CALIFORNIA STATE UNIVERSITY, NORTHRIDGE

A WEIGHT REDUCING CURRICULUM FOR
TRAINABLE MENTALLY RETARDED STUDENTS

A thesis submitted in partial satisfaction of the requirements for the degree of Master of Arts in
Physical Education

by

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May, 1975
The thesis of Gene Allan Newman is approved:

California State University, Northridge

May, 1975
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ABSTRACT

A Weight Reducing Curriculum for
Trainable Mentally Retarded Students

by

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California State University, Northridge

May, 1975

The purpose of this study was (1) to develop guidelines for a weight reducing curriculum for the Trainable Mentally Retarded, and (2) to provide a sampling of instructional materials and procedures which can be employed in a weight reducing program.

Data were collected by reviewing related literature in the following areas: exercise physiology, nutrition, learning theory for the retarded, psychology of obesity, existing weight reducing curricula for normal students, and curriculum development.

A diagnosis of the needs of the obese retarded, a formulation of the objectives of the curriculum, a selection of the content and organization of the curriculum were
undertaken after appropriate data were collected. Guidelines are presented for the selection of the learning experiences, the organization of learning experiences, and the determination of what to evaluate and the evaluation methods. Model learning experiences are presented, along with model evaluation protocols.

Four themes were consistently delineated in the literature for the treatment of obesity, and were included in this curriculum as objectives:

1. Daily exercise to increase caloric expenditure.
3. Control of overeating.
4. Motivation and behavior modification.

The author suggests the following recommendations for further investigation in this area:

1. Testing of the fundamental principles proposed in the curriculum.
2. Research relating to the physiological capacities of the Trainable Mentally Retarded.
3. The development of a methodology to assess body composition from anthropometric measures for both males and females.
CHAPTER I

INTRODUCTION

Today's automated, hypokinetic society is particularly susceptible to obesity. Genetic, environmental, psychological, emotional, and pathological factors intervene to make obesity a complex syndrome. Mayer (27) has stated that obesity is associated with four types of hazards to health:

1. Changes in normal functions of the body (structural, physiological, etc.).

2. Increased risk for developing certain diseases (degenerative heart disease, pulmonary problems, etc.).

3. Detrimental effects on established diseases.

4. Adverse psychological reactions.

While working with the Trainable Mentally Retarded (TMR) at the secondary school level, the author has observed a relatively high incidence of obesity. In addition to the complicating genetic, environmental, psychological and emotional factors, the TMR is additionally handicapped
by diminished cognitive-motor functions, and peer rejection, thereby rendering the retardate less capable of engaging in proper food discrimination and daily exercise; hence, the increased likelihood of a positive energy balance and obesity. To further complicate the obesity syndrome, the Committee on Children with Handicaps of the American Academy of Pediatrics, has stated: "Food is one tangible way parents can communicate concern and affection to the (retarded) child" (1:111).

To remediate the obesity problem of the TMR, a curriculum addressed to that purpose could be of great value; however, a review of the literature failed to provide relevant curricular materials. Comprehensive curricular guides for the handicapped were reviewed: those guides failed to consider the subject of obesity. Also, specialized nutrition instructional materials for the TMR have not been developed. A curriculum is needed which will utilize theory from exercise physiology, nutrition, psychology, existing curricula on weight reduction, and learning theory for the retarded; and which will synthesize these theories into a logical and comprehensive curriculum addressed specifically to the obese TMR student.
Statement of the Problem

This study is concerned with the problem of developing a curriculum to deal with obese trainable mentally retarded students, which may be employed in a Remedial Physical Education class.

Statement of the Purpose

This study has two purposes: (1) To develop guidelines for a weight reducing curriculum for the Trainable Mentally Retarded. (2) To provide a sampling of instructional materials and procedures which can be employed in a weight reducing program.

Significance of the Study

Research has shown that over 30 percent of adult Americans between ages forty and sixty are more than 20 percent overweight (62). These individuals have a greater than 40 percent chance of dying in any given year from heart disease, a greater than 30 percent chance of dying from coronary artery disease, a greater than 50 percent chance of death from cerebrovascular disease, as well as an increased chance of dying from many other diseases (62).

Research has also demonstrated that adults obese
since childhood will have greater difficulty losing weight than those who have become obese after childhood, and that childhood obesity is one of the factors which influences adult obesity (57).

The mentally retarded individual with Down's Syndrome (mongolism) has a 50 percent chance of possessing congenital heart disease, has a limited physical working capacity, has less cognitive/motor capacity to learn games and perform exercises, and therefore has an increased tendency toward juvenile onset obesity, and hence adult obesity (41, 91). Benda (7) has stated that a reliable early symptom of mongolism is the condition of general bodily hypotonia or flabiness with excessive distributions of fat in the abdominal and breast areas. Culley et al (50) investigated the heights, weights, and body builds of a population of institutionalized mentally retarded children. They found that mentally retarded patients without motor dysfunction were similar to mongoloids in terms of body measures. Hayden (126) stated that retarded children showed half as much strength, fatigued 30 percent faster, and carried 35 percent more fat than non-retarded children of the same age.

The physical education profession concerns itself with the physical well-being of society; therefore, the
treatment of obesity could well be instituted under a physical education framework. Seltzer and Mayer (95) are the leading authorities on obesity in the United States. They have stated:

In our judgment, the opportunity for greatest success in the control of obesity lies in tackling the problem in the pre-adult stage, in obese children and adolescents, when the habits of diet and physical activity are more tractable to modification and are not yet as firmly established as in adult life. (95:679).

Seltzer and Mayer also stated:

12 - 20 percent of pre-adult population is obese, and therefore reliance cannot be placed on the individual initiative of parents and children to obtain weight control therapy when needed. Furthermore, the cost of such therapy through private medicine is generally too high for all but a limited number of individuals. The public school system, therefore, affords the most suitable and logical focus for an attack on the problem of weight control in our excessively fat youngsters (95:679).

Seltzer and Mayer also list four advantages for conducting a weight reducing curriculum in the public schools:

1. The largest number of youngsters can be served.
2. Service and supervision can be continuous.
3. The program can be least expensive for family and individual.
4. The problem is placed in education where it should be, because it is not simply a medical issue.
Seltzer and Mayer (95) concluded:

The implication is that such a program (weight reducing program) should become an integral part of all public school systems, and at all levels. The lower the grade level at which the program is instituted, the better for the obese. Further, a program of this sort should be the principal responsibility of the physical education departments of the public schools, with cooperation and supervision of the school physicians, school nurses, and community health departments (95:679).

The introductory statements offered above indicate that (1) obesity is a problem in today's automated society, (2) a weight reducing program should become an integral part of all public school systems, (3) the mentally retarded need a weight reducing program directed toward their unique problems, and (4) relevant curricular materials for the obese TMR are not available.

The findings from this study can be applied to the obesity problem of trainable mentally retarded students. A school program to reduce obesity will help these youngsters reach adulthood as physically fit, socially acceptable, and emotionally healthy individuals.

Curriculum Development Methodology

Curriculum development requires a logical and thoughtfully planned methodology. Taba (34) suggested seven steps to curriculum development:
1. Diagnosis of needs.
2. Formulation of objectives.
3. Selection of content.
4. Organization of content.
5. Selection of learning experiences.
6. Organization of learning experiences.
7. Determination of what to evaluate, and the ways and means of doing it.

The weight reducing curriculum developed in this study has proceeded from step one through step seven above. A diagnosis of the needs of the obese retarded, a formulation of the objectives of the curriculum, a selection of the content and organization of the curriculum, were undertaken after appropriate data were collected. Guidelines are presented for the selection of the learning experiences, the organization of the learning experiences, and the determination of what to evaluate and the evaluation methods. Model learning experiences are presented, along with model evaluation protocols.

To develop a logical curriculum, an interdisciplinary approach is needed. It is assumed that curriculum for all individuals must be addressed to the physical, psychological, and emotional facets of the student. In order to
plan for the physical needs of the obese retarded, exercise physiology literature, and nutrition literature, was reviewed. It is also essential that learning theory for the retarded, and psychology literature be reviewed, in order to provide for the psychological/emotional needs of obese retarded students. In developing a curriculum, it is necessary to review literature related to curriculum development. Also, a review of existing curricula for non-retarded obese students was beneficial in examining the kinds of procedures and activities that have been proven effective.

Figure 1 shows how the various information sources influence the curriculum.
FIGURE 1

INFORMATION SOURCES AND DIRECTION OF INFLUENCE ON THE CURRICULUM

<table>
<thead>
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<th>Formulation of Objectives</th>
<th>Selection of Content of Knowledge</th>
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<th>Determination of Needs and Procedures</th>
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<td>Learning Theory for the Retarded</td>
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Design of the Study

The major portion of this study was a review of the literature involving physiology, nutrition, learning theory for the retarded, psychology of obesity, existing curricula for weight reduction in normal subjects, and curriculum development.

Curriculum development literature has been reviewed and employed in regard to the general organization, conceptualization, and development of this curriculum.

Literature from Exercise Physiology was reviewed to develop insights into the cause and dangers of obesity, to determine what treatments (activities) are indicated, and to develop proper evaluation procedures. The review of physiology literature includes the genetic, environmental, and pathological causes of obesity, and the psychological, structural, and cardiovascular-pulmonary dangers of obesity. In order to determine indicated treatment (exercise requirements), literature involving positive and negative energy balance, metabolism, minimum training stimulus, and physiological capacities of the TMR has been gathered. Literature dealing with ideal percent body fat for men and women, and evaluation of body composition was reviewed in order to formulate procedures to evaluate the students.
Nutrition literature has been dealt with to determine what nutritional practices are suggested for the obese individual. This information was employed in the conceptualization of instructional materials to teach nutrition concepts.

Motor and cognitive learning theory for the mentally retarded, including objectives of cognitive and motor learning, and principles and practices was researched. Theoretical assumptions regarding the processes of motor and cognitive learning by the retarded were utilized in formulating recommendations regarding instructional materials. This information also has application for the determination of the most suitable activities to increase the retardate's metabolic rate, and for the manner of presentation of such activities.

In order to deal with the psychological aspect of obesity, literature concerned with self concept, and the psychology of obesity has been reviewed. These data have implications for the motivation and the behavior modification of obese students, and for the dynamics of the curriculum.

Existing weight reducing programs and curricula for normal students were reviewed. Ideas, concepts, dynamics,
and instructional materials have been adapted (if necessary), and incorporated.

The second phase of this study involved developing principles for a weight reducing curriculum from the concepts and theory elicited from the review of the literature.

Limitations

It must be recognized that obesity, although physiologically the result of a positive energy balance, is often the manifestation of psychological or emotional problems. It is intended that the curriculum will attempt to deal with the symptom, and not necessarily the cause; however, in some instances by treating the symptom, the cause may be alleviated.

Additionally, it must be recognized that the appendices are provided as working examples that can be modified, enlarged, and improved upon as research expands the body of knowledge in the areas of weight reduction and mental retardation.

Thirdly, this study is limited by the amount of literature and research available regarding the subject topic.
Assumptions

The following assumptions were accepted for this curriculum development project:

1. Education can modify behavior and thereby obesity.
2. Weight reducing principles elicited from the literature, regarding normal individuals, can be transferred to the TMR population.
3. Some trainable retardates are capable of cognitive learning.

Definition of Important Terms

In order to facilitate understanding, the following terms are defined as they are used in this investigation:

1. Down's Syndrome - A severe form of congenital mental deficiency. Children have a characteristic appearance: small head, slanting eyes with inner epicanthal fold, and a fissured tongue that usually is large and protruding. About one-eighth of all mentally defective infants are afflicted with this syndrome (35:M58).

2. Educable Mentally Retarded (EMR) - The label given to the mentally handicapped individual, diagnosed by an I.Q. test to have an I.Q. in the approximate range of fifty to seventy.
3. **Obesity** - The term used to label the condition where an individual is from 20 - 30 percent over average weight for his age, sex, and height (35:01).

4. **Remedial Physical Education** - As defined by California Education Code, Remedial Physical Education is designed for pupils who have physical handicaps so severe as to prevent normal participation in physical education classes or normal participation in physical education classes designed to meet the needs of pupils with minor or moderate physical defects (12).

5. **Trainable Mentally Retarded (TMR)** - The label given to the mentally handicapped individual diagnosed by an intelligence quotient test to have an I.Q. in the approximate range of twenty-five to fifty.

**Organization of Remaining Chapters**

In Chapter II, a comprehensive review of the literature pertaining to obesity, exercise physiology, body composition, nutrition, learning theory for the retarded, psychology of obesity, and existing school curricula for weight reduction is presented.

Chapter III contains principles and guidelines for a weight reducing curriculum derived from the review of the literature.
Chapter IV contains a summary of the study, and recommendations for further research.

The appendices include ideas and principles for curriculum implementation. Appendix A includes information for improving physical fitness. Appendix B contains information regarding nutrition education. Appendix C contains behavior modification techniques to control overeating. Appendix D contains physical fitness evaluation procedures, tests to measure nutrition concept understanding, and tests to evaluate percent body fat.
CHAPTER II

REVIEW OF RELATED LITERATURE

Chapter two is divided into seven main sections.
Section one deals with obesity: descriptions of obesity, causes of obesity, and health problems related to obesity are presented. Section two deals with related exercise physiology literature. Positive and negative energy balance, minimum training stimulus, activities suitable for increasing the metabolic rate, and the physiological capacities of the T.M.R. are examined. Section three reviews body composition literature: ideal percent body fat for men and women, fallacies of the height-weight charts, and procedures for evaluation of percent body fat are presented. Section four deals with related nutrition literature; fat synthesis and metabolism, and recommended diet are included. Section five reviews literature related to motor and cognitive learning theory for the retarded. Section six presents literature related to the psychology of obesity: self concept, behavior modification, and motivation are discussed. Section seven deals
with existing school curricula, and programs for dealing with the obese.

SECTION I· OBESITY

Descriptions of Obesity

Obesity has been defined in many ways. Tabers Medical Dictionary (35) defines obesity as a condition where abnormal amounts of fat are deposited on the body. Tabers states, "The term is usually not employed unless the individual is from 20-30% over average weight for his age, sex, and height" (35:01). deVries (14) defines obesity for males as a condition where more than 20 percent of the body weight is composed of fat tissue. Females are considered obese according to Ljunggren (24) when their fat tissue comprises more than 30 percent of the total body weight. These discrepancies in definitions of obesity will be discussed later.

