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An Investigation of Food Identification in Assessment of Developmental Functioning

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To the Graduate Council:

I am submitting herewith a thesis written by Kathryn C. Wall entitled "An Investigation of Food Identification in Assessment of Developmental Functioning." I have examined the final electronic copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Science, with a major in Nutrition.

Mary Nelle Traylor, Major Professor

We have read this thesis and recommend its acceptance:

Mary Rose Gram, Roger Frey, Robert Roney

Accepted for the Council:
Carolyn R. Hodges

Vice Provost and Dean of the Graduate School

(Original signatures are on file with official student records.)

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Accepted for the Council:

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Vice Chancellor
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AN INVESTIGATION OF FOOD IDENTIFICATION IN ASSESSMENT OF DEVELOPMENTAL FUNCTIONING

A Thesis

Presented for the

Master of Science

Degree

The University of Tennessee

Kathryn C. Wall

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ABSTRACT

Nutrition has historically been one of the few disciplines in diagnostic and evaluation centers which has not administered some type of developmental test in making an assessment. A psychological test that would ascertain a range of intellectual functioning by the ability to identify foods and relate a child's cognition of foods to the variety of his diet would be most helpful to nutritionists, especially those working in diagnostic and evaluation centers for mentally retarded and developmentally disabled children. Therefore, the purpose of the study was to determine if a Food Identification Test could be developed for nutritionists in University Affiliated Child Development Centers to predict a broad range of intellectual functioning, to predict variety in the diet, and to predict adequacy of dietary intake as measured by adherence to the Basic Four Food Groups.

A Food Identification Test (FIT) was administered during the fall of 1974 to 112 subjects from the combined school and evaluation of the populations of the University of Tennessee Child Development Center. The test contained 88 color prints of actual food products arranged in order of increasing difficulty based on preliminary work begun in 1973. Data, including raw scores, chronological and mental ages, sex, race socioeconomic status, and three day food records, were collected and compared.

The chi square test for goodness of fit indicated that the frequency distribution of the FIT scores did not follow a normal curve. The FIT raw scores were measured for correlation with mental age, socioeconomic status, mother's level of education, dietary variety scores, and Basic Four Food Group scores using the Spearman's rank-difference correlation method. FIT scores were significantly correlated with mental age at $p < 0.05$. There were no significant differences between the scores of black and white children or between males and females. The reliability coefficient of 0.9685 for the FIT was computed, using Spearman's rank correlation method of split-half scores and was found to be significant at $p < 0.01$. The only predictive validity coefficient found to be significant was for mental age (rho = 0.825). A table using FIT scores to predict three broad ranges of intellectual functioning: average or above; low average or borderline retardation: and mild, moderate, severe or profound retardation was constructed. An overlap of score ranges was seen between the three groups in the population studied. An additional table was compiled using FIT scores to estimate mental ages. For each adjacent level of FIT scores an overlap of mental ages was observed; the mental age ranges for each of the corresponding levels of FIT scores were too large to be definitive. Consequently, the usefulness of the FIT is limited in predicting developmental functioning—either intellectual level or mental age—for individuals in the population tested.

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CHAPTER I

INTRODUCTION

I. STATEMENT OF THE PROBLEM

Nutritionists were latecomers to the interdisciplinary teams working in the nineteen University Affiliated Child Development Centers for the mentally retarded and developmentally disabled in the United States. Nutritionists have valuable information to offer other team members in the diagnosis and evaluation of these children. An assessment of nutritional status includes a review of anthropometric data, biochemical indices, diet history, and an observation of feeding skills. Nutrition has been one of the few disciplines not to administer some type of psychological test to aid in determining the developmental level of the child. Nutritionists have only been able to include a purely subjective observation, rather than an objective finding based on the results of a psychological test, defined as "an objective and standardized measure of a sample of behavior" (1). A psychological test that estimated range of intellectual functioning by the ability to identify foods would be helpful to nutritionists by enabling them to predict the range of intellectual functioning, and thus what to expect from the child observed since feeding skill development at various mental ages has been standardized (Appendix A).

II. PURPOSE, RATIONALE, AND IMPORTANCE

The purpose of the study was to determine if a test could be developed for use by nutritionists in University Affiliated Child Development Centers to predict a broad range of intellectual functioning, to predict variety in the diet, and to predict adequacy of dietary intake as measured by adherence to the Basic Four Food Groups. Nutritionists would have an objective finding related to intellectual functioning to include in their report for team conference rather than a purely subjective observation.

A Food Identification Test (FIT) might also serve as an assessment tool for nutritionists in screeing clinics in local health departments and in government funded programs such as Children and Youth projects. The number of foods a child can identify may be related to greater variety in his diet and thus, the quality of his dietary intake.

A Food Identification Test could also be used as an evaluation tool in determining the effectiveness of an instructional unit on food identification. It could be given as a pre- and post-test and the scores compared.

III. OBJECTIVES

Objectives of this study were as follows:

1. To administer the Revised Food Identification Test, developed in the summer of 1973 at the University of Tennessee Child Development Center in Memphis, to a sample of children with a minimum mental age of three years from the diagnostic and evaluation out-patient population

and the Special Education School at the Child Development Center. The testing was scheduled during the months of September, October, November, and December, 1974, using a standard procedure to administer and score the test.

2. To determine the normality of the distribution curve. When subjects represent a random selection of the population, the frequency distribution of the scores will approximate the shape of the normal distribution curve with neither a right nor left skewing.

3. To test at the 0.05 level of confidence the following hypotheses stated in the null form:

a. There was no significant correlation between the subjects' raw scores on the FIT and their mental ages.

b. There was no significant correlation between the FIT raw scores of the subjects and their social status index scores.

c. There was no significant correlation between the subjects' FIT raw scores and the educational levels of their mothers.

d. There was no significant correlation between the subjects' raw scores on the FIT and the variety in their diets.

e. There was no significant correlation between the subjects' FIT raw scores and their adherence to the Basic Four Food Groups.

f. There was no significant difference between the FIT raw scores of white children and black children.

g. There was no significant difference between the FIT raw scores of males and females.

4. To ascertain the reliability of the test or the consistency of scores obtained and the validity of the test or its ability to measure what it purports to measure.

5. To establish a FIT score range for three broad levels of intellectual functioning and a table of FIT scores and corresponding mental ages, if a significant positive correlation was found between FIT raw scores and mental ages.

IV. LIMITATIONS AND ASSUMPTIONS

The Food Identification Test was not intended to be a psychological test to predict a specific level of intellectual functioning. Its purpose was not to be a shortened form of any standardized psychometric tool.

The children who were tested did not constitute a random sample but were all of the children in the out-patient diagnostic population of the Child Development Center (CDC) and the CDC Special Education School who had a minimum mental age of three years and were registered

between August, 1974, and January, 1975. Blind or deaf children were not included in the test group.

The test was not free of regional and cultural bias. It was administered to black and white Tennessee residents, predominantly from Memphis. Very few other ethnic groups were seen at the Child Development Center.

Although approximately 100 children were tested, the group was not large enough for raw score results on the FIT to be standardized. Thousands of children would need to be tested to develop norms for the number and kinds of foods a child of a given race and of a given sex should be able to identify at a given age.

It was assumed that:

1. Youngsters with a minimum mental age of three years would respond to visual stimuli.

2. Two dimensional color visuals could depict foods realistically.

3. The form of the foods chosen, raw or cooked, best illustrated the food.

4. The mental age scores, dietary data, and socioeconomic information were accurately tabulated and reported to the author.

5. The children would try to complete the test to the best of their capabilities.

V. PROCEDURES

This study was based on the preliminary work on a Food Identification Test begun at the University of Tennessee Child Development Center in

Memphis during the summer of 1973. A nutrition trainee developed and administered a pilot Food Identification Test (Appendix B) similar to the form of the Peabody Picture Vocabulary Test to 64 subjects from the University of Tennessee Child Development Center combined school and evaluation populations. The test, containing 176 color prints of the actual food products, was revised and shortened to 88 items, resulting in a less time consuming test (Appendix B). Data, including raw score, mental age, sex, age, race and socioeconomic status, were collected and compared. The raw FIT scores of the pilot study correlated highly with mental age with a Spearman's coefficient of 0.85 ($p < 0.01$). Mental age was determined by the subject's score on the Wechsler Intelligence Scale for Children or the Stanford-Binet. No significant difference was seen between the various social classes. The trainee's study indicated that further time should be spent in determining how knowledge of food products relates to socioeconomic status, dietary intake, and mother's educational level (2).

The present study investigated the findings of the administration of the Revised FIT to children at the University of Tennessee Child Development Center during September, October, November, and December, 1974. The FIT scores were correlated with mental age, social status index scores, mothers' years of education, Basic Four Food Group scores, and dietary variety scores. The FIT scores of black and white children and the FIT scores of males and females were tested for significant differences. Tables using FIT scores to estimate a broad range of intellectual functioning and mental age were compiled.

VI. ORGANIZATION OF THE STUDY

The remainder of the report of the study is divided into four major sections: review of literature, methods and materials, results and discussion, and summary, conclusions, and recommendations. The first section, review of literature, considers psychological tests, picture vocabulary tests, and factors in food choices. In the next major section, methods and materials, the procedures for data collection and analysis are cited. The third section, results and discussion, describes the subjects, the distribution of scores, the outcome of the testing of the hypotheses, and the relationship of the FIT to developmental functioning. The last section is composed of a summary of the findings, conclusions drawn from the findings, and recommendations.

CHAPTER II

REVIEW OF LITERATURE

I. PSYCHOLOGICAL TESTS

Test Development

Psychological tests are planned so that the test can serve as a diagnostic tool to predict a particular trait or behavior. Consequently, there are certain steps that one should follow to construct a "satisfactory device for quantifying observations of human characteristics" (3). The trait or performance that the test is to predict must first be determined. Test item selection becomes the primary task after the purpose has been determined. Item analysis aids in the selection of the most discriminating items. This analysis makes possible the shortening of the test and arrangement of the items in order of difficulty. This procedure is essential in producing a reliable, valid tool (1). When a test is arranged so that it begins with the easier items and advances to the more difficult items, the testee gains confidence in his ability and eliminates the time and frustration involved with items beyond his capabilities (1).

The test details must be arranged next in a particular form and a scoring system developed. For the test to yield reliable results every time, the test must be given in a standardized manner. The examiner and examinee should both have clear, concise directions written for them.

Once the directions have been read to the testee, one should administer practice problems to help ascertain the examinee's understanding of the directions (4).

After the test form development, scoring policies must be delineated to limit the type of the score and its significance to the total measurement. The last step is the evaluation of the tool in terms of its reliability and validity. Based upon the above results, the test can be revised checked again, and normative data collected. Evaluation of a testing insturment is a continuing process as new data are accumulated (4).

Test Evaluation

Certain criteria must be met if a test is to be a good measuring device. Uniformity, i.e., in testing conditions, time limits, oral instructions, demonstrations, administration, and scoring, must be present for the test to be standardized (1). Subjective data can thereby be reduced, and more meaningful data can be collected for norm development from the sample given the standardized test. Standardizing a test involves administering it to a large number of subjects representative of the population for whom the test was devised. The average performance, standard deviation, standard error of the mean, and numerous other statistical analyses can be made and norms developed (1).

