 tablespoon,	90
Catsup, chili, or tomato sauce,	1 tablespoon,	20
Custard sauce,	2 tablespoons,	40
Fruit sauce,	2 tablespoons,	90
Chocolate sauce,	2 tablespoons,	90
Hard sauce,	2 tablespoons,	100
Butterscotch sauce,	2 tablespoons,	200
CANDY:		
Candy bar, milk chocolate,	1 small bar (7/8 ounce)	125
Fondant mints or patties,	1 average, (40 to a pound)	40
Chocolate creams,	1 average, (35 to a pound)	50
Fudge, plain,	1 piece, 1" square	100
Peanut brittle,	1 piece, 2½x2½x¼"	120
Gumdrops,	1 large or 8 small	35
Marshmellows	1 average (60 to a pound)	25
FOUNTAIN SPECIATIES:		
Milk shake, chocolate	fountain size (5 oz.)	400
Malted milk shake	fountain size	500
Cocoa, all milk	1 table size cup (6 oz.)	180
Sundaes,	1 medium, 2 tbsp. topping,	225-335
Sodas,	fountain size	260
Eggnog,	1 large glass (8 oz.) milk,	290
Carbonated drinks,	1 large glass (8 oz.)	110
Lemonade, slightly sweetened,	1 large glass (10 oz.)	100
Ginger ale,	1 large glass (8 oz.)	80
Gingerflip,	1 large glass, milk, ginger ale, ice cream,	225
Mambo shake,	1 large glass, milk, sugar, banana, ice cream, lemon juice,	300
Mint Cow,	1 large glass, milk, mint extract, chocolate syrup, ice cream,	320
OTHER SNACKS:		

Food	Size of portion	Calories
Pizza, quickly made type,	1 medium serving, 4" dia.	185
Hamburger, including bun,	1 medium lightly buttered bun,	360
Hot dog, including bun,	1 medium	210
Potato chips,	10 medium or 7 large	110
Pickles,	1 large dill or sweet pickle, 4 slices of cucumber, 1 tbsp. relish,	15
Olives, green	2 medium	15
Pretzels,	5 sticks	20
Popcorn, lightly buttered,	½ cup,	75

COUNT THESE TOO:

Salad dressing		
cooked type,	1 tbsp.	30
french dressing,	1 tbsp.	60
mayonnaise,	1 tbsp.	90
lemon juice or vinegar,	1 tbsp.	3
Salad oil,	1 tbsp.	125
Jam, syrup, sugar,	1 tbsp.	55
Beer, lager, bottled,	250 cc, glass	130
Beer, lager, draft,	250 cc, glass	120
Ale,	250 cc, glass	155
Mixed drinks, cocktails,	75cc, glass	
Alexander		225
Bronx		235
Daiquiri		125
Manhattan		175
Martini, dry		135
Mint julep		200
Old fashion		105
Tom collins		135

APPENDIX B: SUGGESTED EXERCISES

1. TOE TOUCH

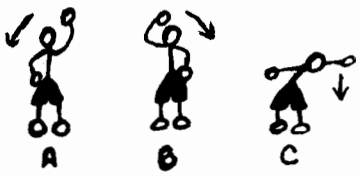
Bend over touch toes 10 times, rest, and repeat exercise.

2. LEG STRETCH

a) Bend from waist touch left toe with right hand 10 times.

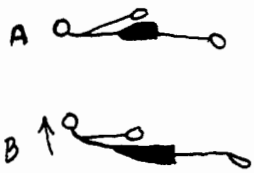
b) Bend left, touch right toe with left hand 10 times.

3. 8-4-2



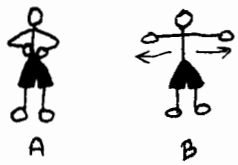
Do 8 repetitions in each position a,b,and c. Follow with four repetitions in each of the positions, then two. Complete the exercise by repeating the activity a second time.

4. WING LIFT



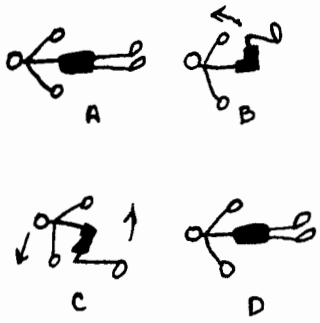
Lie face down on floor with arms extended behind body. Try to lift head and trunk off floor to a count of five. Release and return to floor position. Repeat activity five times.

5. ARM FLING



Fling arms from position A to B ten times, rest,repeat ten times.

6. HIP ROLL

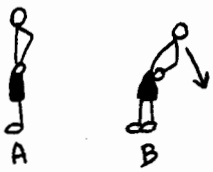


a) Lie down, b) bring legs up to chest, c) roll over to left and touch knees to floor, then roll right and touch knees to floor, d) return to starting position. Repeat activity five times.