Causes of Obesity

Many authors have attributed obesity to a number of different factors. In regard to the psychogenic causes of obesity, Reeve (87) has suggested a sadomasochistic defense system. Blazer (43) believes the core of the obese problem is that the compulsive eater has given up the struggle
to preserve a nonderogatory attitude toward himself. Rascovksy (36) felt that the family environment of the obese child is characterized by an over-protecting and domineering mother who stimulates in an exaggerated fashion the relation of dependence on the child. Hammer (20) reported that even in the case of clinical problems which are generally regarded as constitutional in origin, there is evidence that modeling after the parents sometimes plays a major role in establishing the dysfunction. Lemieux and Martel (67) have reported that overeating by adolescents is a deficiency in emotional maturity. Holland and Ward (21) suggest that it is possible that emotional conflicts upset physical homeostasis not through their effects on emotions such as anxiety, but rather through their effect upon a more basal level of central nervous system functioning, the midbrain or pain-pleasure level of functioning.

Several investigators have described the etiology of obesity in terms of a positive energy balance. deVries (14) stated that, "Since the law of conservation of energy tells us that energy can neither be gained or lost but only change in form, we must look for this energy to be deposited in the form of body fat..." (14:224). Green (55) studied 350 cases of obesity and reported that
inactivity was found to be associated with 67.5 percent of the cases, and increased food intake was found in only 3.2 percent. Mayer (69) stated that when weight increases, the impulse for physical exertion decreases. Mayer found that a decreased tendency for muscle activity is a common finding among obese people.

Johnson et al (61) studied twenty-eight obese girls selected from the high school age group with controls of the same height, age, school grade, and socioeconomic status. Johnson found that the obese girls ate less than their controls, but spent a strikingly smaller time (2/3 less) in occupations involving exercise. Stefanik (102) studied fourteen obese adolescent boys and fourteen paired non-obese controls at a summer camp. He found that the obese boys ate less and participated less in exercise than their controls.

Bullen (44), using time-motion studies in industry, found from estimating caloric expenditures based on a particular pose, that the average obese adolescent girl expends less energy than her non-obese counterpart.

Several authors have reported that obesity results from a disturbance in the neurological apparatus associated with satiety. In 1950, Miller et al (73) described for the first time the peculiar feeding behavior of rats
made obese by hypothalamic lesions. Obese rats overate when food was freely available, but when an impediment was placed in the way of their eating, food intake not only decreased, but to a far lower level than that of control rats without hypothalamic lesions. Miller felt that the behavior of the hypothalamic obese animals suggests that their behavior is characterized by an impairment in the mechanism of satiety, and probably also by an impairment in the desire to eat. Penick and Stunkard (83) have also studied hypothalamic obese animals. They feel that the need for food becomes compulsive and the desire for food drives the obese individual in the way that a desire for narcotics drives the addict, or the need for a drink drives the alcoholic.

Nisbit (77) studied humans and reported that obese humans demonstrate a condition similar to that of the hypothalamic obese rat described by Miller, namely, they will overeat until an impediment is placed in the way of the eating. Schacter (93) also studied humans and reported that humans show characteristics similar to hypothalamic rats. According to Schacter, normal subjects ate more when their stomachs were empty than when they were full. Obese subjects ate as much, in fact slightly more, when their stomachs were full as when they were empty. The
actual state of the stomach has nothing to do with the eating behavior of the obese according to Schacter.

The relationship between adult obesity and childhood obesity has been studied by many investigators. Abraham (37) has shown that adults obese since childhood are particularly refractory to therapy. Young et al (119) have suggested that childhood obesity is one of the factors which determines adult obesity and also plays a part in subsequent problems of weight control.

Knittle and Hirsh (66), Hirsh and Knittle (57), and Salons and Knittle (92) have found that the state of nutrition of a rat during its first three weeks of life determines the subsequent character of its adipose tissue and even its future size. Overfeeding during this critical period produces a high cellular adipose tissue, whereas undernutrition results in tissue with an abnormally low number of adipose tissue cells. According to the above authors, with increasing age, adipose tissue progressively loses its ability to grow by cellular hyperplasia, and by adult life, any increase in body fat is accomplished by an increase in cell size, not an increase in cell number. In regard to humans, the above authors have stated that persons obese since early life experience the compounded problem of an increased number of adipose tissue cells, and
the increased size of adipose tissue cells. The authors concluded that one suffering from juvenile onset obesity might be able to achieve weight loss, but only by decreasing the fat content of his excessive number of adipose tissue cells to an abnormally low concentration.

Several authors have studied the relationship between obese parents and their offspring. Bauer (6) found by studying 1,600 obese patients in Vienna, that 73 percent had one or both parents obese. Bauer also reported that one-half the offspring of an obese and an average parent were obese, and two-thirds of the offspring of obese and obese matings were obese. Gurney (70) found that only 9 percent of children of average weight parents were obese.

Withers (117) studied weight correlations between parents and adopted children, and between parents and natural children. He found that the weight picture of natural children correlates with the weight of their parents; however, the weight of adopted children and their step parents did not correlate. Mayer (70:A105) concluded that, "From studies, it is evident that while environmental factors play a role in the control of body weight, genetic factors are of paramount importance." One hypothesis of the genetic cause of obesity is that the gene which helps to determine obesity is a sex-linked
recessive lethal gene (70).

Several authors have labeled obesity as a multi-etiological phenomenon. Penick and Stunkard (83) have developed evidence that obesity is a disease of multiple etiology involving social factors, situational determinants, physiology of adipose tissue, and disturbances of body image. Mayer (69) stated that obesity is the end product of many syndromes. Mayer further stated that the causes of obesity are psychological, physiological, and the effects of a permissive environment which no longer makes activity compulsory for survival. Kiell (73) stated that at this time, obesity is best viewed as having multiple causes: metabolic, neurological, psychological, and socioeconomic.

Health Problems Related to Obesity

Mayer (27) reported that obesity is associated with four types of hazards to health:

1. Changes in normal functions of the body.
2. Increased risk of developing certain diseases.
3. Detrimental effects on established diseases.
4. Adverse psychological reactions.

Mayer also listed problems associated with obesity. Among those problems are respiratory difficulties, less exercise
tolerance, more difficulty breathing, and higher frequencies of respiratory infections. Mayer stated that the respiratory difficulties associated with obesity may be a direct cause of coronary heart disease.

devries (14) reported that in physical performance, obesity is a distinct disadvantage because a large portion of the body weight, which does not contribute to performance, must nevertheless be moved, at a definite cost in terms of energy. devries went on to explain that obesity has been shown to be associated with increased incidence of diabetes, gallstones, high blood pressure, and heart disease.

**Obesity: Summary of Principles**

1. Several authors have suggested an array of psychogenic causes for obesity.

2. From a physiological standpoint, obesity is the result of a positive energy balance.

3. A decreased tendency for muscle activity is a common finding among obese people.

4. Inactivity, and not increased food intake, is responsible for about two-third of the obese population.

5. It is possible that obesity is caused by a
disturbance in the neurological apparatus associated with satiety, and the actual state of the stomach has nothing to do with the eating behavior of the obese.

6. Individuals obese since early life, will have more difficulty losing weight than those who gain weight after adulthood.

7. Obesity is a multi-etiologal phenomenon. Metabolic, neurological, psychological, and socioeconomic factors influence obesity.

8. Obesity is associated with four types of hazards to health:
   a. Changes in normal functions of the body.
   b. Increased risk for developing certain diseases.
   c. Detrimental effects on established diseases.
   d. Adverse psychological reactions.

SECTION II: RELATED EXERCISE PHYSIOLOGY LITERATURE

Physiological Capacities of the Mentally Retarded

There are available a limited number of studies which have described the physiological working capacities of the retarded (both EMR and TMR). Brace (123) administered the
AAHPER Youth Fitness Test to sixty-five mentally retarded boys. Subjects performed best on sit-ups and poorest on pull-ups and on running and jumping events. Brace concluded that retarded boys were, generally, below national norms.

Carter (45) compared forty-five EMR boys to thirty-five normal boys using the AAHPER Youth Fitness Test. The non-retarded boys scored higher on all test items; however, the scores for the EMR boys were near the national average for physical fitness scores. Bar-Or (39) tested retarded boys and girls age six to fifteen using a maximum working capacity test. The subjects ranged in I.Q. from fifty to ninety. He found that the retardates had a similar aerobic capacity to that described in the literature for intellectually normal children of various countries.

Sengstock (96) studied thirty EMR boys age ten to fifteen and compared them to normal boys of comparable chronological ages. The EMR boys were also compared to thirty younger boys (five to thirteen) of normal intelligence. The older normal boys were superior to the EMR boys. The EMR boys performed midway between the older normals and the younger normals.

Rarick (31) commenting on physical working capacities of the mentally retarded in general, indicated that more
research is needed on the exercise tolerance and physical working capacity of the mentally retarded children. On the basis of the retarded physical and motor capacity of these children, one would hypothesize that they would also show a work capacity lower than that of normals.

Drowatzky (16) indicated that the overweight condition of mentally retarded individuals is symptomatic of their lower levels of physical fitness.

Tandon and Edwards (111) studied Down's Syndrome subjects with cardiac malformations. Fifty-five subjects were studied: thirty females and twenty-five males. All the subjects had congenital heart disease. Tandon and Edwards reported that 60 percent of these subjects had persistent common atrioventricular canal problems, 29 percent had a tetralogy of Fallot, 50 percent had an atrial septal defect, and 50 percent had patent ductus arteriosus. Berg et al (41) and Rowe and Uchida (91) studied subjects with Down's Syndrome and reported that in about 50 percent of the subjects with Down's Syndrome, some sort of congenital heart disease is present.

Shannon (127) studied heart rate responses to exercise of normals and TMR subjects. Forty-five normals and forty TMR boys were studied. Resting heart rates, work heart rates, and recovery heart rates were measured. Shannon
concluded that the TMR subjects gradually fall behind normal subjects in measured heart rates. By the fifteenth year, the recovery heart rate of the TMR is significantly different from boys with normal intelligence. The recovery heart rate improves with chronological age in normal subjects. The recovery heart rate does not improve with age in retardates. Indications are that the capacity for exercise becomes significantly different between normal and retarded subjects as chronological age increases.

Minimum Training Stimulus

In order to increase an individual's physiological working capacity, and therefore increase his ability to exercise, the cardiovascular system will need to be strengthened. It is necessary to know how much exercise is needed in order to strengthen the cardiovascular system.

Several work physiologists have studied the cardiovascular response to exercise and have reported an array of minimum training stimuli formula. Karvonen et al (22) found that a run of one-half hour daily for four weeks did not increase working performance if the heart rate was 135 or lower; however, resting heart rate did decrease when the training stimulus was more than 135 beats/min.

Hollmann (59) conducted a study in which subjects
trained for thirty minutes daily, five days per week, on a bicycle ergometer. Hollmann concluded that if the training heart rate was lower than 130 beats/min., an increase in maximum oxygen uptake (Max VO₂) from 2900 to 3067 milliters of oxygen per kilogram of body weight per minute (ml/kg/min) occurred. However, if the training heart rate was greater than 130 beats per minute, an increase in Max VO₂ from 3067 to 3567 ml/kg/min occurred.

Roskamm (90) studied eighty soldiers which he divided into four groups. The groups trained one-half hour daily (five days per week), for four weeks. Group one trained at a workload in which the heart rate was equal to resting heart rate plus 70 percent of the difference between resting and maximum heart rate. Group two trained at a heart rate 50 percent higher than it would have been for group one, for one minute, and for the next minute at a heart rate 50 percent lower than that at which group one trained. Group three interval trained also, at a heart rate 50 percent greater than the heart rate for group one, for two and one-half minutes, and for the succeeding two and one-half minutes they trained at a heart rate 50 percent lower than that for group one. Group four was a control group which experienced normal military training procedures without added exercise. The results of the study indicated that
group three had the greatest training effect on an index of maximum working capacity. Group one was the only group to show significant heart rate decreases at low work loads (100 watts). Roskamm concluded that:

It seems that training by means of an uninterrupted work load is most efficient in decreasing the heart rate at rest and in the low and middle intensity encountered in daily life. However, interval training in which the work load is changed every two and one-half minutes seems to be more effective than training in which the workload is changed every minute (90:897).

Skinner (100) using middle-age subjects, concluded from his study that a training stimulus which will cause a heart rate equal to resting heart rate plus 70 percent of the difference between resting and maximum, with brief periods of one to three minute tachycardia at 70 percent to 85 percent of the difference between resting and maximum, is suitable for the middle-aged.

Owen et al (81) conducted stress tests with NASA Manned Spacecraft Center executives as subjects. On the basis of the test results, exercise prescriptions were suggested. For the age group under study this represented approximately 70 percent of the maximum heart rate attainable.

Wilmore and Haskell (116) presented exercise prescriptions based on the linear relationship between heart
rate and energy expenditure. They assigned a training heart rate which corresponded to 75 percent of the subjects' predicted maximum oxygen uptake.

Faria (52) studied college students training at various intensities. Faria concluded that:

It appears that this (training) threshold lies somewhere below 140 beats/min. for the subjects in this study, and that it may not be necessary to train to an intensity beyond 150 beats/min. in order to improve physical working capacity (52:48).

Sharkey (97) studied intensity and duration of training and concluded that high exercise intensities yield optimal training benefits when combined with moderate exercise durations.

Karvonen (22) studied untrained medical students exercising on a treadmill. Karvonen concluded that a training stimulus equal to a heart rate of 60 percent of the difference between resting and maximum heart rate is needed to improve physical condition of the students.

Hollmann and Venrath (60) have found that a training stimulus which will cause a heart rate of 115-125 beats/min. will lower the heart rate at rest and during submaximal work for a subject.

**Indicated Physical Activities**

In Section I, literature was presented which indicated
that lack of physical activity is responsible for about 60 percent of today's obesity. Literature which suggests activities to increase the metabolic rate is discussed below.

Mayer et al (71) have shown that while appetite increase follows inactivity in the range of normal activity in animals, this is not so in the low levels of activity. They found that sedentary animals (those most apt to be obese) actually display a decrease in appetite with an increase of up to one hour of daily exercise. Mayer and his collaborators have also shown that this principle applies to humans.