The second criterion for a good test is its reliability. Reliability refers to the extent to which it is internally consistent and the extent to which it yields consistent results upon testing and

retesting. Methods of estimating reliability fall into two general classifications: (1) relative reliability and (2) absolute reliability. The first of these is generally stated in terms of a coefficient of correlation, known as the reliability coefficient. This statistic indicates the extent to which individuals in a group maintain relatively consistent scores when two sets of measures are obtained and correlated. The second method, absolute reliability is stated in terms of a standard error of measurement, which is an estimate of the deviation of a set of obtained scores from their "true scores." The methods used to derive the reliability coefficient are as follows: (1) the same form of the test is administered twice to the same group of individuals, (2) two separate but equivalent forms of the test are administered to the same individuals, and (3) the test items of a single test are subdivided into two presumably equivalent and separately scored sets; the two sets of scores are correlated as though they were obtained from two equivalent forms or from two testing with the same form (1).

The third criterion of testing evaluation is "objectivity," or the extent to which personal error has been avoided. The test should be free of subjective judgment from the examiner in the administration, scoring, and interpretation of scores. An index used to measure the degree of objectivity could be developed, but this tool is seldom used since the objectivity of a test can be judged by it reliability (4).

Test validity is the fourth evaluation measure. If a test measures what it purports to measure, it is valid for that particular function. There are seven types of validity: (1) predictive validity—

ability to forecast, (2) face validity—term used to characterize test materials that appear to measure what the test's author desires to measure, (3) content validity—an estimate of the relevance of the test items, individually and as a whole, (4) factorial validity—functional unities are identified by analyzing the intercorrelations among a number of separate, relatively restricted measures, (5) construct validity—the degree to which the test items individually and collectively sample the range or class of activities or traits, (6) concurrent validity—indication of the process of validating a new test by correlating it, or otherwise comparing it for agreement, with some present source of information, and (7) cross validation—the process of validating a test by using a population sample other than the one on which the instrument was originally standardized (5).

Test Interpretation

The interpretation of test scores is a difficult task since a raw score on any psychological test is of limited value. Therefore, development of psychological test norms which convert a raw score into a relative measure that will represent the test performance of the standardization sample is necessary. These scores should determine the individual's "relative standing in the normative sample," and "provide comparable measures" so that performance on different tests can be compared (1). Raw scores should be converted into one of three major types: age score which is the child's mental age on the test; percentile which is an indicator of position within the standardization

sample; or standard scores which express the individual's deviation from the mean (1). In order to compare intellectual functioning at any age, the intelligence quotient developed in the 1916 form of the Stanford-Binet Intelligence Test is used. The IQ is the ratio of mental age to chronological age, the fraction being customarily multiplied by one hundred to avoid the use of decimals. A subject's IQ should remain constant and be comparable at all ages (1). All test scores must be weighed carefully so any specialist in the testing field could use the measurement scale as the basis on which a more informed decision can be made (4).

Picture Vocabulary Tests

Testing is sometimes difficult with the person who is unable to vocalize well, with the deaf, or with those who have orthopedic handicaps. Such persons are not penalized when a picture vocabulary test is administered. They utilize a pointing response to indicate the picture selected when a stimulus word is given. These tests provide a measure of use vocabulary (1).

One such test is the Peabody Picture Vocabulary Test which is designed to measure verbal intelligence through hearing vocabulary. This test is useful with subjects who do not read or who have a speech impairment. The scale is fair to asphasics, stutterers, remedial readers, and autistic and psychotic persons. The test and scale is set so it may be given to any "English speaking resident of the United States between two years six months and eighteen years who is able to hear words, see the drawings, and has the facility to indicate 'yes' or 'no' in a manner which communicates" (6).

High test value, ease in administration, shortness, objectivity, and ease in scoring are some of the advantages of this particular test (6). The Peabody Picture Vocabulary Test consists of one hundred fifty plates containing four pictures. When the plate is presented, the examiner provides the stimulus word and the subject responds by indicating the picture that exemplifies the meaning of the word. Raw scores on this test can be converted to both mental age and intelligence quotient (1).

II. FACTORS IN FOOD CHOICES

A child's ability to identify foods is influenced by his intelligence and the foods to which he exposed in his environment. A child may be able to recognize foodstuffs because he has seen them advertized on television or in the newspaper, because he has seen them in a grocery store or being served in a restaurant, his home, or the home of a friend or relative. Since children have consumed the majority of food eaten since infancy in the home, it would appear that the food served according to the food habits and beliefs of the family, especially the mother, would exert the most influence on his cognition of foods.

Food habits have been defined as the way in which individuals, in response to social and cultural pressure, select, consume, and utilize portions of the available food supply (7). The need for more study of the role of personal, cultural, socioeconomic, religious, and educational factors in determining food practices, beliefs, and attitudes has been noted (8, 9, 10, 11).

Biological and psychological factors influence eating patterns. From infancy various influences affect the development of food habits (12, 13). Numerous foodstuffs have become symbolic, being associated with security and comfort, social status, reward or punishment, power, and love. Food can be a method of communication to express feelings and emotions—consciously or unconsciously (14).

It has been found that the homemaker's educational attainment shows the greatest relationship to her nutritional knowledge. Homemakers who graduated from high school had better practices, i.e., used of all the basic food groups, than those who had only some high school, and these in turn, had better practices than those who attended grade school only (15). Better educated mothers appear to stress the vitamin- and mineral-rich foods more than the energy-rich foods (16). However, college graduates were found to compose the largest group of women who accepted false beliefs about food (17).

The amount and quantity of family food depends on income, with those having a greater income able to have more kinds and a greater quantity of food. Diets were found to vary in quality and quantity at different levels of the social structure with the interpretation of income in terms of values and aspirations relating a family to their position within society (18). Metheny et al. found that the level of nutrient content of the diets of pre-school children varied with the income of the family (19). Economic conditions determine whether a person can follow his normal food patterns or must change them to meet financial limitations (20, 21).

People's choice of food is multifactorial. Attitudes toward food are affected by personal contact, professional advice, and advertising. Those who are considered friends or allies offer the food advice that individuals accept most readily. To some extent, persons distrust the food given by outsiders, by strangers (22). Dickins found that friends, relatives, and family members exert the strongest influence on homemakers in purchasing or preparing a new food with the family being the strongest influence (23). Cosper found that the strongest family influence was the husband (7), while Dickins found that children were a much more important influence than husbands (23). Professionals who do not seem alien and unconcerned can affect dietary changes with the most facility (22).

In summary, cultural, social, personal, and situational factors are the motivating forces that influence people to accept certain foods. Cultural motivation is transferred from generation to generation. Social factors influence people to consider the preferences and opinions of others when selecting food. This third factor, personal motivation, is related to one's education, age, physiological and psychological characteristics, and the influence of other family members. The fourth factor is the situation in which the family finds itself at the time of making the decision to buy. Situations would be varied by income, available food supply, level of living, and employment of the wife. The situational factor is embedded in the other three—cultural, social, and personal (23).

CHAPTER III

METHODS AND MATERIALS

A study was undertaken during the fall of 1974 in an attempt to develop and validate a test which could be used by nutritionists in University Affiliated Child Development Centers to predict a broad range of intellectual functioning, variety in the diet and adequacy of dietary intake. The Revised Food Identification Test (FIT), developed by a nutrition trainee in 1973, was used for this purpose.

I. DATA COLLECTION

Description of Subjects

The subjects were chosen from the out-patient population admitted for diagnosis and evaluation and the Special Education School at the University of Tennessee Child Development Center during September, October, November, and December, 1974. While these children were suspected of being mentally retarded (24) or having a developmental disability, past records showed that only approximately half were mentally retarded.

Only children who had a least a three-year-old mental age and were not blind or deaf were accepted in the sample. The application forms on each child were screened to eliminate those children who obviously would not meet these criteria. The children were black and white Tennessee residents predominantly from Memphis. Very few other racial or ethnic groups were seen at the Child Development Center.

Individual Test Record Form

The testing form used was the Revised Food Identification Test (Appendix B) developed during the summer of 1973 at the University of Tennessee Child Development Center in Memphis. The pilot Food Identification Test, similar to the form of the Peabody Picture Vocabulary Test, was administered to 64 subjects from the Child Development Center's combined school and evaluation populations. The test, containing 176 color prints of actual food products, was revised and shortened to 88 items resulting in a less time consuming test.

This reduction from 176 of the most universally used foods selected from a review of Bowes and Church Food Values of Portions Commonly Used (25) was accomplished through test item analysis. The number of times the food item was correctly identified was tabulated, and the percentage of correct selections was calculated and ranked in descending order (Appendix C). The selections on the Revised FIT were limited to the most discriminatory items (those chosen by less than 85 percent of the subjects) and then ranked in order of difficulty with the easiest items appearing in the beginning and the most difficult items being placed toward the end. This ranking makes possible the termination of the test after six failues in eight consecutive trials (6).

Pilot study data, including raw score, mental age, sex, age, race, and socioeconomic status, were collected and compared. The raw score correlated highly to mental age and intellectual functioning with a Spearman's coefficient of 0.85 ($p < .01$), but no significant difference

was seen between the various social classes. The study indicated that further time should be spent in determining how knowledge of food products relates to socioeconomic status, nutritional status, and mother's educational level (2).

Instructions for Introducing and Administering Test

The Revised Food Identification Test (2), developed during the summer of 1973, was administered by using a standardized procedure necessary for the test to be given in an acceptable manner. The instructions for the Revised Food Identification Test (Appendix B) are similar to the instructions for the Peabody Picture Vocabulary Test.

The child was not asked to identify the food by name, but by pointing to the correct item. Thus a child was not penalized for lacking expressive skills; he needed only receptive skills.

Scoring and Mental Age Determination

The raw score on the Revised FIT was derived from the number correctly selected. The child's mental age (MA) was determined by his IQ score on the Weschler Intelligence Scale for Children (26) administered by licensed psychological examiners at the Child Development Center. If this score was not available, equivalent scores on the Stanford-Binet Intelligence Scale (27), were used to determine the child's mental age. Mental age was calculated by multiplying the IQ by the chronological age (CA) of the subject. MA = IQ x CA.

A specific mental age expresses the average intellectual attainment of children of that chronological age. This concept is used routinely in

intelligence tests in which items are arranged by age levels. Items are tested on representative groups of children at successive age levels. A series of levels of difficulty is then arranged so that new groups of randomly selected children will attain average MA scores which are equal to their average CA's. When such a test is administered, the child is given all the items in the range of his abilities, including the highest level at which he can pass all the items (basal age) and the lowest at which he fails all of them. The MA score is obtained by adding to the basal age level credit for each item passed at any age level above it. (24).

Social Class Index

The social class index used as an indicator of social status involved ratings of the parent's occupation, income, and education. Each scale was scored and each individual score then weighed in the total index. The Index of Social Status used (Appendix D) was adapted from the socioeconomic scales of Warner (28) by the Social Work Department at the University of Tennessee Child Development Center.

II. DATA ANALYSIS

Normality of Distribution Curve

A chi-square test for goodness of fit was employed to determine the normality of the distribution of Food Identification Test scores. If the distribution was normal, it would be appropriate to make parametric assumptions. If non-normality was observed, nonparametric statistical methods would be used in the analysis of data.

Testing of Hypotheses

To test the (A) hypothesis: There was no significant correlation between the subjects' raw scores on the FIT and their mental ages, a Spearman's rank-difference correlation coefficient was computed.

To test the (B) hypothesis: There was no significant correlation between the FIT raw scores and subjects' socioeconomic index scores, a Spearman's rank-difference correlation coefficient was calculated. between the FIT scores and the socioeconomic index scores according to the University of Tennessee Child Development Center Index of Social Status.