7. HIP WALK

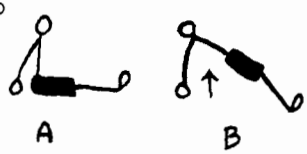
Sit in floor, move forward about six feet by rolling from side to side.(a) Then reverse direction, return to starting point. (b)

8. BACK BEND



With hands on hips, a) bend back from the waist ten times, rest, repeat ten times.b)

9. BACK PUSH-UP



Sit on floor, a) raise hips up, b) hold, count to 15. Lower to floor and repeat five times. Over a period of time increase number of repeats to ten.

APPENDIX C: DESIRABLE WEIGHTS FOR WOMEN[1]

Weight In Pounds According To Body Frame[2]

Height with shoes	Age 18 small frame	Age 18 medium frame	Age 18 large frame	Height with shoes	Age 19 small frame	Age 19 medium frame	Age 19 large frame
4'11"	97-104	103-111	110-120	4'11"	98-105	104-112	111-121
5'0"	98-106	105-113	112-122	5' 0"	99-107	106-114	113-123
5'1"	100-108	107-115	114-124	5'1"	101-109	108-116	115-125
5'2"	103-111	110-118	117-128	5'2"	104-112	111-119	118-129
5'3"	106-114	113-121	120-131	5'3"	107-115	114-122	121-132
5'4"	109-118	117-125	124-135	5'4"	110-119	118-126	125-136
5'5"	112-121	120-128	126-138	5'5"	113-122	121-129	127-139
5'6"	116-125	123-133	131-143	5'6"	117-126	124-134	132-144
5'7"	119-129	127-137	135-147	5'7"	120-130	128-138	136-148
5'8"	122-132	130-140	138-151	5'8"	123-133	131-141	139-152
5'9"	126-136	134-144	142-155	5'9"	127-137	135-145	143-156
5'10"	129-140	138-148	145-159	5'10"	130-141	139-149	146-160
5'11"	132-143	141-151	148-162	5'11"	133-144	142-152	149-163

Height with shoes	Age 20 small frame	Age 20 medium frame	Age 20 large frame
4'11"	99-106	105-113	112-122
5'0"	100-108	107-115	114-124
5'1"	102-110	109-117	116-126
5'2"	105-113	112-120	119-130
5'3"	108-116	115-123	122-133
5'4"	111-120	119-127	126-137
5'5"	114-123	122-130	128-140
5'6"	118-127	125-135	133-145
5'7"	121-131	129-139	137-149
5'8"	124-134	132-142	140-153
5'9"	128-138	136-146	144-157
5'10"	131-142	140-150	147-161
5'11"	134-145	143-152	150-164

[1] Metropolitan Life Insurance Co. Table

[2] Large = 6.3"-6.8" Medium= 5.6"-6.2" Small= 4.6"-5.5"

INDIVIDUAL PROGRESS CHART FOR DIET AND EXERCISE STUDY

Name _____ Group Classification _____

Course Section _____ Recommended Weight Range _____

Age _____ Height _____ Study Group _____

	2 weeks	4 weeks	6 weeks	8 weeks	10 weeks	12 weeks	summary
Caloric Intake							
Weight							
Measurements							
a) Chest							
b) Bosom							
c) Waist							
d) Hips							
e) Thigh							
f) Calf							
g) Ankle							
h) Wrist*							

*Necessary for establishing body frame

Caloric need to maintain current weight _____

- indicates loss

+ indicates gain

APPENDIX E: PROGRESS CHART COMPLETED

INDIVIDUAL PROGRESS CHART FOR DIET AND EXERCISE STUDY

Name Janice Thofson
Course Section F & S Winter
Age 18 Height 5'6"

Group Classification Medium frame
Recommended Weight Range 123-133
Study Group "B" experimental

	2 weeks	4 weeks	6 weeks	8 weeks	10 weeks	12 weeks	summary
Caloric Intake	1535	909	779	848	727	683	913 aver.
Weight	151	150	148	147	145	144	-7 lbs.
Measurements							
a) Chest	37.0"	36.0"	37.0"	34.0"	35.0"	34.5"	-2.5"
b) Bosom	37.5"	37.75"	36.0"	37.5"	37.75"	37.0"	-0.5"
c) Waist	28.0"	28.0"	28.0"	27.5"	27.0"	27.25"	-0.75"
d) Hips	38.5"	41.0"	39.0"	40.75"	39.5"	39.5"	+1.0"
e) Thigh	22.0"	23.25"	22.50"	22.50"	23.0"	21.0"	-1.0"
f) Calf	13.75"	13.75"	13.50"	13.50"	13.50"	13.0"	-0.75"
g) Ankle	9.0"	8.75"	8.50"	8.50"	8.25"	8.25"	-0.75"
h) Wrist*	6.0"	6.0"	6.0"	6.0"	6.0"	6.0"	0

* Necessary for establishing body frame

Caloric need to maintain current weight 3020 calories

- indicates loss

+ indicates gain