Pollack et al (85) studied middle-aged men on a walking program. Pollack studied the energy cost of walking and concluded that walking may be considered from moderate to heavy in regard to energy expenditure. The energy expenditure of walking is curvilinear at speeds faster than four miles per hour, and at increased speeds can require more kilocalories per minute than jogging at slower speeds. The training heart rate data show walking to be moderate to vigorous activity which has sufficient intensity to cause a significant training effect. DeVries (14) reported that walking one-half hour per day will result in a weight loss of five pounds per year.
Wilmore et al (115) found that significant reductions in body weight and percent body fat occurred after a ten-week program of jogging at low to moderate intensity three times per week.

deVries (14) explained that because weight gain is a result of a positive energy balance, three alternatives to reduce weight are available:

1. Increased energy expenditure and constant food intake.
2. Decreased food intake and constant energy expenditure.
3. A combination of 1 and 2 above.

deVries stated: "For the moderately obese (10 to 30 percent above normal), a combination of diet and exercise is probably the optimal procedure" (14:232). deVries further indicated that for exercise to be effective in reducing weight, it must be of the endurance type so that energy expenditure may be maximized. deVries suggests that the following six training principles be considered for endurance purposes:

1. The exercise must allow for gradual progression from low levels to higher levels of energy expenditure.
2. Participants must be protected from injury to
bony and connective tissues in the early stages.

3. Exercise must be vigorous enough to result in increased body heat, as evidenced by sweating.

4. Intensity of the exercise should be as high as possible, and should last for at least thirty minutes. Maximal energy output cannot be obtained if the musculature is quickly exhausted by a few quick maximal repetitions, as in weight lifting.

5. Soreness should be prevented or relieved.

6. After a minimum level of fitness is achieved, the program should be built around activities that are enjoyable and thus self-motivating.

deVries (14) described a phenomenon related to exercise which he called the metabolic after-effect of exercise. According to deVries the increase in metabolic rate incurred during exercise is the main cause of energy loss. However, there is also an increased resting metabolic rate that will last for several hours after exercise is terminated. This rate will be from 7.5 to 28 percent higher for four hours after a vigorous workout. This increased metabolic rate will persist for at least six hours after exercise, and this effect of exercise, over and above the energy cost of the exercise itself, would have resulted in
a weight loss of four or five pounds per year if the individuals tested had exercised daily.

**Exercise Physiology: Summary of Principles**

1. Retarded boys generally perform below national norms on physical fitness tests.
2. In about fifty percent of subjects with Down's syndrome, some sort of congenital heart disease is present.
3. The capacity for exercise declines with age in retardates, and the capacity for exercise becomes significantly different between normals and the retarded as chronological age increases.
4. A training stimulus of approximately 60 percent of the difference between resting and maximum heart rate appears to be sufficient to improve the physical condition of the students.
5. Sedentary individuals will show decreases in appetite with an increase in daily exercise.
6. For the moderately obese, a combination of diet and exercise is probably the optimal procedure to reduce weight.
7. For exercise to be effective in reducing weight, it must be of the endurance type so that energy
expenditure may be maximized.

8. Walking is an excellent activity to increase caloric expenditure.

9. The following principles should be employed when designing exercise programs for the obese:
   a. The exercise must allow for gradual progression from low levels to higher levels of energy expenditure.
   b. Participants must be protected from injury to bony and connective tissues in the early stages.
   c. Exercise must be vigorous enough to result in increased body heat, as evidenced by sweating.
   d. Intensity of the exercise should be as high as possible, and should last for at least thirty minutes. Maximal energy output cannot be obtained if the musculature is quickly exhausted by a few quick maximal repetitions, as in weight lifting.
   e. Soreness should be prevented or relieved.
   f. After a minimum level of fitness is achieved, the program should be built around activities which are enjoyable and thus self-motivating.

SECTION III: BODY COMPOSITION LITERATURE

Exercise and Body Composition

The relationship between exercise and body composition has been examined by many investigators. Pariskova (30) analyzed the body composition of 1,460 individuals and
concluded: "One of the most important factors influencing body composition is the intensity of physical activity, and this is true in youth, adulthood, and old age" (30:250).

Mayer (69) stated that when activity is reduced below a minimum level, a corresponding decrease in food intake did not result, and obesity developed.

Whipp and Ruff (114) studied adolescent boys and girls engaged in a weight reducing program. After six weeks of physical activity, body weight decreased by approximately 9 percent. Oxygen consumption for each work rate was decreased. Whipp and Ruff attributed the change in oxygen consumption to an increase in work efficiency as a result of maintaining a decreased tissue mass, rather than a modification of the intrinsic energetic mechanisms of muscle.

Jokl (62) reported the results of the Kentucky Physical Fitness experiment. Adolescents were evaluated after five months of physical training and found that: (1) mean weight remained constant, (2) significant decreases in external fat (10-60 percent) and increases in active tissue (up to 30 percent) occurred, (3) there were no corresponding changes in control group parameters.

Dempsey (51) observed obese and non-obese young men undergoing a program of vigorous cardiovascular exercise.
He reported that there was a mean decrease in total body weight of 12.30 pounds, a decrease of total body fat of 6.5 percent, a mean increase of fat free weight of 5.24 pounds, and a decrease in abdominal girth of one inch.

Mayer and Stare (72) reported that cardiovascular exercise is an important aid to weight reduction but only if it is carried out frequently, consistently, and in moderation. Mayer and Stare also reported that since the energy cost of exercise is approximately proportional to body weight, it follows that the overweight person will require more energy, and hence burn up more body tissue, for the same amount of exercise, than a person of desirable weight. Mayer and Stare went on to report:

Thus any increase of the caloric intake above the balance level in a physically active person will cause only a modest increase in weight because of the energy cost of moving the extra poundage. On the other hand, in a sedentary individual, less energy will be expended moving the extra weight and hence weight gain will be more rapid and more pronounced (72:341).

deVries (14) explained that one gram of fat produces approximately 9.5 kilocalories. Thus, one pound of fat will be deposited in the body when an excess of approximately 4,300 kilocalories have been consumed. Conversely, if the energy spent is greater than the energy consumed, there is a negative balance of 4,300 kilocalories, and a
pound of fatty tissue will have been lost.

**Standard Height-Weight Tables**

An editorial in the *Journal of the American Medical Association* (63) in 1970 stated:

The final goal of the many therapeutic maneuvers which have been proposed to induce weight loss in obese individuals is induction of negative caloric balance to produce a significant decrease in total body fat. However, change in total body fat is not readily measured by either physician or patient, and one must rely on measurements of change in total body weight (63:492).

The article went on to explain:

Treatment of obesity is often a frustrating task. Consequently, the plethora of treatments that are published each year by physicians and laymen is not surprising. Unfortunately, most of these regimens are directed toward accelerating weight loss which is not necessarily the same as accelerating fat loss (63:493).

Behnke (40) first reported that lean body mass is a more accurate measure of obesity than height and weight tables.

Seltzer and Mayer (94) listed three disadvantages of the height-weight tables. Those limitations are:

1. Obesity does not necessarily correlate with weight.

2. Average weights in Metropolitan Life Insurance tables are nine to ten pounds less for men, and three to four pounds less for women than average
values obtained in the National Health Examination survey of the United States Public Health Service.

3. The tables give no definitions of frames, so the user is unable to characterize his frame in the same way as the authors of the tables.

devries (14) discussed the fallacies of the Air Force standards for optimal weight. These tables do not allow weight increases with age. Recommended weights for ages 26-30 are applicable to all ages. During each decade after age 25, the body loses about 3 percent of its metabolically active cells. These cells are replaced by fat.

Wamsley and Roberts (113) studied fifty-one Air Force personnel using two criteria of obesity. The two criteria were 115 percent ideal body weight and 20 percent body fat. Wamsley and Roberts found that fifteen subjects who were not obese by Air Force standards (15 percent over ideal weight), were nevertheless obese (more than 20 percent body fat). Six cases considered overweight by the tables were not obese. Thus, the tables are inaccurate: twenty-one of fifty-one cases were incorrectly classified by the tables.

**Ideal Body Composition**

Ljunggren (24) has reported that the differences in total body fat between men and women has been assessed
quantitatively by densiometry. In young persons of normal
weight, the amount of fat expressed as a percentage of
total body weight, has been found to be twice as large in
women as in men. The values (20-30 percent for women and
10-20 percent for men), appear reasonable when compared
with the results of the few available direct measurements
made on cadavers. Several other authors have published
findings which substantiate Ljunggren's findings (65,119,
120,121,101).

Evaluation of Percent Body Fat

Several authors have reported various methods for
determining percent body fat. Cowgill (49) presented three
formula for estimating specific gravity from height and
weight. The specific gravity is then converted into per­
cent body fat. Cowgill believed that his equations give
good results precise enough to prove useful in physiology
and medicine. However, Cowgill's formula did not take into
account a change in percent body fat without a corres­
ponding change in weight.

Von Dobeln (112) presented regression equations which
calculate percent body fat from height, weight, and
anthropometric measurements. Von Dobeln reported that when
fat free weight is calculated by body density, the error is
less than 2 percent. When the fat free weight is calculated by height, the error is about 9 percent. When Von Dobeln's formula is used, the error is about 4 percent. These calculations only apply to young, healthy males.

Sloan et al (101) conducted underwater weighings as the criterion on fifty women subjects. Skinfold measures and anthropometric measures were then taken and compared to the criterion measurement. According to Sloan, the best single predictor of density was skinfold thickness over the iliac crest \( r = -0.71 \). The correlation with skinfold thickness of the back of the arm was of the same order \( r = -0.68 \). The multiple correlation between these two measures failed to increase this correlation.

Behnke (40) reported a formula for computing lean body weight using biacromial, bi-iliac, wrist, and knee measurements. Behnke reported a \( \pm 5 \) percent standard error in the estimate of lean body weight from selected diameters.

Shephard (99) reported the correlation of skinfold measures to other measures of percent body fat. Under laboratory conditions, all simple indices of obesity (regression equations, anthropometric measures) give a less accurate prediction of body fat than the measurement of skinfold thickness.
Consolazio (13) reported the efficacy of skinfold measurements for estimation of body composition. He stated:

The differences between different observers measuring the same subject are extreme. Coefficients of variation of as much as 50 percent have been found between trained observers (13:303).

In view of the limitations of using skinfold measurements, Consolazio made the following recommendations:

1. All measurements should be made by a single observer who has had practice with the measuring technique for several weeks preceding the study.

2. All measurements should be made in the early morning upon arising, in order to minimize the effect of variations in state of hydration.

3. Extreme conservatism should be used in interpretation since the obesity-leanness index is derived from empirical factors.

Wilmore (128) presented a formula to determine lean body weight using anthropometric measures. Wilmore reported that his formula has a .94 correlation with the criterion measurement. His formula was only available for males.
Summary: Body Composition Literature

1. One of the most important factors influencing the body composition of an individual is the intensity of physical activity in which the individual is engaged.

2. Regular exercise will cause decreases in percent body fat.

3. Obesity does not necessarily correlate with weight.


5. Generally, a female will possess between 20 and 30 percent body fat. A male will possess between 10 and 20 percent body fat.

6. Various methods to determine percent body fat have been developed. Of these, the underwater weighing method is the most accurate; however, elaborate equipment is needed.

7. Estimation of percent body fat using anthropometric measurements will produce results which could be useful for classroom application.
Fat: Synthesis and Metabolism

devries (14) explained that fat, carbohydrate, and protein have a common path in the final stages of their metabolic breakdown. The reactions are catalyzed by specific enzyme systems. The fatty tissues found beneath the skin (between the muscles and padding the viscera) are in a constant state of flux. Neutral fat from blood replenishes the fat stores of the various fat cells, which release them when needed for energy. When a positive energy balance exists, synthesis of fat tissue from excess carbohydrate or protein occurs in the liver, from whence it is transported to the fat cells.

Recommended Diet

The Committee on Children with Handicaps of the American Academy of Pediatrics (1) suggested that balanced, adequate nutrition, and attention to eating habits are important with handicapped individuals. The Committee recommended:

A modification of the present diet, with substitution of foods lower in calories and limits on concentrated sweets and fats, is a successful approach to a reducing diet. Every effort should be made for the child to be as physically active as possible, and plans should be made for
developing and maintaining his muscle tone within limits of his abilities (1:111).

Mayer (27) recommended a balanced diet, containing no less than 14 percent of protein, no more than 30 percent of fat (with saturated fats cut down), and the rest carbohydrates with sucrose (ordinary sugar) cut down to a low level.

Ball et al (38) studied intermittent fasting as a treatment for obesity. They subjected obese patients to three consecutive 32-day periods. Each patient fasted for 16 days, and went on an 800 calorie diet for 16 days before again fasting. They found that the major component of weight loss was not fat, but protein and water. The periods of caloric restriction following fasting were characterized by minimal change in body weight, rapid reaccumulation of previously lost water and nitrogen, and loss of fat. The fat loss during fasting was not greater than that during the restricted diet.

Hollifield and Parson (58) found that rats trained to eat their entire daily food ration in one to two hours gain more weight than animals eating ad libitum. It was further demonstrated that the trained rats increased the rate at which their adipose tissue incorporated food breakdown into lipids by twenty-five times.
Gordon et al (56) applied the findings from Hollifield and Parsons study to humans. The initiated treatment in obese patients with a 48-hour fast (to break the metabolic pattern of augmented lipogenesis), then instituted a 1,320 kilocalorie diet that consisted of 400 kilocalories of protein, 720 kilocalories of fat, and 200 kilocalories of carbohydrate. The diet was given in six feedings daily, corresponding to breakfast, midmorning, lunch, midafternoon, supper, and bedtime. All feedings were similar in size. No subject complained of hunger at any time, and some subjects lost as much as 100 pounds.

deVries (14) described a "long haul" concept of weight control. According to deVries,

A sensible approach would involve a dietary restriction of only 300 to 500 kilocalories per day, with a progressive build-up of exercise - such as an hour of tennis or horsebackriding (another loss of 400 to 600 kilocalories). In this fashion, pleasurable habits can be formed that require no changes and that do not cause the distress of semi-starvation on a crash diet. The process may take a little longer, but it will be infinitely more successful (14:239).

Astrand and Rodahl (5) described a slimming diet similar to that by deVries:

It should be emphasized that the most lenient way to weight loss involves allowing plenty of time for the measures to take effect. The diet should be critically examined and an attempt made to eliminate some hundred kcal/day, for instance by
substituting artificial sweeteners for sugar and skim milk for whole milk. Furthermore, a 2 km (1\frac{1}{4} mile) walk or run per day would add 100 kcal to the expenditure, the result being a total net reduction in fatty tissue equivalent to 200 kcal/day. Therefore after a month, everything else being equal, the body will be storing 6000 kcal less than before, equivalent to 1 kg of adipose tissue. After a year the body weight would be reduced by 12 kg (about 25 pounds) (5:480).

Summary: Nutrition Literature

1. Neutral fat from blood replenishes the fat stores of the various fat cells, which releases them when needed for energy.