To test the (C) hypothesis: There was no significant correlation between the subjects' FIT raw scores and the educational levels of their mothers, a Spearman's rank-difference coefficient of correlation was calculated. The number of years of formal education constituted the educational level of each mother.

To test the (D) hypothesis: There was no significant correlation between the subjects' FIT raw scores and the variety of their diets, a Spearman's rank-difference correlation coefficient was calculated between the raw FIT scores and the variety scores. Variety was defined as the number of different foods consumed in a given period. The definition of food that was used is: a food is anything containing substances that function in one or more of three ways: (1) furnish body fuel, substances whose oxidation in the body sets free energy needed for its activities; (2) provide materials for the building or maintenance of body tissues; (3) supply substances that act to regulate body processes (29). Variety

in the diet was measured by counting the number of different foods eaten on three days when food records were kept by the mother at home (Appendix E). Each mother was given standard verbal and written directions for completing the food records.

To test the (E) hypothesis: There was no significant correlation between the subjects' FIT raw scores and their adherence to the Basic Four Food Groups, a Spearman's rank difference correlation coefficient was computed between the raw FIT scores and the dietary scores. The dietary intake from the three-day-food records kept at home by the mother was scored on a scale of 0 to 15 (Appendix F). Fifteen, the perfect score, was given if a child ate four servings from the bread and cereal group, three servings from the meat group, four servings from the fruit and vegetable group, and four servings from the milk and dairy products group. The maximum number of points a child's diet could receive for any group was the number recommended. Thus, if a child consumed seven servings from the bread and cereal group in one day, the number of points given for that group was four. The amount of food to constitute a serving was based on age according to the United States Department of Agriculture Meal Pattern for Children (Appendix G).

To test the (F) hypothesis: There was no significant difference between the FIT raw scores of white and black children, the Kolmogorov-Smirnov test was applied.

To test the (G) hypothesis: There was no significant difference between the FIT raw scores of males and females, the Kolmogorov-Smirnov test was administered.

III. TESTS OF THE INSTRUMENT

Determination of Test Reliability

To determine the reliability of the FIT the split-half method was employed. Since the items were arranged in an approximate order of difficulty, they were divided on an odd and even test item basis. Once the two half-scores were obtained for each subject, they were correlated using the Spearman's rank-difference correlation method.

Determination of Test Validity

The coefficients of correlation between FIT raw scores and mental ages, social status index scores, Basic Four Food Group scores, and dietary variety scores were used as the predictive validity coefficients. If significant, each coefficient was an index of the validity of the FIT in predicting the outcome of that particular area.

IV. RELATIONSHIP OF FIT TO DEVELOPMENTAL FUNCTIONING

FIT scores for intellectual levels (Appendix H) were established in three broad ranges: (1) average or above; (2) low average or borderline retardation; (3) mild, moderate, severe, and profound retardation. Three broad ranges of intellectual functioning rather than ten levels were established to insure a large enough sample in each range. The FIT would have to be a more sensitive instrument to predict one of ten intellectual levels in comparison to predicting one of three broad ranges of intellectual functioning.

A table using FIT scores to estimate mental age was also compiled. The FIT scores were divided into nine groups: 0-10, 11-20, 21-30, 31-40,

41-50, 51-60, 61-70, 71-80, 81-88. The mental age range of the children who scored in each of these groups was tabulated.

CHAPTER IV

RESULTS AND DISCUSSION

During the fall of 1974 the Food Identification Test (FIT) was administered to a sample of children at the University of Tennessee Child Development Center in Memphis in an attempt to develop a valid measure to be used by nutritionists in predicting a broad range of intellectual functioning, as well as variety in diet and adequacy of dietary intake. In this chapter the results of the study are reported and discussed.

I. DESCRIPTION OF SUBJECTS

Number of Subjects

The Food Identification Test was administered to 112 children during the months of September, October, November and December, 1974, at the University of Tennessee Child Development Center in Memphis. Eight of these children's scores had to be eliminated because the children responded poorly to the test; six were so hyperactive and distractible and two were so frightened because of the separation from their mothers that inaccurate results were obtained. Fourteen children's scores had to be eliminated because their mental ages which were expected to be at least three years were less than than when psychological tests were administered. The number of subjects who responded well was 90 of the 112 children. The administration of the test required 10-40 minutes depending on the child's speed of response, his attention span, and his cognizant ability. The test was terminated when six of eight consecutive items were incorrectly answered.

Age

Chronological ages ranged from 4.17 to 16.00 years, with a mean of 8.66 years. The highest mental age obtained was 16.64 years and the lowest, 3.00 years, with mean mental age of 7.26. Table 1 delineates the age distribution.

Race and Sex

Seventy-eight percent, or 70, of the 90 subjects were white and 22 percent, or 20, were black. Seventy-eight percent, or 70, of the subjects were male, while 22 percent, or 20, were females. A breakdown of males and females by race is given in fig. 1.

Socioeconomic Status

Socioeconomic data were unavailable on five of the 90 subjects. Based on subjects' scores on the Index of Social Status (Appendix D), the 86 remaining subjects were placed in the following social classes: lower (84-67), upper lower (66-52), lower middle (51-38), upper middle (37-23), and upper (22-12).

Six percent, or five, of the 85 subjects were of the upper class. Twenty-one percent, or 18, were classified in the upper middle strata and 34 percent, or 30, were in the lower middle class. Thirty-nine percent were in the lower class with 24 percent, or 20 in the upper lower class and 15 percent, or 13 in the lower lower class. These data are shown in fig. 2.

Intellectual Functioning

On the basis of the psychologists' reports, the subjects were placed in one of the ten intellectual levels recognized in the Child Development

Table 1

Chronological and mental ages of Food Identification Test subjects

Category	Subcategory	Number	Percent of Subjects[a]
I.			
Chronological Age	16	1	1
	15	1	1
	14	2	2
	13	4	4
	12	4	4
	11	2	2
	10	3	3
	9	12	13
	8	17	20
	7	14	16
	6	15	18
	5	12	13
	4	3	3
	3	0	0
II.			
Mental Age	16	1	1
	15	0	0
	14	2	1
	13	1	1
	12	1	1
	11	1	1
	10	1	1
	9	8	9
	8	10	11
	7	8	9
	6	13	15
	5	20	23
	4	15	17
	3	9	10

[a]Rounded to the nearest whole percent and adjusted to equal 100%.

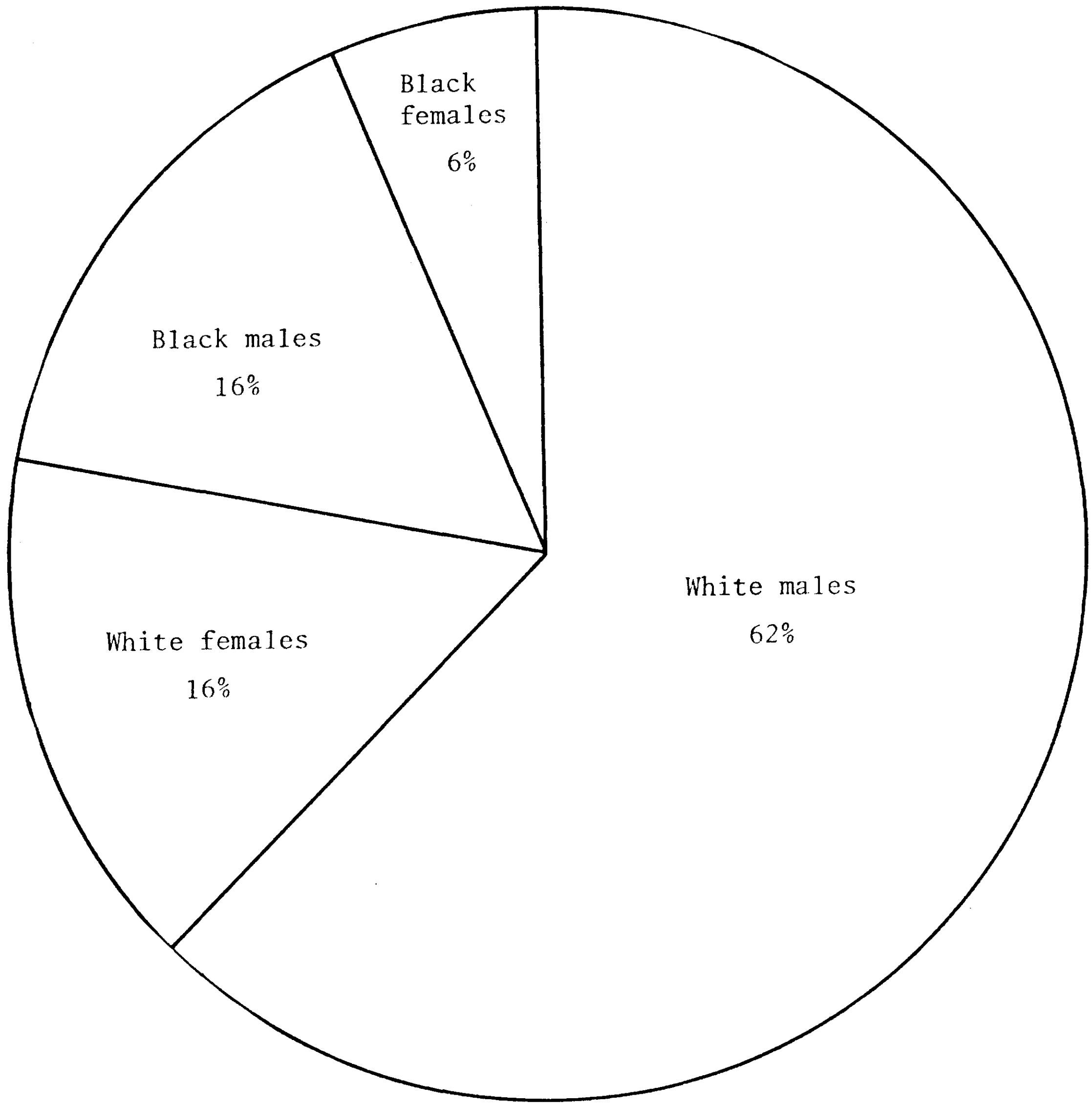

Fig. 1. Sex and race of Food Identification Test subjects.[a]

[a]Data for the 90 subjects were rounded to the nearest whole percent and adjusted to equal 100 percent.