2. When a positive energy balance exists, synthesis of fat tissue from excess carbohydrate or protein occurs in the liver where it is transported to the fat cells.

3. A diet containing no less than 14 percent protein, no more than 30 percent of fat, and the rest carbohydrate is a sensible diet for weight reducing.

4. A diet which changes an individual's life style is the most effective program for weight reducing and retention of weight loss.

5. A diet which eliminates approximately 100 kcal/day combined with increased activity (1\frac{1}{4} mile
walk/day = an energy expenditure of approximately 100 kcal/day) will cause a reduction in body weight of approximately 25 pounds per year.

SECTION V: LEARNING THEORY
FOR THE MENTALLY RETARDED

Cognitive Learning

The mentally retarded offer some unique problems to the educator. Recently, educational research has attempted to delineate principles for teaching the retarded. Stein (104) has commented on this educational trend:

In ancient times, deviates of all types were destroyed. As society became more civilized, the handicapped were spared but segregated; many became wards of the state or were kept in institutions where a life in chains was not uncommon. Even a generation ago, little hope was offered the parents of a mentally retarded child, who was generally relegated to a solitary, sedentary and unproductive life hidden in an upstairs bedroom or placed behind bars in an institution. Today we can offer a great deal of encouragement and hope to the parents of a retarded child. It has been shown time after time that the retarded can be helped; they can be taught and they can become productive and contributing members of society (104:25).

Frankel et al (19) have listed six objectives for teaching the retarded:

1. To receive impressions and later translate these impressions into thought.
2. To act in response to these thoughts and impressions.
3. To make use of accidentally discovered facts.
4. To apply trial and error.
5. To think logically.
6. To draw feasible conclusions from logical thought.

According to Frankel, to obtain the above objectives, the following principles and practices should be employed:

1. A high level of stimulation must be provided. This should include the kind and variety of stimulation which will necessitate his responding to the situation.
2. Require that the children make decisions in many instances.
3. Provide many situations in which the child must differentiate, compare, and match various items.
4. Expose the child to events which will help him to perceive the effects his own actions have upon various events.
5. Increase the demands made on the child as improvement occurs.
6. Maintain an understanding, strict discipline. Gradual efforts should be made to encourage
self-discipline.

7. Give rewards freely and promptly for good performances only. Ordinarily, rewards in the form of verbal praise are sufficient.

8. Devise tasks which are appropriate to each child's mental and physical ability. This may require, at times, use of special aids, or again, starting a task at a simplified level.

9. Drill periods should be relatively short to avoid possible boredom.

10. Remember that successful experiences, even the smallest achievements, are more helpful to learning than failures.

Ebersole and Kephart (17) have stated that:

Teaching the brain-damaged child is a controlled, systematic procedure, guided by a knowledge of the stimulus-response process as well as by a knowledge of how the child neurologically interrelates his learning, as presented in the cell assembly theory (17:43).

Ebersole and Kephart suggest that teaching include, in order:

1. A comprehensive awareness of the child's abilities, so that the most favorable avenues of approach to learning may be employed.

2. Reinforcement and stabilization of learning,
using distributed practice.

3. The establishment of meaningful and useful thought processes by forming and relating cell assemblies.

Ebersole and Kephart explain that when teaching the retarded, a multi-sensory approach should be employed. When teaching through a multi-sensory strategy, determination of the most efficient sense avenue for the particular child is necessary. The principal presentation of information should be made through this sense, with the other sense avenues complementing it.

Meyers et al (28) have described learning as a stimulus-response phenomenon. A learner's response, according to Meyers, is or is not repeated depending on its consequences. Thus, if the response is one desired by parent and teacher, the learning situation must be structured to provide the right kind of consequence - a reinforcer. A consequence may be negative in the sense that its withdrawal increases the future occurrence of the desired response. Example: putting an end to the unpleasant effects of a misdeed may increase the probability of its recurrence. According to Meyers et al, the operant theorist secures desirable responses by:
1. Providing the right situational cues, thereby increasing the likelihood of correct responses.

2. By control over the consequences or contingencies of response - reinforcing desired ones, carefully not reinforcing the wrong or undesired ones.

Meyers et al feel that negative reinforces (punishment) should not be employed, but rather use positive reinforcers or withholding of positive reinforcers. To sum up the cognitive position regarding the education of the retarded, the following principles have been postulated by Meyers:

The teacher assumes a slowly-emerging cognitive power of mind which in the retarded is slower to grow than in the normal. The child must not be given lessons beyond his present understanding. Part skills, specific competencies, and many concrete examples may be given, but higher order abstractions will take time to achieve. Higher order command is the goal with all children and is consciously strived for, it is not expected to come easily with the retarded...Only that which is sufficiently concrete should be presented until such time as generalizations could be made. Finally, the teacher should use more examples in explaining a principle because the retarded learner will grasp concrete concepts. Since he has difficulty generalizing, it may be necessary to teach each necessary competency rather than to expect transfer from one learning (28:320).

Motor Learning Theory

Stein (104) commenting on the motor behavior of retarded youngsters stated:
Mentally retarded boys and girls do not play spontaneously or innovate as do normal children. They have to be taught to play, whether the play be individual, parallel, or group (104:27).

Stein went on to explain the philosophy of Physical Education for the retarded:

Undoubtedly the progress that has been shown by mentally retarded subjects who have participated in planned programs of physical education has occurred through the interplay of a complex of factors: achievement and success (for many it may be the first time they experience the satisfaction of even completing a task), improved confidence, better adjustment, feeling of importance because of the interest centered on them, increased competitive spirit, increased pride, improved physical condition, more perseverance, and increased desire to perform well. With retarded children, these factors have even greater significance than with the normal population.

Much of an individual's success today is determined by his ability to understand and manipulate verbal symbols. Because the retarded are nonverbal, many have known nothing but failure and frustration as they have wrestled with the abstractions of programs in which success is determined by academic ability. This condition manifests itself in poor learning, inadequate social adjustment, and delayed achievement. Programs and activities in which the retarded child can express himself in nonverbal but concrete, symbolic, and meaningful ways take on even greater meaning. Important contributions to emotional and psychological stability are made through the cathartic values of activity and movement (104:27).

Beter and Cragin (10) also studied learning theory for the mentally retarded. According to Beter and Cragin, studies in psychosomatic medicine are continuing to establish the fact that there is a biological integration which
renders mind and body inseparable. Learning, according to Beter and Cragin, is essentially a doing, ongoing process of making sense from what we touch, see, smell, hear, and taste. These senses, along with the kinesthetic sense, are channels of input information which the cognitive processes assimilate. The conceptualized data evolve and are represented in overt behavioral patterns. Beter and Cragin feel that it is through the kinesthetic sense that movement experiences can make a significant contribution toward helping the mentally retarded child find himself. Steinhaus (105) has also commented on the kinesthetic sense. Steinhaus feels that without the sensations that arise from activity in the muscles and joints, our "inner" world of concepts would be flat and completely unreal. Steinhaus feels that an integrated activity is a significant experience and the only place where the average individual still gets totally integrated experience, one in which the whole individual acts, thinks, and feels together is on the athletic field, playing field, or gymnasium.

Corder (124) studied the effects of physical education on intellectual development of EMR boys. An experimental group received a daily one-hour period of physical education which became progressively more demanding, for four weeks. The experimental group showed significant
gains over the control group on the full and verbal scales of the Wechsler Intelligence Scale for Children.

Oliver (80) studied institutionalized mentally retarded boys, age 12-15 in England. Subjects participated in a ten-week physical education program for three hours/day. The program involved individual remedial exercises, strengthening activities, and recreative team games. The control group participated in two periods of physical education per week. The experimental group improved significantly in all measures of athletic achievement, physical fitness, and strength. There were also measurable and significant changes in emotional stability, medical evaluation, and personality adjustment, and there were significant changes in the I.Q.'s of 25 percent of the experimental group. There were no I.Q. changes in the control group.

Alleman (122) reviewed existing literature dealing with the effects of massed and distributed practice on learning motor skills by the mentally retarded. Alleman concluded:

1. In normal population, distributed practice is generally superior to massed practice for learning and performance.
2. It was postulated that mentally retarded subjects would be handicapped by massed practice due to the slow rate in which neural pathways are laid down by dull organisms. However, research is divided in this area also. Latest research indicates that there is no support for the modified consolidation theory, and that there is little difference in the learning of mentally retarded under massed or distributed practice.

3. Normal subjects were found to develop more reactive inhibition from a massed practice schedule than from a distributed practice schedule. Results obtained in the majority of experiments conducted comparing normal and retarded subjects indicated that normals build up reactive inhibition at a faster rate than the retarded, and therefore the retarded would not be inhibited by massed practice.

Alleman also reviewed the literature on retention of verbal and motor skills. He concluded:

1. The research indicates that retardates are equal to normal I.Q. subjects on long term retention of verbal material and perceptual motor skills, when material tested is within the ability range
of the retarded subject.

2. The more meaningful the material, the better it is retained by both normals and retardates.

3. What is most efficiently learned is retained the longest.

4. Overlearning a skill provides better retention of that skill.

Summary: Learning Theory for the Mentally Retarded

The following cognitive learning principles have been suggested by the literature:

1. A high level of stimulation must be provided which will necessitate the retardate's response to the situation.

2. The retardate should be presented many situations which allow him to exercise his decision-making abilities.

3. Situations should be presented which allow the retardate to differentiate, compare, and match various items.

4. The retardate should be exposed to events which will help him to perceive causality, particularly to perceive the effects of his own actions upon various events.
5. Demands placed on the child must be increased as improvement occurs.

6. Rewards should be given freely and promptly for good performances. Ordinarily rewards in the form of verbal praise are sufficient.

7. Tasks should be devised which are appropriate to each child's mental and physical ability.

8. Drill periods should be relatively short to avoid possible boredom.

9. Successful experiences, even the smallest achievements are more helpful to learning than failures.

10. A determination of the most efficient sense avenue for each child is necessary. The principal presentation of information should be made through this sense, with the other sense avenues complementing it.

11. Desirable responses can be secured by providing the right situational cues, thereby increasing the likelihood of correct responses. Also control over the consequences or contingencies of response (reinforcing desired ones, carefully not reinforcing the wrong or undesired ones) will increase the likelihood of the correct response.
12. Concrete examples should be presented until such time as generalizations could be made.

The following motor learning principles have been suggested by the literature:

1. Overlearning a skill provides better retention of that skill.

2. The more meaningful the material, the better it is retained.

3. That which is most efficiently learned is retained the longest.

4. Distributed practice schedules are generally superior to massed practice schedules.

5. Mentally retarded children, unlike normals, need to be taught to play.

SECTION VI: THE PSYCHOLOGY OF OBESITY

Self Concept

In addition to the physical health hazards related to obesity (Section I), there are also potential psychological problems which accompany obesity. Monello and Mayer (74) found that obese girls perceived themselves as victims of intense prejudice, obsessive concern, passivity, and withdrawal when tested psychologically. Monello and Mayer suggest that treatment of the obese must be performed with
tact, and the patient must be known and followed carefully so as to make sure that the medical and cosmetic advantages of weight reduction are not counterbalanced by psychological trauma.

Stunkard and Mendelson (33) reported that of all the behavioral disturbances to which obese individuals are subject, only two are specifically related to their obesity: overeating, and disturbances in body image. Stunkard and Mendelson found that many, but not all, obese individuals have disturbances in their body image. These individuals may possess the following characteristics:

1. Views of the self. Many refuse to look in the mirror.

2. Self-consciousness in general. It sometimes seems that obese people feel that nothing happens to them except in relationship to their weight. Many obese people feel that when derogatory things happen to them, it is because of their excess weight.

3. Self-consciousness in relation to opposite sex. Almost all subjects with body image disturbances had serious difficulties with the opposite sex. These difficulties seemed to result from a self-consciousness about how others viewed their
obesity. The disturbances ranged from avoidance and inhibitions to hateful devaluation of the opposite sex. These disturbances occurred almost exclusively among persons who became obese during childhood or adolescence. Stunkard and Mendelson went on to explain that brain-damaged individuals view their obesity in a different manner than non-brain-damaged individuals:

1. They have preoccupations with obesity. He sees the world in terms of his weight.
2. He may divide society up into persons of differing weights, and his orientation toward others may be largely in terms of this division. He envies persons thinner than himself, and feels contempt for those who are fatter.

Stunkard and Mendelson listed three factors which predispose an obese individual to development of disturbed body image:

1. Onset of obesity prior to adult life.
2. Presence of neurotic behavior patterns.
3. Censure by significant family members.

Caskey (46) reported that as early as five years old, children show a strong preference for the ectomorphic and mesomorphic body types and a strong aversion for the
endomorphic type, regardless of the child's own body type. When asked to describe silhouettes of the three body types, students assigned only socially positive adjectives to the mesomorphic image. The endomorphic body image was assigned only adjectives with socially negative connotations.

Regardless the psychological problems related to obesity, Mayer (70) has concluded:

If there is one disease condition where an ounce of prevention is worth a pound of cure, it is obesity. It has been shown repeatedly that on a statistical basis, treatment of obesity is not very successful. This may be in part because obesity sets up a psychologic chain of events which tends to make the condition self-perpetuating; i.e., obsessive concern with weight leads to passivity, expectation of rejection, greater inactivity, etc. Recent work from my laboratory also suggests that when a subject has once been obese some irreversible psychologic changes occur which may make the regaining of weight more "efficient" than the first weight gain. The realization of the susceptibility to obesity of obese patients' close relatives should provide the pediatrician or school physician with a rationale for early institution of an adequate regimen of dietary instructions and exercise for likely candidates for overweight (70:A108).

Motivation and Behavior Modification

Oxendine (29) presented the philosophy of traditional motivation techniques. Oxendine catalogued rewards into external and internal. External rewards are composed of symbolic rewards (praise, certificates, etc.) and material rewards (money, gifts, etc.). Internal rewards, according
to Oxendine are psychological in nature: they give the individual a feeling of adequacy and a good self concept. Oxendine stated that rewards should:

1. Be found within the activity - not separate or unrelated to it.
2. The reward should lead the winner to further activity in the same line of endeavor.
3. The reward should produce no consequences in the individual winner which are unacceptable socially.
4. The reward should not serve as the principal incentive: the incentive should come from the satisfactions within the activity.

Oxendine listed some facts regarding the use of punishment as a motivator:

1. Punishment is effective with some children.
2. Punishment can lose its effect.
3. Punishment may create fear in the mind of the learner.
4. Punishment may be humiliating and reinforce inadequacy.
5. Some students respond to reproof better than praise.
6. The drawback to punishment is the inability to establish an equal punishment for all students.
Dobson (15:64) explained the Law of Reinforcement. Simply stated, the Law of Reinforcement is: "Behavior which achieves desirable consequences will recur." Dobson presented three principles of the Law of Reinforcement:

1. If maximum effectiveness is to be obtained from a reward, it should be offered shortly after the desirable behavior has occurred - most children have neither the mental capacity nor the maturity to hold a long range goal in mind day after day.

2. Rewards need not be material in nature - anything that is considered desirable to an individual can serve as reinforcement for his behavior.

Dobson has elaborated on this point by stating:

Too often our parental instruction consists of a million "do not's" which are jammed down the child's throat. We should spend more time rewarding him for the behavior we do admire, even if our "reward" is nothing more than a sincere compliment (15:77).

Dobson also stated that it is unwise to compliment a child for behavior which is not admirable.

Also, specific behavior warranting genuine compliments can be found if it is sought, even in the most mischievous child.

3. Any behavior which is learned through reinforcement can be eliminated if the reward is withheld
long enough. This is called extinction. In order to eliminate an undesirable behavior, one must identify and then withhold the critical reinforcement.

According to Dobson, many adults view rewards as bribery. Dobson points out that our entire society is based on a system of reinforcement, yet we do not want to apply it where it is most needed: with young children. Dobson stated:

As adults we go to work each day and receive a pay check on Friday. Getting out of bed each morning is rewarded regularly. Medals are given to brave soldiers; plaques are awarded to successful businessmen; watches are presented to retiring employees. Rewards make responsible effort worthwhile (15:77).

Dobson went on to explain that a teacher/parent must give a child maximum reason to comply with your wishes. Dobson suggests:

1. Decide what is important to the youngster to use as a motivator (money, toys, bicycle, trips, etc).
2. Formalize the agreement. A contract can be written and both the parent and the child sign it.

Zigler (36) commented on reinforcer hierarchy and incentives applied to the mentally retarded. According to Zigler, the retarded are motivated by various types of incentives. Research indicates that retardates have an
extremely high motivation for attention, praise, and encouragement. In normal development, the effectiveness of attention and praise as reinforcers diminished with maturity, and is replaced by the reinforcement in the information that one is correct.

Using Skinnerian stimulus-response techniques described by Dobson, Ferster et al (53) devised a very extensive program for weight reducing. This program received little attention until the late 1960s.

Until recently, reports in medical literature agree that no more than 25 percent of obese persons entering treatment will lose as much as twenty pounds, and only 5 percent will lose as much as forty pounds. In 1967 Stuart (107) reported that 80 percent of patients who entered treatment using behavior modification techniques lost more than twenty pounds, and 30 percent lost more than forty pounds. This was the best results of out-patient treatment for obesity yet reported.

Penick et al (82) conducted research at the University of Pennsylvania. Their study compared a group using behavior modification techniques to (1) a group using traditional group therapy techniques and (2) to average medical literature. The weight loss of the behavior modification group exceeded that of the traditional therapy group:
13 percent lost more than forty pounds, 53 percent lost more than twenty pounds. These results rank with the best reports in the medical literature. The behavior modification program consisted of four principles:

1. Description of the behavior to be controlled. The patients kept daily records of the amount, time, and circumstances of their eating. These records increased the subject's awareness of how much he ate, and the large variety of environmental and psychologic situations associated with eating. For example, after two weeks of record keeping a 30-year old housewife reported that for the first time she recognized that anger stimulated her eating.

2. Modification and control of the discriminatory stimuli governing eating. Most of the patients reported that their eating occurred in a wide variety of places and at many different times during the day. They were accordingly encouraged to confine their eating, including snacking, to one place. In order not to disrupt domestic routines, this place was usually in the dining room. Further efforts to control the discriminatory stimuli included the use of a distinctive
table setting, including an unusually colored place mat and napkin. Patients were encouraged to make eating a pure experience unaccompanied by any other activity, particularly reading, watching television, or arguing with the family.

3. Development of techniques which control the act of eating. Techniques were developed to help patients decrease the speed of their eating, to become aware of various components of the eating process, and to gain control over these components. Counting each mouthful of food eaten during a meal, and placing utensils on the plate after every third mouthful until the mouthful was chewed and swallowed were methods used to gain control over components of the eating process. The patients were taught to eat more slowly, because the investigators felt that obese persons eat more rapidly than others. Because it takes about twenty minutes for the signal of satiety to travel to the brain, they consume much more than required to give the sensation of fullness.

4. Prompt reinforcement of behaviors which delay or control eating. A reinforcement schedule
utilizing a point system, was devised for control of eating behavior. Exercise of the suggested control procedures during a meal earned a certain amount of points; devising an alternative to eating in the face of strong temptation earned double this number of points. Points could be converted into money.

The program also consisted of negative reinforcement. Doctoring favorite snack foods with castor oil was one method of negatively reinforcing eating. Also failure to exercise control result in a loss of points.

Stunkard and Mahoney (108) commented on the use of behavior modification techniques. They reported:

We still do not know the potential of this improvement (behavior modification) in terms of initial weight loss and weight maintained. But 12 controlled studies carried out within the past 5 years all reported results favoring behavior modification over a variety of other treatment methods - an unprecedented example of unanimity among researchers working on this complex and heterogeneous disorder (108:45).

Stunkard and Mahoney state that the behavior modification approach postulates that some of the most divergent types of behavior disorder are learned responses, and that modern learning theories have much to teach us about the acquisition and extinction of such responses. Environmental factors largely control the food intake of the obese.
This helps to explain the inability of routine medical management to effectively treat the obesity syndrome. Because traditional weight reduction programs fail to teach control of environmental eating cues, they leave the individual unable to cope with his peculiar vulnerability to such cues. By emphasizing specific training in "stimulus control," behavior modification helps him to manage the environmental determinants of his eating. Stunkard and Mahoney listed principles regarding incentives:

1. A behavior which takes effort is seldom developed or maintained without powerful incentives - rewards or punishments.

2. Rewards are generally more effective than punishment.

3. Rewards such as improved health, social approval, and physical attractiveness should be enough to maintain the patient's efforts at self-control. However, when weight loss is achieved by altering eating patterns, through behavior modification, rather than through the usual drastic dietary changes, weight is lost relatively slow (1 lb./week). Therefore, the rewards of such gradual loss are often too delayed to effect continued adherence to the program.
Group pressure and the therapist's approval seem to be two effective methods. However, there is the danger that improvement induced by the influence of the group or the therapist may be reversed when these sources of motivation are no longer available.

Self reward (awarding oneself gift certificates, etc.) is more effective than punishment (for failure to lose weight, patients fined themselves).

Patients who rewarded themselves to special privileges or purchases for having attained weekly weight loss goals were less successful in their long-term weight reduction than patients whose rewards were tied to improvements in their eating habits.

Levitz and Stunkard (68) conducted a study using TOPS (Take Off Pounds Sensibly) groups for subjects. Some groups used behavior modification techniques, and some used nutrition education procedures. During three months of active treatment, fewer TOPS members dropped out of the behavior modification group than out of the nutrition education and control groups.
Schacter (93) reviewed the literature on effects of taste on the consumption of food. He found that both obese rats and humans ate more food than their normal controls when the food tasted good, but less food than their normal controls when the food tasted badly.

Foxx (54) reported that social reinforcement was used to motivate a fourteen year old mildly retarded girl to lose weight. The experiment showed that social reinforcement is a valuable tool to use in motivating individuals to lose weight.

Summary: The Psychology of Obesity

1. Treatment of the obese must be performed with tact, and the patient must be known and followed carefully so as to make sure that the medical and cosmetic advantages of weight reduction are not counterbalanced by psychological trauma.

2. Disturbances in an individual's self concept may result in the obese.

3. Factors which predispose an obese individual to development of a disturbed body image include:
   a. Onset of obesity prior to adult life.
   b. Presence of neurotic behavior patterns.
   c. Censure by significant family members.
4. It has been shown repeatedly that on a statistical basis, treatment of obesity is not very successful. This may be in part because obesity sets up a psychological chain of events which tends to make the condition self-perpetuating.

The following principles apply to motivation and behavior modification:

5. When using rewards, the following points should be considered:
   a. Rewards should be found within the activity, not separate or unrelated to it.
   b. Rewards should lead the winner to further activity in the same line of endeavor.
   c. Rewards should produce no consequences in the individual which are unacceptable socially.
   d. The reward should not serve as the principal incentive: the incentive should come from the satisfactions within the activity.

6. The Law of Reinforcement states: "Behavior which achieves desirable consequences will recur."

7. The following principles should be employed when using reinforcement:
a. A reward should be given shortly after a desirable behavior has occurred.

b. Rewards need not be material in nature - anything that is considered desirable to an individual can serve as a reward for his behavior.

c. Any behavior which is learned through reinforcement can be eliminated if the reward is withheld long enough.

8. Attention, praise, and encouragement serve as primary reinforcers for the retarded.

9. Behavior modification has been applied successfully in weight reduction programs. The following four principles have been proven successful:

   a. Identification and description of the behavior to be modified.

   b. Modification and control of the discriminatory stimuli governing eating.

   c. Development of techniques which control the act of eating.

   d. Prompt reinforcement of behaviors which delay or control eating.
SECTION VII: EXISTING PROGRAMS FOR THE OBESE

School Programs

A review of the literature suggests that few programs have been developed to deal with the obese in an educational setting. Christakis et al (47) studied ninety obese freshman boys who were divided into an experimental and control group. The groups were observed for eighteen months. The control group participated in normal physical education. The experimental group participated in normal physical education, and in addition received instruction in nutrition, and body building. The experimental group also participated in a special basketball league. The obese boys in the experimental group gained an average of 5.8 pounds, while the boys in the control group gained an average of 13.5 pounds. Christakis concluded that a combined program of nutrition education and physical fitness is a feasible and practical method to curtail prevalence and degree of obesity in high school boys.

Mody et al (75) studied eleven obese college girls who participated in a ten-week program. The girls were tested on a treadmill, and from the energy expenditure data received, the individuals were given exercise programs equal to 500 kilocalories per day. Five tracks were
formulated for each subject. These tracks ranged from 50 percent of the distance walked at 3 mph and 50 percent run at 4 mph, to 100 percent run at 5 mph. Students selected the particular track they desired each day. The subjects were also given brief instructions in nutrition and energy balance, but were told not to limit their intake. There was an average decrease in mean thickness of skinfold measures, and significant changes in body composition occurred.

Stuart (107) suggested that a three-part program be utilized for individuals to lose weight. The program should include:

1. Environmental control of overeating.
3. Regulated increase in energy expenditure.

Rohrbacker (89) studied subjects 8-18 years old involved in an eight-week camp program. The program consisted of four aspects:

1. Physical activity.
2. Nutrition re-education.
3. Social activities.
4. Informal environment.

The subjects consumed between 1200-1400 kilocalories/day. The subjects lost an average of thirty-three pounds in the
eight-week period. Rohrbacker concluded that the special camp program affected the long-term linear trend of weight gain of the subjects.

Roby and Reuter (88) suggested six steps for the initiation of a weight control program. Those steps are:

1. Contact School Health Officials - present them with an outline of the course. Have the officials give a physical examination to each student. The officials will also act as a consultant in the program.

2. Enrollment - Instructors will screen their classes for overweight students. The candidates are then interviewed to determine their need and motivation for losing weight. The classes should not exceed twenty students per class.

3. First week of class - Weight and body composition data of the students are recorded. Pictures of the students are taken. Students record their food intake for several days. Students are instructed in nutrition concepts. Suggested diets are presented.

4. Exercise programs - The exercise programs are intended to increase the caloric expenditure, and improve physical fitness of the students.
Endurance running, calisthenic exercises, weight training (low resistance and high number of repetitions), and other activities are included. Exercise should be moderate for the first few weeks.

5. Teach - the role of exercise in weight control is explained. Proper nutrition, and the hazards of obesity are presented.

6. Motivation - movies, girth and skinfold measures taken every 5-6 weeks, periodic talks by a physician, photographs, motor fitness testing, and weekly weight checks can serve as motivating procedures.

Piscopo (84) listed four steps which he felt should be employed in a weight reducing program. Those steps are:

1. Identification of the obese.
3. Specific exercise plans.

Seltzer and Mayer (94) reported that a weight reducing program should be voluntary in nature, and should include:

1. Increased daily physical activity - An enjoyable activity should always be included during the
period. Subjects should be encouraged to remain active during weekends and vacations by pursuing those sports which were of interest to them.

2. Nutrition Education - Information presented with respect to good daily food habits, functions, and sources, as well as daily requirements of essential food nutrients, energy metabolism, etc., will be of benefit. No attempt should be made to place the obese children on programs of reduced caloric diets (growing youngsters need proper daily nutrition). Material should also be presented to parents. Visual aids, wax food models, pamphlets, booklets on good nutrition, posters, films, etc. could be of great value.

3. Psychological support - Encouragement and motivation are integral parts of a successful program. All members of staff, and parents should help to motivate the child.

Summary: Existing Programs for the Obese

1. A weight reducing program should include:

   a. Environmental control of overeating.

   b. Nutrition planning.

   c. Regulated increase in physical activity.
2. The importance of exercise should be taught to students engaged in a weight reducing program.

3. The school health personnel should be contacted, and presented with an outline of the course. The officials should act as consultants in the program.
CHAPTER III

A WEIGHT REDUCING CURRICULUM

The purpose of this study, as stated in Chapter I, is (1) to develop guidelines for a weight reducing curriculum for the trainable mentally retarded, and (2) to provide a sampling of instructional materials and procedures which can be employed in a weight reducing program.

In Chapter II, a comprehensive review of the literature relating to obesity and mental retardation was presented. Using an analogy from learning theory, Chapter II is the "input" chapter. Chapter III represents an attempt to process the input, extract principles and generalizations, and synthesize these data into a curriculum. Chapter III satisfies the first purpose of this study, and is the "processing" or "thruput" chapter. The tangible materials, or "output," are presented in the appendices, thereby satisfying the second purpose of this study.

Objectives of the Curriculum

The review of the literature in Chapter II presented an array of opinions regarding the etiology, and treatment
of obesity; however, several themes were present throughout the literature with sufficient frequency to be considered in this curriculum development. Those four themes are:

1. In order to increase caloric expenditure, an exercise program should be an integral part of a weight reducing curriculum.