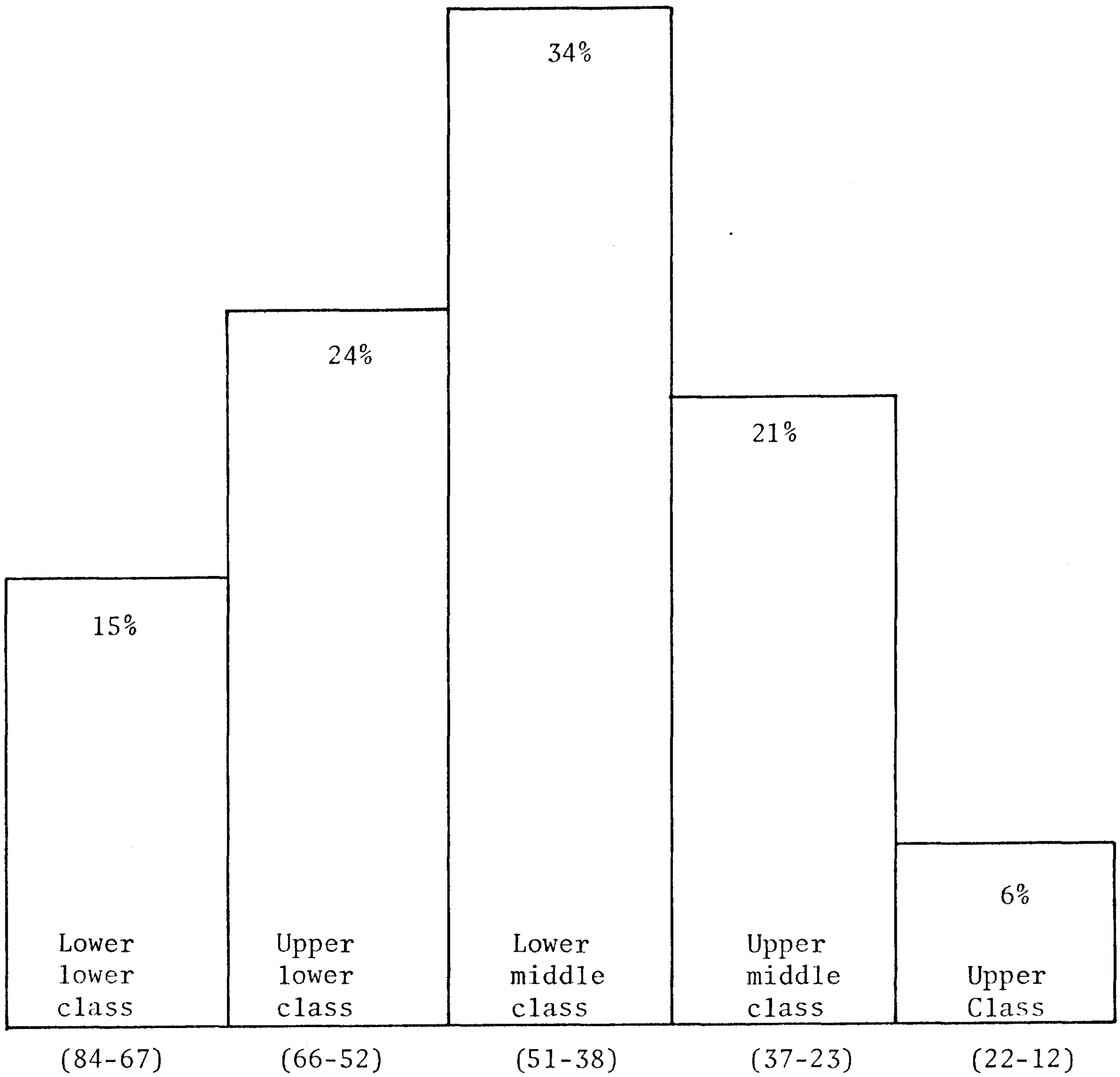

Fig. 2. Social status index scores of Food Identification Test subjects.[a]

[a]Data for the 86 subjects were rounded to the nearest whole percent and adjusted to equal 100 percent. Social status index used was developed by the Social Work Department, University of Tennessee Child Development Center (Appendix D).

Center's Classification System for Intellectual Functioning (Appendix H). One child was of very superior intelligence and two were superior for a total of 3 percent of the population. Five percent, or 5, tested as high average; 33 percent, or 30, as average; and 16 percent, or 14, as low average. Borderline retardation was indicated in 19 percent, or 17, of the subjects. Twelve percent, or 11, were mildly retarded; 10 percent, or 9, were moderately retarded; and 1 percent, or one, severely retarded. No children in this test population were found to be profoundly retarded. The population by level of intellectual functioning is shown in fig. 3.

II. STATISTICAL ANALYSIS OF DATA

Distribution of Scores

Raw scores on the administered FIT ranged from 87 to 7 with 88 being a perfect score. The mean score was 50.35; the median 53.50; and the mode, 72.00. One standard deviation was ±22.87.

The normality of the distribution was determined by employing a chi square test for goodness of fit of the obtained data to the hypothetical curve of a normal distribution (30). The chi square value obtained was 26.319, indicating that the distribution was not normal, as illustrated in fig. 4. Therefore, nonparametric statistical methods were used in the analysis of data.

Testing of Hypotheses

The (A) hypothesis: There was no significant correlation between the subjects' raw scores on the FIT and their mental ages, was rejected

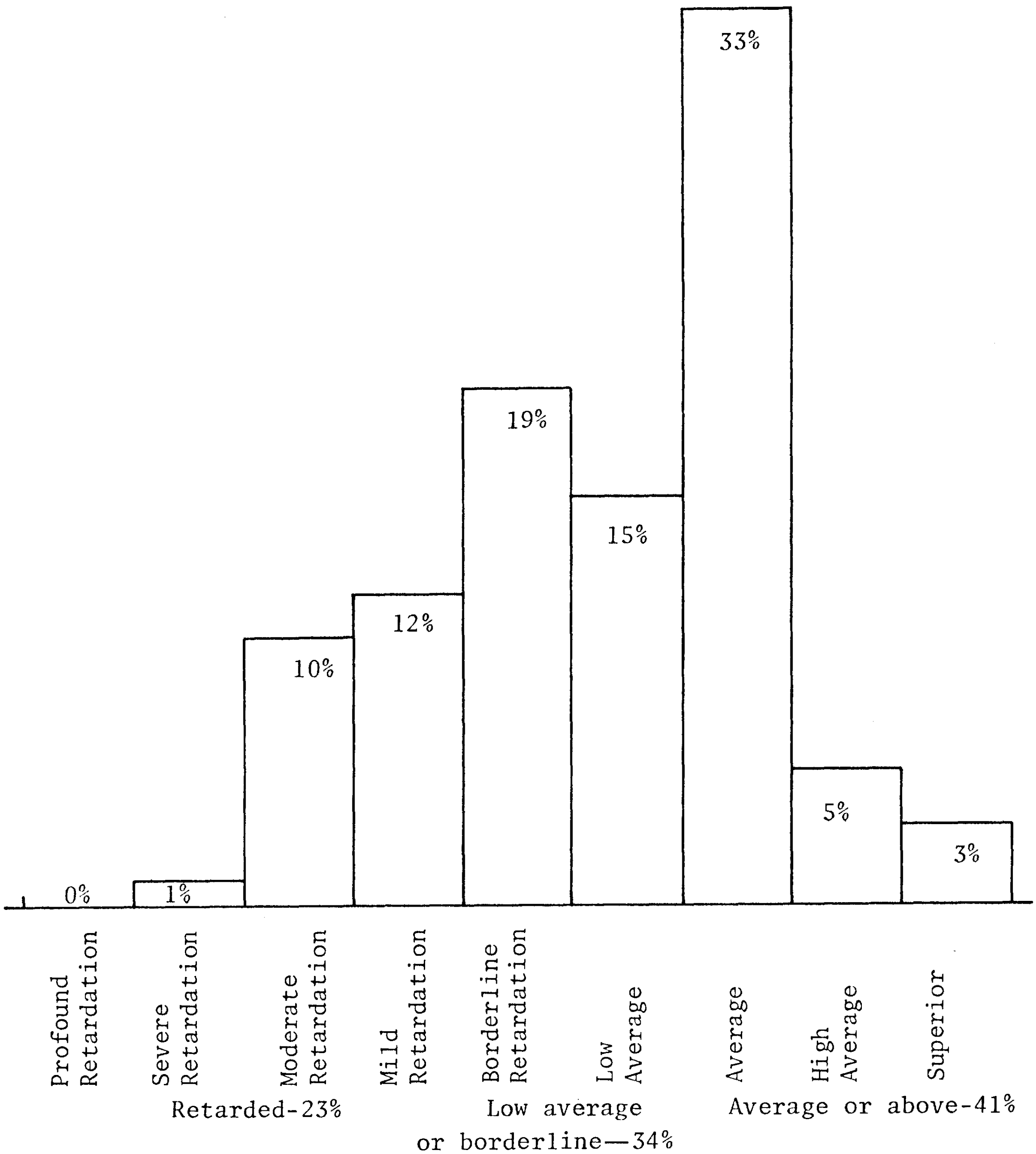

Fig. 3. Levels of intellectual functioning of Food Identification Test subjects.[a]

[a]Data for the 90 subjects were rounded to the nearest whole percent and adjusted to equal 100 percent. Intellectual functioning classification used was University of Tennessee Child Development Center Classification (Appendix H).

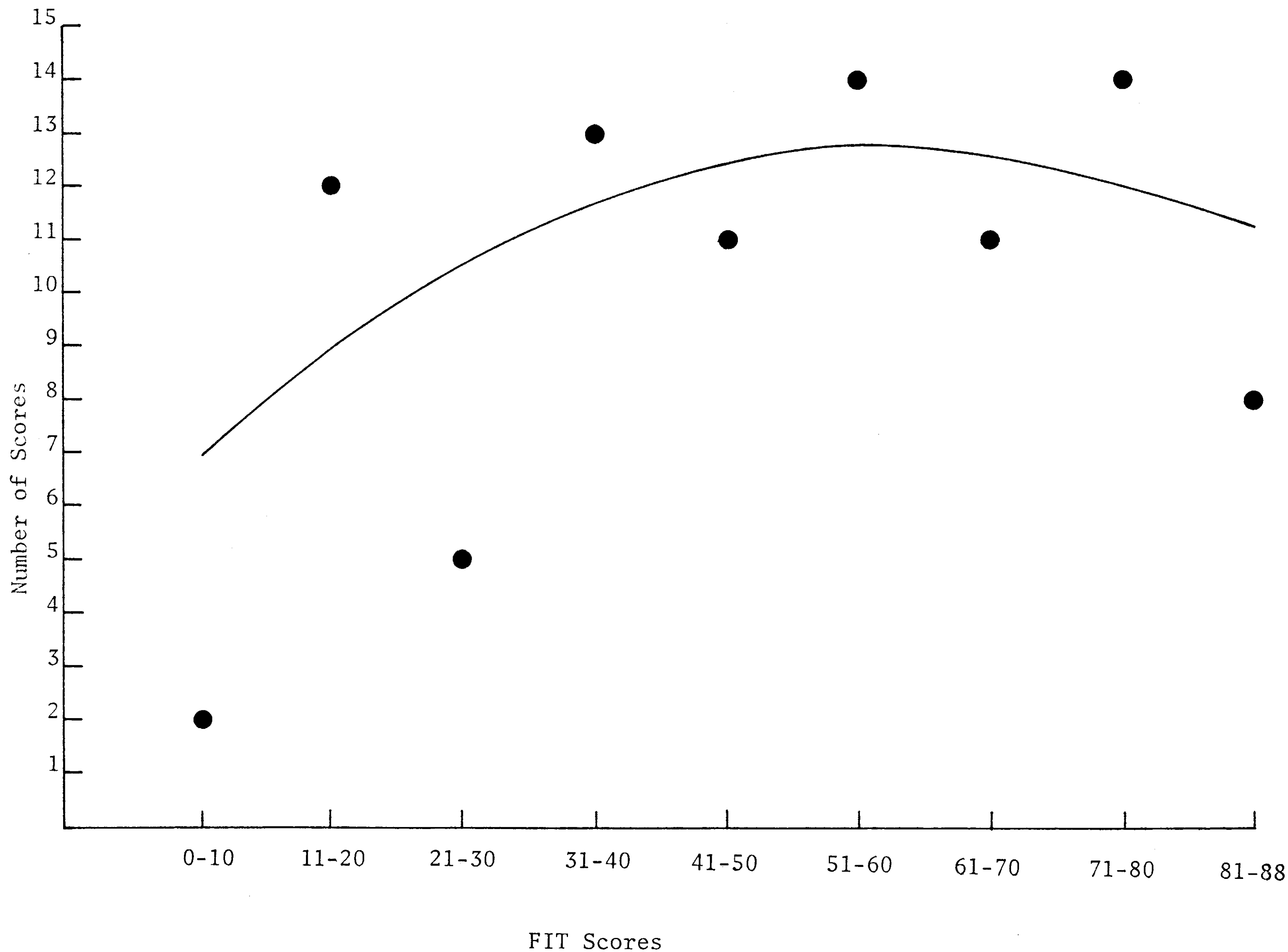

Fig. 4. Distribution of Food Identification Test scores

at the 0.05 confidence level. The computed Spearman's rank-difference coefficient of correlation (30) was 0.825. The correlation coefficient was calculated using 74 scores because 16 of the 90 scores were from children whose psychological test was not considered current, i.e., in 1974. This situation occurred because there were 17 children in the Center's out-patient diagnostic population to receive partial re-evaluations—either audiology, speech and hearing, dental or psychiatric.