3. Control of overeating is essential.

4. The obese student must be motivated to engage in and maintain a weight reducing program.

These four themes represent the objectives of this weight reducing curriculum. Below, the themes are stated as objectives:

1. The student will engage in daily exercise which will increase caloric expenditure.

2. The student will engage in nutrition education which will provide for the acquisition of concepts regarding proper nutrition.

3. The student will control the overeating process.

4. The student will be motivated to engage in, and maintain a weight reducing program.

Figure 2 shows the objectives and goals of this curriculum, and the rationale for the selection of those
objectives and goals. Following Figure 2 are the principles and guidelines which should be adhered to in order to obtain the objectives.

**Objective I: Daily Exercise**

An increased caloric expenditure is fundamental to weight reduction. By increasing the student's caloric expenditure through exercise, a weight loss will ensue. It is therefore essential that the student's tolerance for exercise (working capacity) be increased. In order to increase working capacity, the following principles should be followed:

1. The student should engage in daily physical activity.
2. Interval training where the load is changed every two and one-half minutes is most effective for improving maximum working capacity.
3. During these two and one-half minute intervals of tachycardia (increased heart rate), a heart rate equal to about 60 percent of the difference between resting and maximum heart rate is needed.
4. High exercise intensities yield optimal training benefits when combined with moderate exercise durations.
### Figure 2

**Rationale for Selection of Objectives and Goals**

<table>
<thead>
<tr>
<th>Objective/Goal</th>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Objective I:</strong> Daily exercise and improved physical fitness</td>
<td>-To increase caloric expenditure</td>
</tr>
<tr>
<td>Goal I: Improved physical fitness</td>
<td>-To increase tolerance for exercise and therefore facilitate caloric expenditure</td>
</tr>
<tr>
<td>Goal II: Development of recreational skills</td>
<td>-To provide skills so student may participate in enjoyable daily exercise</td>
</tr>
<tr>
<td><strong>Objective II:</strong> Nutrition Education</td>
<td></td>
</tr>
<tr>
<td>Goal I: Understand nutrition concepts</td>
<td>-To provide essential knowledge so that the student is able to discriminate between the values of various foods</td>
</tr>
<tr>
<td>Goal II: Understand the relationship between caloric intake, physical activity, and weight reduction</td>
<td>-To provide the student with knowledge to enable him to understand the need for exercise</td>
</tr>
<tr>
<td><strong>Objective III:</strong> Control Overeating</td>
<td></td>
</tr>
<tr>
<td>Goal I: Keep records of students eating behavior</td>
<td>-To control caloric intake</td>
</tr>
<tr>
<td>Goal II: Elimination of environmental stimuli associated with eating</td>
<td>-To determine environmental stimuli associated with eating</td>
</tr>
<tr>
<td>Goal III: Control the act of eating</td>
<td>-To control overeating</td>
</tr>
<tr>
<td>Goal IV: Development of reinforcement schedule</td>
<td>-To eliminate excessive caloric intake</td>
</tr>
<tr>
<td><strong>Objective IV:</strong> Motivate student to lose weight</td>
<td></td>
</tr>
<tr>
<td>Goal I: Offer rewards shortly after desirable behavior has occurred</td>
<td>-To modify undesirable eating behaviors</td>
</tr>
<tr>
<td>Goal II: Extinguish undesirable behaviors</td>
<td>-To decrease caloric intake</td>
</tr>
</tbody>
</table>
5. Exercise should be of the endurance type.

6. The exercise should allow for gradual progression from low levels to higher levels of energy expenditure.

7. Participants should be protected from injury to bony and connective tissue in the early stages. Static stretching exercises should be employed.

8. Exercise must be vigorous enough to result in increased body heat evidenced by sweating.

9. Intensity of the exercise should be as high as possible, and last for at least thirty minutes. Maximal energy output cannot be obtained if the musculature is quickly exhausted by a few quick maximal repetitions.

10. Soreness should be prevented or relieved.

In order to maintain a daily exercise program, a minimum level of fitness is needed. Once the student reaches a point where he can exercise without stressing his musculo-skeletal or cardiovascular/pulmonary systems, the program should be built around activities that are enjoyable and thus self-motivating.

Students and parents should meet with the physical education teacher to discuss the student's extra-curricular physical activities. They should decide on the activities
the students wish to pursue; the teacher can then teach
the activity and the parents can reinforce the instruction
at home.

When teaching activities which the student will pursue
recreationally, the following principles should be em-
ploved:

1. The retarded must be taught to play, they do not
   play spontaneously, as do normal children.
2. Teaching should be success orientated.
3. In order to provide success orientated instruc-
tion, a skill should be broken down into parts,
and each part should be over-learned before moving
on to the next part. This way the student will be
successful learning each simple part.
4. Practice periods should not be so long as to be-
come boring for the student. By breaking the
skill into parts, a part can be taught and
learned in one session. The next day that part
can be reviewed, along with previously learned
parts, and then a new part can be taught.
5. Positive reinforcement should be utilized fre-
ey.
6. Teaching should be multi-sensory. Example: tell
   student, show student, have student feel the
teacher's body parts as he (the teacher) performs
7. Care should be taken so that the student performs the skill properly, so that a proper kinesthetic feel will develop.

8. Motivation will facilitate learning. The skill being taught should be meaningful to the student. If the student is not motivated to learn, the experience will be frustrating for both the student and the teacher.

Objective II. Nutrition Education

The literature also presented a unanimity of thought regarding nutrition education for the obese. By understanding the mechanics of weight gain and weight loss, the principles of proper food selection, and the mechanics of food preparation, the student will approach the goal of independence and self-sufficiency regarding caloric intake.

Some, but not all, retarded students can profit from instruction in nutrition education. Nutrition concepts should be taught to those who have the potential to benefit from such instruction. The home economics class provides an excellent environment for nutrition education; however, the physical education or health education class can also initiate nutrition instruction.
The "Framework for Health Instruction in California Public Schools" listed four major concepts that should be taught in a Nutrition Unit (11). Those major concepts are:

1. Nutrition is important in the everyday functioning of an individual.

2. Individuals throughout life require the same nutrients, but in varying amounts.

3. Food processing and preparation influence the nutritional value and safety of foods.

4. Dietary fads and misconceptions can be detrimental to health.

These concepts are expanded in the appendix.

The literature revealed several principles to be followed when teaching the retarded cognitive subject matter. The following are principles elicited from the review of the literature in Chapter II:

1. A multi-sensory approach should be employed. A determination of the most efficient sense avenue for the particular child is necessary: the principle presentation of information should be made through this sense, with the other sense avenues complementing it.

2. Desirable responses can be secured by:
a. Providing the right situational cues, thereby increasing the likelihood of correct responses.

b. Reinforcing desired responses, and carefully not reinforcing wrong or undesired ones.

3. Learning experiences should be success orientated.

4. Examples should be concrete (pictures, models, etc.).

5. Drill periods should be relatively short to avoid boredom.

6. Rewards should be given freely. Usually verbal praise is sufficient.

7. Students should be allowed to make decisions.

8. Learning should proceed from the simple to the complex. The simple concepts should be over-learned before proceeding on to more complex concepts.

9. Since the retarded have difficulty making a transfer from one learning experience to another, each desired concept should be taught using the principles above. It should not be expected that the student will make the transfer from one experience to another.
Objective III: The Control of Overeating

The control of overeating is perhaps the single most important objective of this curriculum. A student may understand nutrition concepts, and he may exercise daily, but those factors are merely academic if he continues to overeat. The literature is replete with methodology to control the act of eating; however, few programs have been proven successful in retention of weight loss.

The behavior modification techniques described in Chapter II represent the best results of outpatient treatment for obesity yet reported. The behavior modification procedure postulates that overeating is a learned response to environmental stimuli, and that those responses can be systematically extinguished.

When utilizing the behavior modification approach, it is essential that eating behaviors be modified, and proper behaviors rewarded. Rewards should not be given for weight loss because the reinforcement will not be prompt; however, rewarding eating behavior can provide for prompt reinforcement.

In order to control an individual's food intake, the following behavior modification techniques are suggested:

1. Parents should keep records of the child's eating, including time, amount, place, and circumstances
of eating. These records will indicate what environmental stimuli (if any) are associated with the act of eating.

2. Students should eat in the same place each day, without environmental stimuli associated with other activities (i.e. no T.V., no radio, no toys, no arguments, etc.). A distinctive table setting, including an unusually colored place mat and napkin is desirable.

3. Techniques should be developed and employed which control the act of eating. Examples are counting each bite of food, or placing utensils on the plate after every third mouthful until the mouthful is completely swallowed.

4. A reinforcement schedule utilizing a point system should be devised. Points can be given for exercise of the suggested control procedures during meals, or for not eating when tempted, or for daily exercise, etc. Points can be converted into rewards weekly.

**Objective IV: Motivation**

Achievement of the first three objectives is directly related to an individual's motivation to lose weight. An
absence of motivation will impede the weight reduction process. Likewise, the presence of motivation will greatly enhance the process.

When an obese individual enters into a weight reducing program, it is essential that the teacher identify the student's motive to lose weight. When a student does not wish to engage in the weight reducing program, the teacher should present the various reasons why a weight loss would be prudent: cosmetic, health, and social reasons are probably the three most common motives for weight reduction.

Behavior modification techniques can be of great value in the weight reducing curriculum. When utilizing rewards and behavior modification, the following principles are suggested:

1. If maximum effectiveness is to be obtained from a reward, it should be offered shortly after the desirable behavior has occurred.

2. Rewards need not be material in nature. Anything that is considered desirable to an individual can serve as reinforcement for his behavior.

3. A behavior can be extinguished if the reward is withheld long enough. Note: The reinforcement must first be identified.
4. Give the child maximum reason to comply with your wishes. Decide what is important to the youngster as a motivator, and use that as a reward (money, toys, trips, etc.).

Evaluation of Curriculum Objectives

In Chapter I, seven steps were listed for curriculum development. The last step in the curriculum development, according to Taba (34), is a determination of what to evaluate, and the ways and means of doing it. In order to determine the effectiveness of this curriculum, the four objectives of the curriculum need to be evaluated. Below are principles for evaluation. More detailed information regarding evaluation procedures is presented in the appendices.

1. Since this curriculum is designed to reduce adiposity, a measurement of percent body fat should be made so that changes in body composition are identifiable. A system of measurement using anthropometric measurements is desirable. The literature indicates that percent body fat measures should be taken periodically, (approximately every five weeks).

2. Physical Fitness assessments should be conducted
periodically (approximately every ten weeks). Muscular and cardiovascular endurance, power, flexibility, and strength should be measured. These tests will indicate the degree of improvement (if any) in an individual's work efficiency. These tests can also serve as a motivational tool.

3. The student's knowledge of nutrition concepts should be evaluated prior to, and after exposure to the curriculum. This evaluation will indicate the effectiveness of nutrition instruction, and could be of great value to the teacher.

4. Evaluation of the relative effectiveness of controlling the eating process is essential. Communication with the parents is needed for an accurate evaluation. This evaluation should be quite frequent (two or more times per week), and will aid the teacher and parents in program planning.

Figure 3 presents the four objectives of the curriculum and the goals under each objective. Suggested learning experiences, and suggested evaluation procedures, are also presented.
FIGURE 3: OBJECTIVES OF CURRICULUM

OBJECTIVE I: DAILY EXERCISE AND IMPROVED PHYSICAL FITNESS

<table>
<thead>
<tr>
<th>Suggested Goals</th>
<th>Suggested Learning Experience</th>
<th>Suggested Evaluation Procedures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goal I: Improved Physical Fitness</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A. Improved Strength</td>
<td>*Strength may be improved by working against resistance. Resistance can be provided by working with partners, weights, bars, dumbbells, medicine balls, apparatus, logs, ropes, or other kinds of weighted objects: as well as stationary.</td>
<td>*Bent Arm Hang Leg Lift</td>
</tr>
<tr>
<td>B. Improved Power</td>
<td>*Power is developed in activities of an explosive nature where force is generated and released at a specified moment. Jumping, certain types of throwing activities, and activities designed for quick, forceful movements encourage the development of power.</td>
<td>*Standing Long Jump</td>
</tr>
<tr>
<td>C. Improved Agility</td>
<td>*Agility is developed by activities in which the body must be maneuvered in space. Twisting, turning, side-stepping and sudden starting and stopping are dependent upon agility.</td>
<td>*Shuttle Run</td>
</tr>
</tbody>
</table>

*More detailed information included in appendices
FIGURE 3 (Continued)

<table>
<thead>
<tr>
<th>Suggested Goals</th>
<th>Suggested Learning Experience</th>
<th>Suggested Evaluation Procedures</th>
</tr>
</thead>
<tbody>
<tr>
<td>D. Flexibility</td>
<td>*Flexibility is developed in activities that provide for maximum range of movement in any given point. Stretching, swinging, swaying and other similar body movements promote flexibility.</td>
<td>*Modified Sit and Reach Test</td>
</tr>
<tr>
<td>E. Improved Endurance</td>
<td>*Muscular endurance is closely related to strength. Almost all activities which develop strength can be adjusted to promote endurance. A maximum number of repetitions against a fixed resistance is one of the best ways to develop muscular strength.</td>
<td>*Bent Leg Sit-Ups/min.</td>
</tr>
</tbody>
</table>

*More detailed information included in appendices*
<table>
<thead>
<tr>
<th>Suggested Goals</th>
<th>Suggested Learning Experience</th>
<th>Suggested Evaluation Procedures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goal II: Development of Recreational Skills</td>
<td>*Activities which the student wishes to pursue, and which will increase caloric expenditure should be taught. Activities should be decided upon in conjunction with parents. Age and ability level should be taken into consideration when deciding on activities.</td>
<td>Tests which will measure each specific skill. Subjective Evaluation</td>
</tr>
</tbody>
</table>

*More detailed information included in appendices*
**OBJECTIVE II: NUTRITION EDUCATION**

<table>
<thead>
<tr>
<th>Suggested Goals</th>
<th>Suggested Learning Experiences</th>
<th>Suggested Evaluation Procedures</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Goal I:</strong> Understand the following Nutrition Concepts:</td>
<td><em>A multi-sensory approach utilizing pictures, models, real food, lectures, films, trips, and projects.</em></td>
<td><em>Pre-test - Post-test</em></td>
</tr>
<tr>
<td>A. Nutrition is the food you eat and how the body uses it.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B. Food is made up of different nutrients needed for growth and health.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C. All persons, throughout life, have need for the same nutrients, but in varying amounts.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D. The way food is handled influences the amount of nutrients in food, its safety, appearance, and taste.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
FIGURE 3 (Continued)

<table>
<thead>
<tr>
<th>Suggested Goals</th>
<th>Suggested Learning Experiences</th>
<th>Suggested Evaluation Procedures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goal II: Understand the relationship between caloric intake, physical exercise and weight reduction.</td>
<td>*A multi-sensory approach utilizing pictures, models, real food, lectures, films, trips, and projects.</td>
<td>*Pre-test - Post-test</td>
</tr>
</tbody>
</table>

A. An increase or decrease in food intake will cause a corresponding change in weight.

B. Increased physical exercise will increase caloric expenditure, and a corresponding change in weight will ensue.

*More detailed information included in appendices
FIGURE 3 (Continued)

OBJECTIVE III: CONTROL O V E R E A T I N G

<table>
<thead>
<tr>
<th>Suggested Goals</th>
<th>Suggested Learning Experiences</th>
<th>Suggested Evaluation Procedures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goal I: Parents and teachers will keep records of</td>
<td>*Records should include time of eating, amount, place, and circumstances of eating. These records</td>
<td>Subjective Evaluation</td>
</tr>
<tr>
<td>the student's eating behaviors.</td>
<td>can be used in conjunction with nutrition education.</td>
<td>See Goal IV.</td>
</tr>
<tr>
<td>Goal II: Elimination of environmental stimuli</td>
<td>*Students should eat in the same place each day, without excessive stimuli (radio, T.V., toys,</td>
<td>Subjective Evaluation</td>
</tr>
<tr>
<td>associated with eating.</td>
<td>etc.). A distinctive table setting is advisable.</td>
<td>See Goal IV.</td>
</tr>
<tr>
<td>Goal III: Employment of techniques which control</td>
<td>*Counting each bite of food, placing utensils in place periodically, etc.</td>
<td>Subjective Evaluation</td>
</tr>
<tr>
<td>the act of eating.</td>
<td></td>
<td>See Goal IV.</td>
</tr>
<tr>
<td>Goal IV: Development of reinforcement schedule.</td>
<td>*A reinforcement schedule utilizing a point system should be devised. Points can be given for</td>
<td>Subjective Evaluation</td>
</tr>
<tr>
<td></td>
<td>exercise of suggested control procedures, daily exercise, for not eating when tempted, etc.</td>
<td>See Goal IV.</td>
</tr>
</tbody>
</table>

*More detailed information included in appendices
## FIGURE 3 (Continued)

### OBJECTIVE IV: MOTIVATION

<table>
<thead>
<tr>
<th>Suggested Goals</th>
<th>Suggested Learning Experiences</th>
<th>Suggested Evaluation Procedures</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Goal I:</strong> Rewards offered shortly after the desirable behavior has occurred.</td>
<td><em>A reinforcement schedule utilizing a point system.</em></td>
<td>Procedure has intrinsic evaluation characteristics.</td>
</tr>
<tr>
<td><strong>Goal II:</strong> Extinguish undesirable behaviors.</td>
<td><em>Identify reward for the undesirable behavior, and withhold the reward.</em> A reinforcement schedule in conjunction with that of Goal 1 is helpful.</td>
<td>Subjective Evaluation</td>
</tr>
</tbody>
</table>

*More detailed information included in appendices*
Organization and Implementation

Many existing school services and programs can be incorporated into the weight reducing curriculum, thus creating an interdisciplinary approach. Figure 4 shows how various school personnel can be employed.

The literature revealed that childhood obesity is one of the factors which determines adult obesity. Therefore, it is essential that obesity be identified early, and treatment started immediately. Periodic screening by teachers and school health services will expedite the identification and referral processes.

Prior to a student's engagement in a weight reducing program, he will need a physical examination and a health clearance. The health clearance should state any activities which may be contraindicated.

The objectives of the curriculum should be obtained through articulation with other programs, as previously mentioned. However, the curriculum could conceivably be presented by one teacher. Regardless of the manner of implementation, the parents should play an integral part in the weight reducing strategy, and communication with the parents to explain the curriculum is of the utmost
importance. The parents could be employed in order to achieve and/or reinforce all four objectives.
## FIGURE 4

**EMPLOYMENT OF SCHOOL SERVICES AND PROGRAMS IN WEIGHT REDUCING CURRICULUM**

<table>
<thead>
<tr>
<th>Food</th>
<th>Prevention</th>
<th>Screening and Referral</th>
<th>Selection and Preparation</th>
<th>Daily Exercise</th>
<th>Nutrition Education</th>
<th>Control of Eating</th>
<th>Motivation</th>
</tr>
</thead>
<tbody>
<tr>
<td>School Nurse and Physician</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Home Economics Teacher</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>School Psychologist and/or counselor</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Cafeteria Staff</td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Physical Education Teacher</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Entire Faculty</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Parents</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>
CHAPTER IV

SUMMARY AND RECOMMENDATIONS

Summary

The principles presented in Chapter III are well supported by the review of the literature. The weight reducing curriculum presented in Chapter III is a generalized framework; the specific lesson plans, evaluation tools, etc., can change as new techniques and procedures are developed. Additionally, the teacher's philosophy, experiences, and personality will dictate how he conceptualizes the specifics of the curriculum. This writer's conceptualizations of the specifics are presented in the appendices.

Recommendations

Prior to the development of a comprehensive teaching guide, the effectiveness of the fundamental principles should be tested. A well-controlled experimental design needs to be developed and employed to determine the effectiveness of the curriculum. If the principles presented
in Chapter III prove effective, the development of a comprehensive teaching guide would be the next step undertaken prior to the implementation of this curriculum.

Research relating to the physiological capacities of the Trainable Mentally Retarded is needed. Conclusive research to determine the retardate's cardiovascular response to exercise could be beneficial for determining proper exercise prescriptions to transcend the training threshold.

Additionally, a methodology to assess body composition from anthropometric measures for both males and females is needed.
BIBLIOGRAPHY

Books


26. Los Angeles City Unified Schools, Health Services Branch. Reducing Diet. Form 33.320-5M.


**Periodicals**


Other Documents

122. Alleman, J. R. "The Effects of Massed and Distributed Practice Schedules on Trainable Mentally Retarded in the Learning and Retention of


APPENDICES
APPENDIX A: IMPROVING PHYSICAL FITNESS

In a weight reducing program, the objective of improved physical fitness has a dual purpose: (1) to engage in activity and thereby increase caloric expenditure, and (2) to increase an individual's tolerance for exercise and concomitantly increase the individual's capacity for caloric expenditure.

Components of Physical Fitness

Sequenced Instructional Programs in Physical Education for the Handicapped (25) has listed several components of physical fitness. Strength, power, agility, flexibility and endurance are components of physical fitness, and are defined below.

**Strength** - Strength may be developed by working against resistance. Resistance can be provided by working with partners, weights, bars, dumbbells, medicine balls, apparatus, logs, ropes, or other kinds of weighted objects; as well as stationary objects.

**Power** - Power is developed in activities of an explosive nature where maximum force is generated and released at a specified moment. Jumping, certain types of throwing activities, and activities designed for quick, forceful movements encourage the development of power.

**Agility** - Agility is developed by activities in which the body must be maneuvered in space. Twisting, turning, side-stepping and sudden starting
and stopping are dependent upon agility.

Flexibility - Flexibility is developed in activities that provide for the maximum range of movement in any given point. Stretching, swinging, swaying and other similar body movements promote flexibility.

Endurance - Endurance is of two types - Muscular and Cardio-respiratory.

Muscular Endurance - Muscular endurance is closely related to strength. Almost all activities which develop strength can be adjusted to promote endurance. A maximum number of repetitions against a fixed resistance is one of the best ways to develop muscular endurance.

Cardio-respiratory endurance - Cardio-respiratory endurance is improved by appropriate prolonged rhythmical activity: interval running, swimming, cross-country running, hiking, bicycle riding, and running games.

Planning an Exercise Program

Sequenced Instructional Programs in Physical Education for the Handicapped (25) has listed six principles to be followed when planning an exercise program.

1. A warm-up should be planned. Exercises which involve the large muscle groups of the arms, legs, and trunk should receive the major attention. The warm-up should be of gradually increasing intensity.

2. Exercise should be specifically planned for the component to be developed. For example: To develop strength, the overload principle must be used. That is, the muscle must be taxed beyond that which it has been able to perform on prior occasions. The way to overload a muscle is to increase the intensity (heavier workload-more resistance) or increase
the rate (attempt to perform the repetitions at a faster speed).

3. Exercise must be vigorous enough to place demands upon the pupil in order to require specific adaptation. Exercise that is too mild is of little value.

4. Exercise must be individualized according to each pupil's health and physical capacity.

5. A "tapering off" should be planned. Moving about moderately following vigorous exercise is beneficial.

6. A medical examination is essential at regular intervals.

When planning an exercise program, the principles listed in Chapter III should be incorporated. To evaluate the effectiveness of the program, see Appendix D.

To determine the immediate intensity of an activity, the pulse rate can be monitored by placing your fingertips on an individual's neck at the point where the jaw meets the neck. This Carotid artery pulse rate is readily determined by counting the pulsations for fifteen seconds and multiplying the sum by four. Thus:

beats/15 seconds - 40

multiply sum x 4 - 40 x 4 = 160

To improve the Cardiovascular endurance of a student, a minimum training stimulus of 60 percent of the difference between maximum heart rate and resting heart rate is
needed. This can be computed by the following procedure:

Maximum heart rate = approximately 220 - age of student.

Resting heart rate = that heart rate taken during rest.

For an individual fifteen year old with a resting heart rate of seventy-five:

Maximum heart rate = \[220 - 15\] or 205

Minimum training stimulus = \[\text{Resting H.R.} + 60(205-75)\]
\[= 75 + 78\]
\[= 153\]

Resources are listed below which are replete with games and activities which can be employed to improve physical fitness.

Recreational Activities

After an adequate level of physical fitness is achieved, activities which are enjoyable (and therefore self-motivating) should be taught. These activities should have the following characteristics:

1. Capable of lasting for one or more hours.
2. Require moderate to heavy energy expenditure.
3. Capable of being mastered by a TMR.
4. Able to be engaged in three or more times per week. Examples of recreational activities which are
suitable are:

Cycling          *Basketball
Swimming         *Horseback riding
Hiking           *Gymnastics
Bowling          Dancing
*Tennis           Canoeing
*Handball

*Indicates that more advanced motor skills are needed for participation.

Resources


4. Los Angeles City Schools. Physical Education Teaching Guide Kindergarten, Grade One, and Grade Two. Division of Instructional Services, 1957 Publication #472.

APPENDIX B: NUTRITION EDUCATION

Some, but not all, retarded students can profit from instruction in nutrition education. Nutrition concepts should be taught to those who have the potential to benefit from such instruction. Principles regarding teaching the retarded cognitive subject matter were listed in Chapter III. These principles should be followed when teaching nutrition concepts. The following goals, concepts, and activities are suggested:

**Goal I: Understand Nutrition Concepts**

A. Nutrition is the way you eat and how the body uses it.

1. We eat food to live, grow, keep healthy and well, and to get energy for work and play.

Activities:

- Identification of foods from pictures, at supermarkets, etc.
- Explanation of energy. Cars need energy to operate, trains need energy, rockets need energy, people need energy.
- Raise pets in classroom to learn the importance of diet in animals.

B. Food is made up of different nutrients needed for growth and health.
1. All nutrients needed by the body are available through food.

2. Many kinds and combinations of food can lead to a well-balanced diet.

3. No food, by itself, has all the nutrients needed for full growth and health.

4. Each nutrient has specific uses in the body.

5. Most nutrients do their best work in the body when teamed with other nutrients.

Activities:
- Classify foods into four basic food groups using pictures, models, and real food.
- Make food models from paper-mache.
- Interview the school cook.
- Plan different meals using pictures, models, and real food. Serve the planned meal.
- Make a bulletin board showing the four food groups.

C. All persons, throughout life, have need for the same nutrients, but in varying amounts.

1. The amounts of nutrients needed are influenced by age, sex, size, activity, and state of health.

2. Suggestions for the kinds and amounts of food needed are made by trained scientists.

Activities:
- Discuss the foods that babies eat compared with the foods which children and adults eat.
D. The way food is handled influences the amount of nutrients in food, its safety, appearance, and taste.

1. Handling means everything that happens to food while it is being grown, processed, stored, and prepared for eating.

Activities:

- Classify foods as to their origin (plant, animal, or synthetic).
- Prepare and can applesauce or other fruits.
- Take a trip to a cannery, a farm, a bakery, a dairy, a meat packing plant, etc.
- Experiment with foods cooked in different manners.
- Discuss how processing influences the quality of food.
- Buy various foods at the market and prepare the foods at school.
- Present foods which should be avoided when trying to lose weight.

Goal II: Understand the Relationship Between Caloric Intake, Physical Exercise, and Weight Reduction

A. An increase or decrease in food intake will cause a corresponding change in weight.

Activities:

- Discuss the concept of food storage.
- Raise two small pets (mouse, hamster, etc.). Feed one an adequate diet, and the other an abnormal (high caloric) diet. Chart the weights of the animals.

B. Increased physical exercise will increase caloric expenditure, and a corresponding change in weight will ensue.

Activities:

- Review concept of energy as stated above in Goal I-A.

- Classify pictures of overweight, and thin people into exercise and on-exercise groups.

- Raise two classroom pets as above in II-A. Give the overweight pet a treadmill on which to exercise. Chart the change in weight.

RESOURCE MATERIALS

Books

Recommended Dietary Allowances 7th Edition 1968
National Academy of Sciences
A Report of the Food and Nutrition Board
National Research Council

Nutritive Value of Foods
United States Department of Agriculture
Prepared by Consumer and Food Economics Research Division
Agriculture Research Service

Food For Us All
The Yearbook of Agriculture 1969
United States Government Printing Office
Superintendent of Documents
Washington, D. C. 20402
How to Buy Food - By Valerie Moolman  
Cornerstone Library Publication  
Simon and Schuster, Inc.  
830 Fifth Avenue  
New York, New York 10020

Eating for Good Health  
Fredrick J. Stare MD  
Cornerstone Library Publications  
Simon and Schuster, Inc.  
830 Fifth Avenue  
New York, New York 10020

The Consumer  
Gerald Leinwand  
Washington Square Press  
Simon and Schuster, Inc.  
New York, New York 10020

The Brand-Name Calorie Counter  
Corinne T. Netzer  
A Dell Book

Let's Talk About Food  
American Medical Association, Circulation and Records Department  
535 North Dearborn Street  
Chicago, Illinois 60610

Teaching Nutrition in the Elementary School  
American Association for Health, Physical Education, and Recreation  
1201 Sixteenth Street N.W.,  
Washington, D.C. 20036

Nutrition Resource Unit - Primary Grades  
American Association for Health, Physical Education, and Recreation  
1201 Sixteenth Street N.W.  
Washington, D.C. 20036

Sources of Free and Inexpensive Materials  
American Can Company  
230 Park Avenue  
New York, N.Y.
American Dairy Association
20 North Wacker Drive
Chicago, Ill.