The (B) hypothesis: There was no significant correlation between the FIT raw scores and the socioeconomic index scores, was not rejected. The Spearman's rank-difference coefficient of correlation (30) was 0.183. This lack of evidence for a relationship between socioeconomic status and FIT scores was in contrast to other studies (18, 19, 20, 21) that showed a positive relationship between income and diet. The amount and quantity of family food depends on income, with those having a greater income able to have more kinds and a greater quantity of food, according to those investigators. Perhaps the low correlation between socioeconomic scores and FIT scores in this study was due to the socioeconomic index score being a composite score of education, income, and occupation of the father, rather than income alone. A second reason for this lack of correlation may be caused by the child's inability to identify the foods although they were served in his home, indicating a poor relationship between consumption and recognition. Children of greater intellectual ability may score higher on the FIT because of a greater recognition of

names of foods rather than exposure to a greater variety of foods. The correlation was calculated using 85 subjects since current socioeconomic data were unavailable on five children.

The (C) hypothesis: There was no significant correlation between the subjects' FIT raw scores and their mothers' level of education was not rejected. The Spearman's rank-difference correlation coefficient (30) was 0.345. The coefficient was computed using 85 subjects since the mother's educational level was unavailable on five subjects. This low correlation was in contrast to the findings in other studies relating mother's educational level and diet (15, 16, 17); it was found that the more education the homemaker had, the better her food practices. The correlation was lower than expected possibly because the children of better educated mothers were not able to identify more foods due to subnormal intelligence.

The (D) hypothesis: There was no significant correltion between the subjects' FIT raw scores and dietary variety scores, was not rejected since the Spearman's rank-difference coefficient of correlation (30) was 0.088. The coefficient was determined with 69 of the 90 subjects. Twenty-one children's parents or guardians did not return the three-day-food record, or the records were so poorly kept as to be obviously inaccurate. Perhaps the very low correlation was due to the children's inability to identify foods even though they were served in their home. This finding was in agreement with the low correlation between FIT scores and socioeconomic status. A second reason for the poor relationship might

be that in the elimination of non-discriminatory items, many of the foods with which they were familiar because they had been served at home were eliminated.

The (E) hypothesis: There was no significant correlation between the subjects' FIT raw scores and their dietary adherence to the Basic Four Food Groups, was not rejected. The Spearman's rank-difference correlation coefficient was 0.221. The correlation would be higher possibly if the children had equal ability to identify those foods on the FIT that were served in their homes. Another reason for the poor correlation may be that in the elimination of non-discriminatory items, many of the foods that would contribute to the Basic Four score were deleted. Items such as milk, eggs, orange juice, cereal, apples, and bread were eliminated.

Both the (F) and (G) hypotheses: There was no significant difference between the FIT raw scores of white and black children and no difference between the scores of males and females were not rejected upon the results of the administration of the Kolmogorov-Smirnov test (31). Values of 0.147 and 0.160 were obtained.

III. TESTS OF THE INSTRUMENT

Test Reliability

In measuring the reliability or the degree of internal consistency a Spearman's rank-difference correlation coefficient (30) of 0.9685 was calculated on the 90 paris of split-half scores. The Spearman statistic was used because of the lack of normality in the distribution of scores.

The Spearman's coefficient is considered 91 percent as powerful as as Pearson's; therefore, it can be said that this test is reliable, i.e., exhibits internal consistency, at the 0.01 confidence level. The FIT meets the reliability criterion of Guilford (30) who suggests that a test should have a coefficient of at least 0.94.

Test Validity

When the predictive validity of a test is measured, the coefficient that relates the scores of that test to that which is being predicted is known as a validity coefficient. The minimum validity coefficient of a test to be of practical usefulness is about 0.45 (29). Therefore, in reviewing the correlation coefficients obtained between FIT raw scores and mental ages (0.825), socioeconomic scores (0.183), mother's education level (0.345), dietary variety scores (0.088), and Basic Four Food Group scores (0.221), it can be said that the FIT is theoretically useful in predicting mental age only. It should be noted, however, that a coefficient of correlation is purely relative to the circumstances under which it was obtained and should be interpreted in the light of those circumstances, and very rarely, in any absolute sense.

IV. RELATIONSHIP OF FIT TO DEVELOPMENTAL FUNCTIONING

It should not be assumed that the FIT can replace sophisticated, standardized psychological tests such as the Stanford-Binet Intelligence Scale that ascertain intellectual functioning. At the present time the FIT does not predict satisfactorily broad ranges of intellectual functioning as can be seen in table 2. The range of FIT scores overlap

Table 2

Estimation of intellectual level by Food Identification Test scores

No. of Subjects		Intellectual Level[a]	Low	High	FIT Scores Mean	1 S.D.	Mean± 1 S.D.	S.E.
38		Average or above	22	87	62	±17	45-79	1.950
	3	Superior	29	54				
	5	High Average	66	69				
	30	Average	22	87				
31		Low Average or borderline	10	86	45	±20	25-65	2.540
	14	Low Average	17	72				
	17	Borderline	10	86				
21		Retarded	7	76	39	±20	19-59	3.086
	11	Mild	16	76				
	9	Moderate	7	75				
	1	Severe	11	11				
	0	Profound	0	0				

[a]University of Tennessee Child Development Center Classification of Intellectual Functioning (Appendix H).

with adjacent ranges. Consequently, one could not predict with certainty the level of intellectual functioning of a child by his FIT score because the standard deviation within each group is too large. Perhaps the reason for the large deviation is the smallness of the number of subjects in each category.

The estimation of mental age by identification of foods is shown in table 3. The FIT cannot satisfactorily predict mental age. The eight ranges of mental ages for each of the corresponding eight levels of FIT scores are too large to be definitive and overlap with adjacent mental age ranges. The MA ranges are not mutually exclusive. At the present time the FIT is not a sensitive enough testing instrument to accurately predict mental age.

Table 3

Estimation of mental age by Food Identification Test scores

Number of Cases	FIT scores	Mental Age in Years					
		Low	High	Mean	1 S.D.	Mean ±1 S.D.	S.E.
1	0-10	-	-	3.50	-	-	-
13	11-20	3.00	4.75	4.30	1.07	3.23-5.37	.31
5	21-30	3.58	7.59	5.30	1.16	3.69-6.91	.81
10	31-40	3.33	6.99	5.43	1.12	4.31-6.55	.37
12	41-50	4.90	7.19	5.83	.88	4.95-6.71	.26
14	51-60	5.12	8.40	6.52	1.15	5.37-7.67	.32
11	61-70	4.50	12.53	7.74	2.23	5.51-9.97	.71
15	71-80	5.15	14.28	8.61	1.57	6.04-10.18	.41
9	81-88	6.77	16.64	11.00	2.89	8.11-13.89	1.02

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

The purpose of the study was to determine if a Food Identification Test could be used by nutritionists in Unversity Affiliated Child Development Centers to predict a broad range of intellectual funtioning, to predict variety in the diet, and to predict adequacy of dietary intake as to meet the Basic Four Food Groups. As the first objective, a Food Identification Test was administered during the fall of 1974 to 112 subjects from the University of Tennessee Child Development Center's school and evaluation populations. The test contained 88, three by five inch color prints of actual food products from the Basic Four Food Groups. The prints were arranged in order of identification difficulty based on a preliminary Food Identification Test given in 1973. Information on each subject, including raw score on FIT, chronological and mental ages, sex, race, family income level, parents' educational level, father's occupation, and three-day-food records, was collected and compared.

Of the 112 test scores, 22 had to be eliminated because eight children had been too hyperactive or frightened and 14 had tested as having less than a three-year-mental age. The sample contained 90 subjects, none of whom were blind or deaf. Seventy-eight percent of the subjects were white and 22 percent black. Seventy-eight percent were male and 22 percent female. Chronological ages ranged from 4.17 to 16.00 years;

mental ages were from 3.00 to 16.64 years. Six percent of the children were from the upper socioeconomic class, 55 percent from the middle, and 39 percent from the lower class.

In completing the second objective of determining the normality of the distribution curve, a chi-square test for goodness of fit was administered and indicated that the frequency distribution of the FIT scores did not follow a normal curve. Therefore, nonparametric statistical methods were used.

The third objective of testing several hypotheses was completed when the FIT raw scores were correlated, using the Spearman's rank-difference correlation method, with several parameters: mental age, socioeconomic status, mother's level of education, dietary variety scores, and Basic Four Food Group scores. FIT scores were significantly correlated as expected with mental age at $p < 0.05$. Socioeconomic status did not correlate significantly with FIT scores as expected (18, 19, 20, 21). Perhaps this occurred because the income level alone was used in the other studies, while the social status index score was a composite score of income, father's educational level, and occupation. Mothers' years of education was not significantly correlated as expected (15, 16, 17). Perhaps this occurred because the children of better educated mothers did not recognize the foods that were served to them. The children's dietary variety scores and Basic Four Food Group scores did not correlate significantly as predicted. One would assume that the more foods a child could identify, the greater the variety in the diet. However, from the preliminary FIT 88 items which

had been identified by 85 percent of the children were eliminated as being non-discriminatory. Included in these 88 items were foods that frequently contribute to the Basic Four Food Group score. Perhaps socioeconomic status, mother's educational level, dietary variety scores, and Basic Four Food Group score would have been significantly correlated with the FIT scores if the children's ability to identify foods had been unlimited by mental capacity—42 percent of the children exhibited some degree of mental retardation. There were no significant differences as measured by the Kolmogorov-Smirnov test between the FIT scores of white and black children or between males and females.

The next objective was to test the FIT instrument itself. The reliability, or internal consistency, of the test was determined using the split-half method. The Spearman's rank correlation coefficient of 0.9685 was found to be statistically significant at $p < 0.01$. The predictive validity of the test was measured by the Spearman's rank-difference correlation coefficients between FIT scores and mental age, socioeconomic status, mother's educational level, dietary variety scores and Basic Four Food Group scores. The only predictive validity coefficient found to be significant theoretically was for mental age (rho = 0.825).

As the last objective of the study FIT score ranges for three broad ranges of intellectual functioning were constructed, and a table of FIT scores and corresponding mental ages was compiled. The table estimating intellectual functioning: average or above, low average or borderline,

and retarded has limited value due to the large standard deviation of FIT scores within each of the three broad groups. The large intra-group deviation causes an overlap of score ranges between the groups making the placing of a child's score within one of the groups uncertain. Perhaps the deviation in each group could be reduced if a larger number of subjects were tested.