American Dental Association
222 E. Superior Street
Chicago, Ill.

American Home Economics Association
1600 20th St., N.W.
Washington, D.C.

American Institute of Baking
400 E. Ontario St.
Chicago, Ill.

Borden Company
285 Madison Avenue
New York, N.Y.

Bristol-Meyers
45 Rockefeller Plaza
New York, N.Y.

Bureau of Human Nutrition and Home Economics
Department of Agriculture
Washington, D.C.

Carnation Milk Company
Box 2035
Los Angeles, Ca.

Cereal Institute
135 S. LaSalle St.
Chicago, Ill.

Children's Bureau
Department of Health, Education, and Welfare
Washington, D.C.

Evaporated Milk Association
228 N. LaSalle St.
Chicago, Ill.
General Mills Educational Section
Department of Public Services
Minneapolis, Minn.

Kellogg Company
Battle Creek, Mich.

Kraft Cheese Company
500 Peshtigo Court
Chicago, Ill.

National Dairy Council
111 North Canal St.
Chicago, Ill.

National Livestock and Meat Board
36 S. Wabash Avenue
Chicago, Ill.

Nutrition Foundation, Inc.
99 Park Avenue
New York, N.Y.

Swift and Company
Chicago, Ill.

Wheat Flour Institute
309 W. Jackson Blvd.
Chicago, Ill.
APPENDIX C: MOTIVATION AND THE CONTROL OF OVEREATING

Motivation to lose weight will directly influence an individual's adherence to suggested eating procedures and to suggested physical exercise procedures. Chapter III states that a reinforcement schedule utilizing a point system should be devised. Points can be given for proper eating and exercise patterns, but not for weight loss.

When devising a point system, it must be emphasized that the youngster must be given maximum reason to comply with your wishes. Decide what is desirable to the youngster as a motivator, and use that as a reward. Money, toys, trips, etc. are excellent motivators.

Close articulation between home and school is vital if the behavior modification program is to succeed. Enclosed is an example of a behavior modification chart based on a point system. This chart utilizes principles suggested in Chapter III. This chart can be kept at home or at school; however, both parent and teacher should collaborate before recording daily results.

Each day, stars are awarded to the youngster for successful compliance with each listed goal. If the student receives the pre-determined amount of stars for the
FIGURE 5
SAMPLE MOTIVATIONAL CHART

Weekly Goal: Trip to Dodger Game on Saturday

Stars Needed: 40

<table>
<thead>
<tr>
<th>Daily Goals</th>
<th>Sunday</th>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
<th>Thursday</th>
<th>Friday</th>
<th>Saturday</th>
</tr>
</thead>
<tbody>
<tr>
<td>I kept track of foods I ate.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I ate in my &quot;special place.&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I ate slowly.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I put fork down after every third bite.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I did not eat food offered by friends.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I exercised today.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I took a walk after dinner.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
particular week, he will receive the reward on Saturday (in this case a trip to the baseball game).
APPENDIX D: EVALUATION PROCEDURES

To ascertain the effectiveness of this curriculum, the students should be evaluated to determine if the objectives have been realized. The following evaluation procedures are recommended.

**Physical Fitness**

Research indicates that physical fitness tests are highly related to I.Q. level when the level of the student is below normal intelligence (125:13). The ability to memorize and think reflectively was shown to have a direct bearing on the score achieved in the performance of a given test. Fait (125:13) studied the problem of physical fitness tests for the mentally retarded and reported:

In the physical fitness tests which involve a complex pattern of movement, the intelligence factor influences the score as much or more than the physical fitness factor that the test is purported to measure, and so an accurate profile of the physical fitness of the mentally retarded is not secured.

The following tests measure the various components of physical fitness listed in Chapter III. These tests were chosen because they measure more accurately the true level of physical fitness of the mentally retarded than is possible with tests designed for normal youngsters. These
tests were developed specifically for the mentally re­tarded, and have low correlation coefficients with I.Q.

Evaluating Strength

The bent arm hang, and leg lift, are tests developed by Fait (125) to measure strength and muscular endurance.

Bent Arm Hang - A horizontal bar or doorway bar may be used for this test. A stool approximately twelve inches high is placed under the bar. The subject steps onto the stool and takes hold of the bar with both hands, using a reverse grip (palms toward the face). The hands are shoulder's width apart. The subject brings his head to the bar, presses the bridge of the nose to the bar, and steps off the stool. He holds this position as long as possible. The timer starts the watch as the subject's nose presses to the bar and the body weight is taken on the arms. The watch is stopped when the subject drops away from the bar. The tester should be ready to catch the subject in the event that he fails. The number of seconds the subject held the position is recorded on a score card. Table 1 presents norms for Bent Arm Hang (Score in Seconds).
## TABLE 1
NORMS FOR BENT ARM HANG (SCORE IN SECONDS)

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Leg Lift - The subject lies flat on his back with his hands clasped behind the neck. A helper should hold the subject's elbows to the mat. The subject raises his legs, keeping the knees straight until they are at a 90 degree angle. Another helper, who stands to the side of the subject, extends one hand over the subject's abdomen at the height of the ankles when the legs are fully lifted. This serves as a guide to the subject in achieving the desired angle and encourages him to keep the legs straight. He should be instructed to touch the shins against the helper's arm. The subject is to do as many leg lifts as
possible in the twenty second time limit. He begins on the command of "Go" and ceases on the command of "Stop." The score is the number of leg lifts performed during the twenty seconds. Table 2 presents norms for leg lift.

**TABLE 2**

**NORMS FOR LEG LIFT**

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**Evaluating Power**

The standing long jump is a test of power. This test was taken from the AAHPER Special Fitness Test Manual for the Mentally Retarded (3).

Standing Long Jump - A mat, floor, or outdoor jumping pit is needed for this test. The student stands with his feet several inches apart and the toes just behind the
takeoff line. Preparatory to jumping, the pupil swings the arms backward and bends the knees. The jump is accomplished by simultaneously extending the knees and swinging forward the arms. The student is given three trials. The best of the three trials is recorded in feet and inches. Tables 3 and 4 present norms.

**Evaluation of Agility**

The shuttle run is a test of agility. This test was taken from the AAHPER Special Fitness Test Manual for the Mentally Retarded *(3)*.

Shuttle Run - Two parallel lines are marked on the floor 30 feet apart. Two blocks of wood (2'x2'x4") are placed behind one of the lines. The pupil starts from behind the other line. On the signal "Ready, Go!", the pupil runs to the blocks, picks one up, and runs back to the starting line, and places the block behind the line. He then runs back and picks up the second block, which he carries back across the starting line. The blocks must be placed behind the line, not dropped or thrown. The score is the elapsed time between the starting signal and the moment the pupil crosses the finish line. Tables 5 and 6 present norms.
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Evaluation of Flexibility

The Modified Sit and Reach Test is a measure of flexibility. This test is taken from The Mentally Retarded Child and His Motor Behavior (9).

Modified Sit and Reach Test - Tape measures or yardsticks are the only materials needed for this test. Several testing stations may be set up and a tape measure or yardstick would be needed for each station. The yardstick or tape measure is placed on the floor and secured with masking tape. The individual is seated on the floor in a position with the legs extended and spread on either side of the yardstick and with the heels of both feet in line with the fifteen-inch mark on the yardstick. The performer should bob forward three times, and each time should reach forward with both hands and touch the tape as far out as possible. An assistant should hold the knees of the performer to assure their extension when reaching. The best of the three trials is recorded as the score (Table 7).

Evaluating Muscle Endurance

The bent Leg Sit-Up is a test of muscle endurance. This test is taken from the AAHPER Special Fitness Test Manual for the Mentally Retarded (3).
TABLE 7

PERCENTILE NORMS FOR THE MODIFIED SIT AND REACH TEST (EMR)

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Bent Leg Sit-Up Test - The student lies on his back on a gymnasium mat with his legs bent and heels on the mat. His hands are placed on the back of the head with the fingers interlaced and elbows wide apart. A partner holds the ankles in contact with the mat at all times. The pupil sits up, touching the elbow to the knee, and returns to the starting position. The exercise is repeated as
many times as possible in one minute. The number of sit-
ups the pupil can execute in one minute will constitute
the score (Tables 8 and 9).

Evaluation of Cardiovascular Endurance

The modified Harvard Step Test is a test of cardio-
vascular endurance. This test is taken from The Mentally
Retarded Child and His Motor Behavior (9).

Due to the relatively high incidence of circulatory
and respiratory problems with the mentally retarded, each
individual should be subjected to a thorough physical ex-
amination prior to administration of this test.

Modified Harvard Step Test - A stable bench, stool or
platform and a watch or clock with a second hand are
needed. The height of the bench used for this test varies
from thirteen inches to twenty inches, depending on the
type of individuals being tested. Because of the general
physical condition and the incidence of physical handicaps
of mentally retarded children, the authors of this test
recommend that a thirteen-inch bench be used. The in-
dividual stands in front of the bench and on the command,
begins to step onto the bench with one foot, then the
other; on the third count, he steps down with one foot,
then the other (one up - two up - three down - four down).
### TABLE 8: SIT-UP FOR BOYS

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The cadence is twenty-four steps per minute, which means the person being tested will step up with both feet on the bench and bring both feet down to the floor a total of twenty-four times during each minute. The person taking the test should keep his body erect; he may start with either foot and may alternate feet periodically, but he may not jump up or down but must step. The person being tested should attempt to continue stepping for a period of three minutes, but may stop at any time he begins to feel tired. A pulse count is taken for thirty seconds following one minute of rest whether he remained the three minutes or stopped any time preceding the prescribed limit. As soon as the person ceases stepping, he should be seated and remain quiet for one minute; then the pulse is counted for thirty seconds at the wrist or carotid artery in the neck. The following formula is used for computing the individual's cardiovascular efficiency score:

\[
\text{Efficiency score} = \frac{\text{Number of Seconds completed} \times 100}{\text{Recovery pulse} \times 5.6}
\]

Example: Person tested stepped for two minutes, thirty seconds, and his pulse count for thirty seconds following one minute of rest was sixty.
150 x 100 = 15000 = 45

60 x 5.6 = 336

Three assistants are recommended for administering the test: one to watch the time and record the precise length of time the person continued stepping; another to check the pulse, and a third to assist the student when necessary (holding the hand or watching the back). Table 10 presents the norms.

TABLE 10
PERCENTILE NORMS FOR MODIFIED HARVARD STEP TEST FOR EMR STUDENTS

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Nutrition Education

Excellent nutrition pretest and posttest procedures are available through the Dairy Council of California. These tests are useful when evaluating a student's understanding of nutrition concepts, and are appropriate for TMR students because of their use of pictures. Similar tests can be developed which will measure understanding of the relationship between caloric intake, exercise, and weight reduction.

Enclosed is a sample of the California Dairy Council test.

Body Composition

The most accurate method for evaluating adiposity is a determination of percent body fat. Several methods for assessing percent body fat were reviewed in Chapter II; however, sophisticated instrumentation and highly trained investigators are needed. A method utilizing anthropometric measurements would be ideal for classroom use, but such a method for females is unavailable.

After an exhaustive review of the literature relating to body composition assessment, the following protocols
Row 1: Mark the MILK GROUP food.
Row 2: Mark the MEAT GROUP food.
Row 3: Mark the VEGETABLE-FRUIT GROUP food.
Row 4: Mark the BREAD-CEREAL GROUP food.
Row 5: Mark the food that does not belong in any of the FOUR FOOD GROUPS.

<table>
<thead>
<tr>
<th>ROW 1 Milk Group</th>
<th>ROW 2 Meat Group</th>
<th>ROW 3 Veg-Fruit Group</th>
<th>ROW 4 Bread-Cereal Group</th>
<th>ROW 5 Extra Foods</th>
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<tr>
<td>Apple</td>
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<td>Peanut Butter</td>
<td>Cake</td>
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<td>Cheese</td>
<td>Grapes</td>
<td>Potato Chips</td>
<td>Rice</td>
<td>Bread</td>
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<td>Pie</td>
<td>Spaghetti</td>
<td>Baked Potato</td>
<td>Corn on the Cob</td>
<td>Ice Cream Bar</td>
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were decided upon for inclusion in this paper. These protocols were presented by Jack H. Wilmore at the 1973 Southwest AAHPER Convention in Phoenix, Arizona (128).

**Females**

1. Measure the subject's weight in pounds on an accurate scale. The scale should be calibrated periodically to insure accuracy.

2. Using the skinfold caliper, obtain the thickness of the subject's skinfold at the scapula. This should be measured at the inferior angle of the scapula. Take a minimum of two measurements. You should be within one millimeter agreement between the two measurements. Average the closest two measurements.

3. Use the following equation to calculate the subject's lean body weight:

   \[ \text{LBW in LBs} = 20.20 + 0.635 \, \text{wt} - 0.503 \, \text{scapula skinfold} \]

4. To calculate relative body fat (%), use the following equation:

   \[ \text{Relative fat, \%} = \left( \frac{\text{Wt} - \text{LBW}}{\text{Wt}} \right) \times 100 \]
Males

1. Measure the subject's weight in pounds on an accurate scale. The scale should be calibrated periodically to insure accuracy.

2. Using the skinfold caliper, obtain the thickness of the subject's skinfold at the abdomen. This should be measured one inch to the side of the umbilicus on the subject's right side. Take a minimum of two measurements. You should be within 1 mm agreement between the two measurements. Average the closest two values.

3. Use the following equation to calculate the subject's lean body weight:

   \[ \text{LBW in LBs} = 22.62 + 0.793 \text{ wt} - 0.801 \text{ abdominal skinfold} \]

4. As an alternative procedure, measure the abdominal circumference or girth at the level of the umbilicus. Be certain the tape is in a horizontal position. Take a minimum of two measurements. The two measurements should be within \( \pm 1\% \). The values should be recorded in inches. Average the closest two values.

5. Use the following equation to calculate the subject's lean body weight:
LBW in LBs. = 98.42 + 1.082 wt - 4.15

Abdominal Circumference

6. To calculate relative body fat (%), use the following equation:

\[
\text{Relative Fat, } \% = \frac{(\text{Wt} - \text{LBW})}{\text{Wt}} \times 100
\]