The table of FIT scores and corresponding mental ages is also of limited value. The mental age ranges were too large to be definitive and were not mutually exclusive. At the present time the FIT cannot predict accurately the mental age of an individual child. Perhaps the FIT would be useful in predicting mental ages in a group setting since the FIT scores correlated significantly with the mental ages of the population tested.

Indications for use of the FIT scores are limited due to some problems that were encountered. The elimination of non-discriminating items to discern the children's intellectual abilities caused many protective foods that would have contributed to the Basic Four Food Group scores to be ommitted. There is also the problem of a poor relationship between recognition and consumption. Children of greater intellectual ability may be able to identify the majority of test items, although they have little variety in their diets.

Further study of the FIT should be concerned with predicting either mental age or food practices. Nutritionists working in University Affiliated Child Development Centers would benefit the most from a FIT that could predict a broad range of intellectual functioning during their

evaluation period, especially so that an assessment of mental age would be available for us in assessment of feeding skills. If this development of the tool is pursued, an item analysis and a larger sample would be needed to develop a useful FIT Guide to Intellectual Functioning.

If the relationship between the FIT and food practices is pursued, the sample should be of at least average intelligence to aid in determining if a relationship between recognition and consumption exists. An analysis of co-variance would be needed to eliminate the factors of above average intelligence, socioeconomic status, race, sex, and education.

To make the test more sensitive to recognition of Basic Four Food Group items, consideration could be given to revising the present testing tool. Those foods that are not in the Basic Four Food Groups could be replaced with foods that are. If this further revision was pursued, the test would essentially become a new pilot test. Based on the results of the administration of the new pilot test, the test could be evaluated, revised, and normative data collected.

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APPENDICES

APPENDIX A

MENTAL AGE AND FEEDING SKILLS

Table 4

Mental age and feeding skills[a]

Skill	Age in years
Drinks unassisted	0.55
Grasps with thumb and finger	0.65
Masticates food	1.10
Holds and drinks from glass	1.40
Holds and eats with spoon	1.53
Discriminates edibles	1.65
Unwraps candy	1.85
Holds and eats with fork	2.35
Gets drink without help	2.43
Uses knife for spreading	6.03
Uses knife for cutting	8.05
Cares for self at table	9.03

[a]Doll, E. A. (1965) Vineland Social Maturity Scale Condensed Manual. American Guidance Service, Circle Pines, Minn.

APPENDIX B

FOOD IDENTIFICATION TESTS

Pilot Food Identification Test

Name____ Sex M F
last) (first) (initial) (circle)

Examiner____________________________________ Time______________________

Chronological Age___________________________ Race______________________

Mental Age__________________________________ Socioeconomic level_______

Grade in School ____________________________

Parents' Income ____________________________

Mother's occupation_________________________ Father's occupation________

Mother's Educational level__________________

Father's Educational level__________________

Other Test Data

Name of Test	Date	MA	Score	Type of Score

No. Missed__________________ Types Missed__________________

Score __________________ __________________

____

Directions: Record all responses and make oblique strokes through circle to record errors.

	Word	Key	Response	
1.	syrup	F		0
2.	anchovies	A		0
3.	coke	C		0
4.	sauerkraut	C		0
5.	spaghetti & meat sauce	F		0
6.	olives	E		0
7.	graham crackers	D		0
8.	oysters	D		0
9.	kidney beans	C		0
10.	turnip	C		0
11.	mashed potatoes	A		0
12.	grapes	B		0
13.	salami	H		0
14.	lettuce & tomato	F		0
15.	jelly beans	A		0
16.	plums	G		0
17.	oil & vinegar dressing	A		0
18.	tamales	C		0
19.	scrambled eggs	G		0
20.	radishes	A		0
21.	chow mein	A		0
22.	cookies	B		0

Word	Key	Response	
mayonnaise	D		0
egg	F		0
milk	H		0
cereal	E		0
green peas	G		0
rice	F		0
ham hocks	H		0
onion	G		0
pancakes	H		0
salt pork	D		0
veal cutlet	D		0
mushrooms	A		0
water chestnuts	F		0
pot pie	G		0
carrots	D		0
artichoke	A		0
ham & cheese sandwich	F		0
chicken & dumplings	E		0
roll	C		0
tomato	F		0
pudding	E		0
Chinese noodles	A		0

Word	Key	Response		Word	Key	Response	
1. orange juice	B	________	0	chocolate milk	H	________	0
2. hot chocolate	B	________	0	spring onions	G	________	0
3. apple juice	D	________	0	ketchup	A	________	0
				cantaloupe	F	________	0
4. spinach	D	________	0	applesauce	A	________	0
5. hominy	H	________	0				
6. parsley	B	________	0	tuna fish	G	________	0
7. cream cheese	G	________	0	cranberries	B	________	0
				chives	B	________	0
8. acorn squash	A	________	0	cucumber	E	________	0
				grapefruit	F	________	0
9. poor boy sandwich	F	________	0	lime	B	________	0
10. M & M's	B	________	0	grits	H	________	0
11. lasagna	C	________	0	water-melon	D	________	0
12. nuts	D	________	0				
13. prunes	E	________	0	biscuits	B	________	0
14. corn	H	________	0	hot dog	H	________	0
15. sardines	C	________	0	broccoli	C	________	0
				roast	E	________	0
16. strawberry short cake	B	________	0	fruit cocktail	A	________	0
17. greens	D	________	0	pickles	B	________	0
18. fried eggs	H	________	0	field peas	E	________	0
19. muffins	A	________	0	macaroni	B	________	0
20. marshmallows	G	________	0	chicken	F	________	0
21. fish sticks	C	________	0				
22. yellow squash	E	________	0				

Word	Key	Response		Word	Key	Response	
1. salad dressing	G	________	0	mustard	A	________	0
2. soup bone	E	________	0	strawberries	D	________	0
3. ice cream cone	B	________	0	apple	F	________	0
4. shrimp	A	________	0	cabbage	B	________	0
5. asparagus	D	________	0	lemon	B	________	0
6. iced tea	C	________	0	orange	H	________	0
7. pimento	F	________	0	raisins	C	________	0
8. potato chips	F	________	0	soup	C	________	0
9. hamburger	A	________	0	beets	G	________	0
10. salad	A	________	0	macaroni & cheese	G	________	0
11. peaches	E	________	0	candy bar	G	________	0
12. pizza	F	________	0	saltine crackers	C	________	0
13. crackers	G	________	0	bacon	B	________	0
14. pork-n-beans	D	________	0	bologna	E	________	0
15. raspberries	B	________	0	red peppers	F	________	0
16. cheese	H	________	0	pineapple	E	________	0
17. jelly	C	________	0	noodles	G	________	0
18. lima beans	F	________	0	waffles	D	________	0
19. pie	H	________	0	liver	E	________	0
20. cottage cheese	C	________	0	baked potato	H	________	0
21. popcorn	G	________	0	wax beans	H	________	0
22. cranberry sauce	D	________	0	green beans	G	________	0

Word	Key	Response		Word	Key	Response	
1. grape juice	E	________	0	vegetable shortening	C	________	0
2. brussels sprouts	H	________	0	sherbet	C	________	0
3. tomato juice	G	________	0	worcester-shire sauce	E	________	0
4. banana	H	________	0	doughnut	G	________	0
5. french fried potatoes	E	________	0	potted meat	C	________	0
6. bread	A	________	0	fish	D	________	0
7. ham	E	________	0	tangerine	A	________	0
8. garlic	H	________	0	figs	E	________	0
9. pear	B	________	0	coffee	D	________	0
10. okra	E	________	0	toast	H	________	0
11. yams	F	________	0	oatmeal	H	________	0
12. apricots	G	________	0	cabbage slaw	E	________	0
13. lettuce	C	________	0	Vienna sausage	A	________	0
14. bell pepper	A	________	0	crab	C	________	0
15. pork chop	G	________	0	egg plant	E	________	0
16. pretzels	F	________	0	lobster	D	________	0
17. cauliflower	B	________	0	sweet roll	H	________	0
18. coconut	G	________	0	margarine	B	________	0
19. sweet potato	D	________	0	croquette	F	________	0
20. spaghetti	B	________	0	meat	D	________	0
21. blackberries	F	________	0	cake	D	________	0
22. avocado	C	________	0	celery	H	________	0

Test Behavior—Circle appropriate item

Examples needed	only 1	2 or 3	over 3
Rapport	easily a attained	slowly attained	poor rapport
Guessing	guessed when asked	resisted guessing	prone to guessing
Speed of Response	fast	average	slow
Attention Span	very attentive	average	slow
Need for motivation	little needed	some needed	much needed

Physical Characteristics

Hearing:

Need to repeat stimulus words	never	seldom	often
Apparent hearing acuity	good	fair	poor
Hearing aid	did not own	owned but did not wear	wore

Vision:

Distance of eyes from page	under 8"	average 8-20"	over 20"
Apparent visual acuity	good	fair	poor
Glasses	did not own	owned but did not wear	wore

Motor Activity:	hypoactive	average	hyperactive
Sedation:	none	slight	hearing

Comments: ____

____

____

____

Revised Food Identification Test

Name ______________________________ ______________
(Last) (First) (Initial) (Unit No.)

Date ______________________________ Sex M F ______
(Month) (Day) (Year) (Circle)

BD ______________________________ Race ______________

Chronological Age ______________

Other Test Data and Mental Age

Name of Test	Date	MA	IQ
______________	______	____	____
______________	______	____	____
______________	______	____	____

IQ x CA = MA

__ __ __

Socioeconomic Status
Income Level

1. 25,000 or above
2. 12,000 - 25,000
3. 10,000 - 12,000
4. 7,000 - 10,000
5. 5,000 - 7,000
6. 3,000 - 5,000
7. 3,000 or below

Income ________ x 5 = ______
Education ________ x 4 = ______
Occupation ________ x 3 = ______
Total ______

Father's Educational Level* ______________

Father's Occupation ______________

No. of family members ______________

Social Status Index (Circle)
Upper Class
Upper Middle
Lower Middle
Upper Lower
Lower Lower

---

*If no father substitute mother

Test Score
No. attempted ____
No. missed ____
Raw Score ____

Directions: Record all responses and make oblique strokes through circles to record errors. The test should be discontinued when the subject has missed six items out of eight consecutive tries.

Word:		Key	Response		Word		Key	Response	
1.	waffles	C	________	0	1.	okra	D	________	0
2.	cranberry sauce	E	________	0	2.	crab	G	________	0
3.	macaroni	B	________	0	3.	tamales	C	________	0
4.	muffin	H	________	0	4.	radishes	D	________	0
5.	chocolate milk	C	________	0	5.	cran-berries	B	________	0
6.	bell pepper	D	________	0	6.	cottage cheese	A	________	0
7.	pork chop	F	________	0	7.	vegetable shortening	H	________	0
8.	celery	E	________	0	8.	potted meat	F	________	0
9.	fruit cocktail	G	________	0	9.	pudding	D	________	0
10.	beets	A	________	0	10.	Chinese noodles	E	________	0
11.	pineapple	C	________	0	11.	cream cheese	G	________	0
1.	pretzels	F	________	0	1.	spring onion	A	________	0
2.	fish	B	________	0	2.	rasp-berries	H	________	0
3.	coconut	E	________	0	3.	grape juice	F	________	0
4.	syrup	A	________	0	4.	margarine	E	________	0
5.	roll	H	________	0	5.	plums	A	________	0
6.	poor boy sandwich	G	________	0	6.	lobster	F	________	0
7.	canteloupe	D	________	0	7.	salami	B	________	0
8.	shrimp	A	________	0	8.	strawberry shortcake	H	________	0
9.	liver	F	________	0	9.	salad dressing	A	________	0
10.	baked potato	D	________	0	10.	tuna fish	C	________	0
11.	sliced ham	B	________	0	11.	apple juice	D	________	0

	Word	Key	Response	
1.	prunes	H		0
2.	grits	C		0
3.	cabbage slaw	G		0
4.	egg plant	B		0
5.	red peppers	E		0 0
6.	nuts	C		0
7.	Vienna sausage	G		0
8.	tangerine	B		0
9.	cauliflower	H		0
10.	mashed potatoes	G		0
11.	oil and vinegar dressing	D		0

	Word	Key	Response	
1.	hominy	B		0
2.	sauerkraut	A	1	0
3.	salt pork	H		0
4.	sherbet	C		0
5.	sardines	F		0
6.	apricots	B		0
7.	soup bone	E		0
8.	cabbage	G		0
9.	oysters	B		0
10.	garlic	B		0
11.	croquette	H		0

1.	broccoli	B		0
2.	wax beans	F		0
3.	oatmeal	D		0
4.	brussels sprouts	G		0
5.	turnip	G		0
6.	roast	H		0
7.	asparagus	A		0
8.	lime	C		0
9.	ham hocks	C		0
10.	mushrooms	H		0
11.	avocado	F		0

1.	chow mein	G		0
2.	pimento	D		0
3.	figs	A		0
4.	acorn squash	F		0
5.	anchovies	D		0
6.	veal cutlet	E		0
7.	lasagna	C		0
8.	parsley	D		0
9.	artichoke	E		0
10.	yams	F		0
11.	water chestnuts	A		0

Test Behavior—Circle appropriate item

Examples needed	only 1	2 or 3	over 3
Rapport	easily attained	slowly attained	poor rapport
Guessing	guessed when asked	resisted guessing	prone to guessing
Speed of Response	fast	average	slow
Attention Span	very attentive	average	distractible
Need for Motivation	little needed	some needed	much needed

Physical Characteristics

Hearing:

Need to repeat stimulus words	never	seldom	often
Apparent hearing acuity	good	fair	poor
Hearing Aid	did not own	owned but did not wear	wore

Vision:

Distance of eyes from page	under 8"	average 8-20"	over 20"
Apparent visual acuity	good	fair	poor
Glasses	did not own	owned but did not wear	wore

Motor Activity:	hypoactive	average	hyperactive
Sedation:	none	slight	hearing

Do you believe that the test performance has indicated the subject's ability? yes_____ no ______

If not, why? ____

____

____

____

Directions for Administering and Scoring Revised FIT

I. Rules for Administration

1. Room should be quiet, undistracting and pleasant.
2. The examiner should be motivating, professional, and congenial.
3. Do not over do praise but motivate the subject by saying: Good! You are doing well. Even with an incorrect response say: That was a good answer.
4. Directions should be given in the same manner each time so read the directions rather than give them from memory.
5. Words may be pronounced aloud more than once by the examiner.
6. Always secure a response. Encourage the subject, after a reasonable length of time, to make his selection. Say: Try to give me the answer. Point to one of the pictures.
7. If the subject seems to be pointing to one corner group after group, repeat frequently: Be sure to look at all eight pictures.
8. Record final response by making oblique strokes through circles.
9. Start the test with one of the following:

   Put your finger on ________
   Can you find ____________
   Point to _______________

10. If pointing is impossible, examiner may point to the alternate and the subject should respond with "yes" or "no."
11. Test should be discontinued when the subject has missed six items out of eight consecutive tries.

II. Rules for Scoring

The raw score is derived from subtracting the errors from the total number of items attempted.

Introducing the Test

Introduce the test by saying:

_________________________, today we are going to play a game. (Turn to the same page and say) Here are eight pictures of foods. Can you put your finger on all of them. (If he doesn't point to each of them take his hand and place his finger on all of the pictures). Now I want you to put your finger on only the one picture I name. Can you put your finger on the candy bar? (If the subject doesn't point to a food, place his finger on the candy bar). (When he has successfully done this say) Good, now put your finger on the potato chips. (When the desired response has been made say) That's right, now show me the picture of the cereal.*

Now we will see other food pictures. Each time I say the name of a food you will put your finger on that food. You may not always know the name of the food but point to the one you think is the one I named. Make sure you look carefully on each page (point to both pages).

*If additional trials are necessary use other foods on the sample page of eight.

Table 5

Item placement in Revised Food Identification Test

Page	A	B	C	D	E	F	G	H
1.	spring onion	broccoli	waffles	okra	hominy	pretzels	chow mein	prunes
2.	sauerkraut	fish	grits	pimento	cranberry sauce	wax beans	crab	rasp-berries
3.	figs	macaroni	tamales	oatmeal	coconut	grape juice	cabbage slaw	salt pork
4.	syrup	egg plant	sherbet	radishes	margarine	acorn squash	brussels sprouts	muffin
5.	plums	cranberries	chocolate milk	anchovies	red peppers	sardines	turnip	roll
6.	cottage cheese	apricots	nuts	bell peppers	veal cutlet	lobster	poor boy sandwich	roast
7.	asparagus	salami	lasagna	canteloupe	soup bone	pork chops	Vienna sausage	vegetable shortening
8.	shrimp	tangerine	lime	parsley	celery	potted meat	cabbage	strawberry shortcake
9.	salad dressing	oysters	ham hocks	pudding	artichoke	liver	fruit cocktail	cauli-flower
10.	beets	garlic	tuna fish	baked potato	Chinese noodles	yams	mashed potatoes	mushroom
11.	water chestnuts	ham	pineapple	apple juice	oil and vine-gar dressing	avocado	cream cheese	croquette

APPENDIX C

PILOT FIT ITEM ANALYSIS

Table 6

Pilot FIT item analysis

Item		Percentage of Correct Selection	Item		Percentage of Correct Selection
1.	grapes	100	41.	salad	95
2.	cookies	100	42.	green beans	95
3.	egg	100	43.	tomato juice	95
4.	milk	100	44.	meat	95
5.	pancakes	100	45.	lettuce and tomato	94
6.	orange juice	100	46.	mayonnaise	94
7.	M & M's	100	47.	rice	94
8.	crackers	100	48.	cucumber	94
9.	saltine crackers	100	49.	chicken	94
10.	coke	98	50.	peaches	94
11.	cereal	98	51.	pork-n-beans	94
12.	onion	98	52.	pie	94
13.	biscuits	98	53.	popcorn	94
14.	pickles	98	54.	mustard	94
15.	fruit cocktail	98	55.	strawberries	94
16.	ice cream cone	98	56.	spaghetti	94
17.	potato chips	98	57.	toast	94
18.	apple	98	58.	cake	94
19.	lemon	98	59.	jelly beans	93
20.	orange	98	60.	graham crackers	92
21.	bread	98	61.	corn	92
22.	doughnut	98	62.	french fried potatoes	92
23.	scrambled eggs	97	63.	lettuce	92
24.	fried eggs	97	64.	fish sticks	91
25.	ketchup	97	65.	applesauce	91
26.	watermelon	97	66.	macaroni and cheese	91
27.	iced tea	97	67.	sweet roll	91
28.	cheese	97	68.	olives	89
29.	raisins	97	69.	kidney beans	89
30.	soup	97	70.	pot pie	89
31.	candy bar	97	71.	carrots	89
32.	bacon	97	72.	chicken and dumplings	89
33.	bologna	97	73.	marshmallows	89
34.	banana	97	74.	field peas	89
35.	blackberries	97	75.	lima beans	89
36.	coffee	97	76.	green peas	88
37.	spaghetti	95	77.	hot chocolate	88
38.	ham and cheese sandwich	95			
39.	tomato	95			
40.	hot dog	95			

Table 6 (continued)

Item		Percentage of Correct Selection	Item		Percentage of Correct Selection
78.	spinach	88	120.	Chinese noodles	75
79.	greens	88	121.	cream cheese	75
80.	yellow squash	88	122.	spring onion	75
81.	grapefruit	88	123.	raspberries	75
82.	hamburger	88	124.	grape juice	75
83.	jelly	88	125.	margarine	75
84.	pizza	86	126.	plums	73
85.	noodles	86	127.	lobster	73
86.	pear	86	128.	salami	72
87.	sweet potato	86	129.	strawberry shortcake	72
88.	worcestershire sauce	86	130.	salad dressing	72
89.	waffles	84	131.	tuna fish	70
90.	cranberry sauce	84	132.	apple juice	69
91.	macaroni	84	133.	prunes	69
92.	muffin	83	134.	grits	69
93.	chocolate milk	83	135.	cabbage slaw	69
94.	bell pepper	83	136.	eggplant	69
95.	pork chop	83	137.	red pepper	67
96.	celery	83	138.	nuts	67
97.	fruit cocktail	81	139.	Vienna sausage	66
98.	beets	81	140.	tangerine	66
99.	pineapple	81	141.	cauliflower	65
100.	pretzels	81	142.	mashed potatoes	64
101.	fish	81	143.	oil and vinegar dressing	64
102.	coconut	81			
103.	syrup	78	144.	broccoli	64
104.	roll	78	145.	wax beans	64
105.	poor boy sandwich	78	146.	oatmeal	64
106.	canteloupe	78	147.	brussels sprouts	63
107.	shrimp	78	148.	turnip	63
108.	liver	78	149.	roast	61
109.	baked potato	78	150.	asparagus	59
110.	ham	78	151.	lime	59
111.	okra	78	152.	ham hocks	59
112.	crab	78	153.	mushrooms	56
113.	tamales	77	154.	avocado	55
114.	radishes	77	155.	hominy	54
115.	cranberries	77	156.	sauerkraut	53
116.	cottage cheese	77	157.	salt pork	53
117.	vegetable shortening	77	158.	sherbet	53
			159.	sardines	52
118.	potted meat	77	160.	apricots	50
119.	pudding	75	161.	soup bone	50

Table 6 (continued)

Item		Percentage of Correct Selection	Item		Percentage of Correct Selection
162.	cabbage	48	169.	acorn squash	41
163.	oysters	48	170.	anchovies	38
164.	garlic	45	171.	veal cutlet	38
165.	croquette	45	172.	lasagna	36
166.	chow mein	44	173.	parsley	34
167.	pimento	44	174.	artichoke	34
168.	figs	41	175.	yams	34
			176.	waterchestnuts	27

APPENDIX D

INDEX OF SOCIAL STATUS

INDEX OF SOCIAL STATUS[a]

O...Occupation	. . . Rate 1 to 7 on Occupation Scale	. . . Weight—	x 5
I...Income	. . . Rate 1 to 7 on Income Scale	. . . Weight—	x 4
E...Education	. . . Rate 1 to 7 on Education Scale	. . . Weight—	x 3

INCOME (I)*

1. If gross income is $25,000 or above
2. If gross income is $12,000 - $25,000
3. If gross income is $10,000 - $12,000
4. If gross income is $ 7,000 - $10,000
5. If gross income is $ 5,000 - $ 7,000
6. If gross income is $ 3,000 - $ 5,000
7. If gross income is $ 3,000 - or below

* Income for a family of four. If there are more than four in the family, adjust points depending on the number in the family. For example you might add ¼ to ½ points to each additional person in the family.

EDUCATION (E)

1. Completed graduate work for a recognized profession; graduate of a generally recognized, high status, four-year college.

2. Graduate from a four-year college, university, or professional school with a recognized bachelor's degree, including four-year teacher colleges.

3. Attended college or university for two or more years; junior college graduate; R.N. from a nursing school.

4. Graduate from high school or completed equivalent secondary education; including various kinds of "post high" business education or trade school study.

5. Attended high school, completed grade nine, but did not graduate from high school.

6. Completed grade eight but did not attend beyond grade nine.

7. Did not complete grade eight.

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[a]Developed by Social Work Department, University of Tennessee Child Development Center.

OCCUPATIONS: LEVEL AND KIND

Rate Professionals	Proprietors	Businessmen	White Collar	Blue Collar	Service	Farm Peo
1. Lawyer, judge, physician, engineer, professor, school supt. et. al.	Large businesses valued at $100,000 or more	Top executives President, et al of corp, bank, public utility.	CPS: editor of newspaper, magazines, exec. sec. of status organ.			Gentleman farmer, etc do not sup directly their prop
2. High school teacher, librarian, 4 yr. degree	Business value at $50,000 to $100,000	Asst. office & dept. managers or supervisors; some mfg, agents.	Acct; ins. real estate, stock salesman; edit. writer			Land operators who supervise properties & and have act. urban life.
3. Grade school tea. registered nurse, minister without 4 year degree	Business or equity value from $10,000 to $50,000	Manager of small branches or buyers & salesmen of known mchdse.	Bank clerk auto salesman postal clerk RR or Tel. agent of supr.	Small contr. who works at or supr. his job		Farm owners with "hired help" operators of leased prop. who supr.
4.	Business or equity values from 5–10 thou.	(Stenographers, ticket agent, sales department stores,	bookkeeper; people in et al.	Foreman; master carpenter, elect et al, RR eng.	Police capt. tailor, RR cond. watchmaker	Small land owner, opr. of rented prop, hiring "Hands"
5.	Business equity value from 2–5 thousand	(Dime store clerks, grocery clerks; telephone & beauty operators, et al.		Apprent. to skilled trades repairmen; mod. skilled wrks.	Policemen, Barber, prac. nur. brakeman et al.	Tenants on good farms foreman owners of farms who hire out
6.	Business, equity value at less than $2,000	Semi—skilled factory and production workers; assistants to skilled trade; warehousemen, watchmen.			Taxi, trk. drivers; waiter gas sta.	Sharecroppers; estab. farm laborers Subs'ce farmer
7.	"REPUTED LAWBREAKERS"	Heavy labor; odd-job men; mine or mill hands, unskilled workers.			att. Domestic help, bus boy, scrub woman, janitor helper	Migrant wrker "squatters-nester"

Table 7

Conversion for social status indices

Index score	Relative status status level	Social class prediction
12	A+	(UC)
13- 17	A	Upper Class
18- 22	A-	
		(23-24)
23- 27	B+	(UM)
28- 32	B	Upper Middle
33- 37	B-	
		(36-38)
38- 41	C+	(LM)
42- 46	C	Lower Middle
47- 51	C-	
		(51-53)
52- 56	D+	(UL)
57- 61	D	Upper lower
62- 66	D-	
		(65-68)
67- 71	E+	(LL)
72- 75	E	lower lower
76- 84	E-	

APPENDIX E

THREE DAY FOOD RECORD FORM

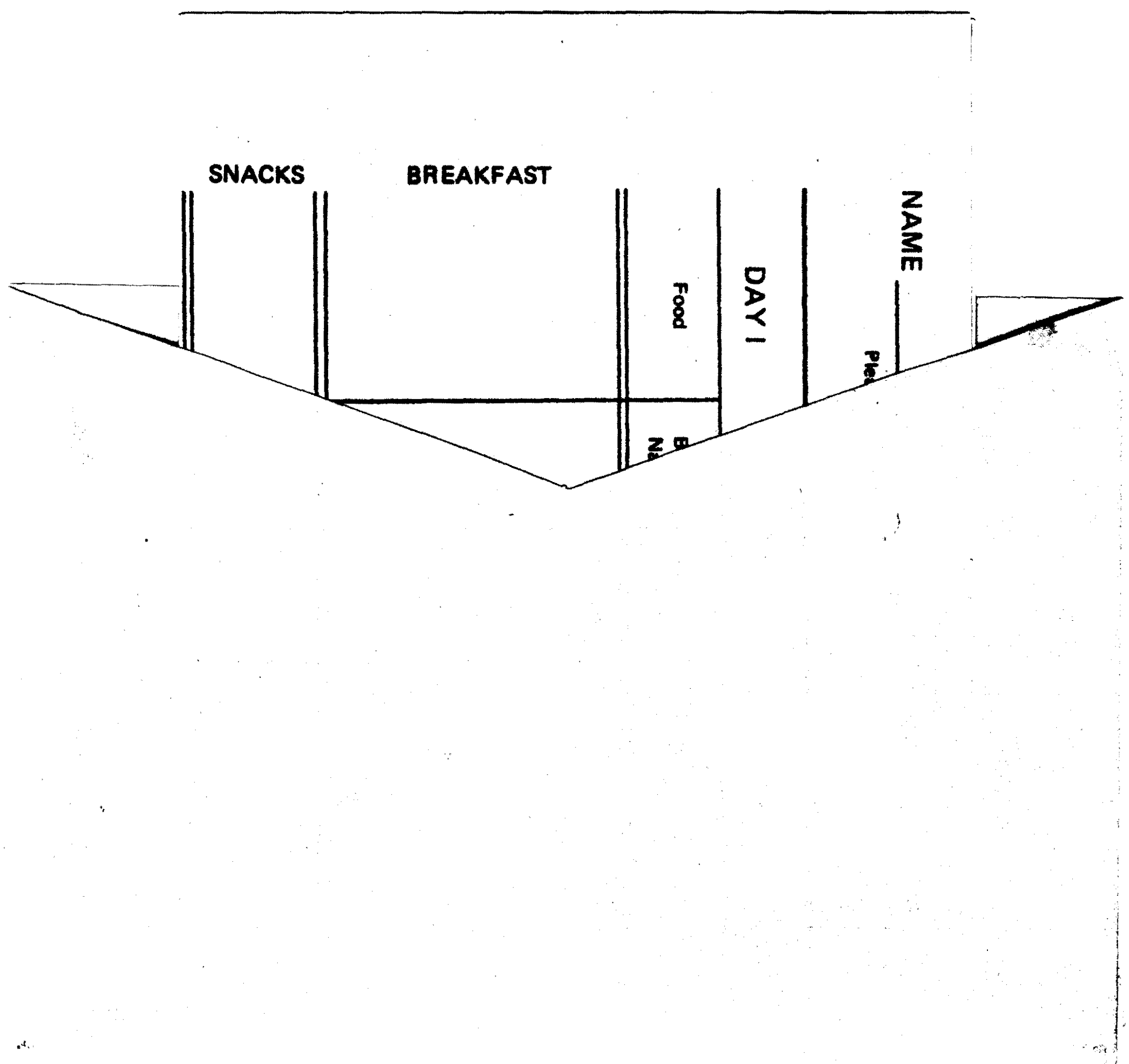

Fig. 5. Three day food record form

Date Returned ______________
NAME ______________________ Unit No: _______ Age _________ Sex _____ Nutritionist ______________ Date Due ______________
Please Print

	DAY I	DATE:			DAY II	DATE:			DAY III	DATE:		
	Food	Brand Name	Cooking Method	Amount Eaten	Food	Brand Name	Cooking Method	Amount Eaten	Food	Brand Name	Cooking Method	Amount Eaten
BREAKFAST												
SNACKS												
LUNCH												
SNACKS												
DINNER												
SNACKS												

APPENDIX F

DIETARY SCORING WITH BASIC FOUR FOOD GROUPS

DIETARY SCORING WITH BASIC FOUR FOOD GROUPS

DIETARY SCORE----PERFECT SCORE 15

Daily Guide	*Food Groups*	*Consumption*	*Total*	*Score*
4	*Bread-Cereals:*			
	a. Breads			
	b. Cereals			
3	*Meat:*			
	a. Eggs			
	b. Lean meat, Fish or Fowl			
	c. Nuts or Legumes			
4	*Fruit-Vegetable:*			
	a. Good sources of Vitamin C (1)			
	b. Good sources of Vitamin A (1)			
	c. Other vegetables and fruits (2)			
4	*Milk and Dairy Products:*			
	a. Milk			
	b. Ice cream			
	c. Cheeses			
0	*Miscellaneous:*			
	a. Sweets			
	b. Party foods (chips, crackers, dips)			
	c. Other beverages (cokes, tea, koolaide)			
	d. Fats and oils			

*Score*____________________

APPENDIX G

USDA MEAL PATTERN FOR CHILDREN

Table 8

USDA Meal Pattern for Children
A guide to the amounts of food for different age groups[1]

Pattern	Children 1 up to 3 years	Children 3 up to 6 years	Children 6 up to 12 years	Age 12 and over
Breakfast Pattern:				
Juice or fruit	1/4 cup	1/2 cup	1/2 cup	1 cup
Cereal or bread:				
Cereal	1/4 cup	1/3 cup	3/4 cup	1 cup
Bread	1/2 slice	1/2 slice	1 slice	2 slices
Milk	1/2 cup (4 fl. oz.)	3/4 cup	1 cup	1 cup
Lunch or Supper pattern:				
Meat or alternate:				
One of the following or combinations to give equivalent quantities:				
Meat, poultry, fish	1 ounce	1-1/2 ounces	2 ounces	3 ounces
Cheese	1 ounce	1-1/2 ounces	2 ounces	3 ounces
Egg[2]	1	1	1	1
Cooked dry beans and peas	1/8 cup	1/4 cup	1/2 cup	1 cup
Peanut butter	1 tablespoon	2 tablespoons	4 tablespoons	5 tablespoons
Vegetable and fruit[3]	1/4 cup	1/2 cup	3/4 cup	1-1/4 cup
Bread	1/2 slice	1/2 slice	1 slice	2 slices
Milk	1/2 cup	3/4 cup	1 cup	1 cup
Butter	1/2 teaspoon	1 teaspoon	2 teaspoons	2 teaspoons

Table 8 (continued)

Pattern	Children 1 up to 3 years	Children 3 up to 6 years	Children 6 up to 12 years	Age 12 and over
Supplemental foods served between meals (A. M. and P. M. snacks):				
Milk or juice..................	1/2 cup	1/2 cup	1 cup	1 cup
Cereal or bread:				
Cereal..................	1/4 cup	1/3 cup	3/4 cup	1 cup
Bread...................	1/2 slice	1/2 slice	1 slice	2 slices

[1] Individual children will differ in amounts they will eat.

[2] When egg is served use in addition to a half portion of meat or other alternate for all except children 1 up to 6 years.

[3] Should include at least two kinds

APPENDIX H

CLASSIFICATION SYSTEMS FOR INTELLECTUAL FUNCTIONING

Table 9

Classification systems for intellectual functioning

Stanford-Binet Classification System[a]

Intellectual Level	IQ Range
Very superior	150+
Superior	130-149
High average	110-129
Average	90-109
Low average	80-89
Borderline defective	70-79
Mentally defective	69 and below

Child Development Center Classification System[b]

Intellectual Level	IQ Range
Very superior	130+
Superior	120-129
High average	110-119
Average	90-109
Low average	80-89
Borderline retardation	70-79
Mild retardation	52-69
Moderate retardation	36-51
Severe retardation	20-35
Profound retardation	20 and below

[a]Terman, L. M. & Merrill, M. (1960) Stanford-Binet Intelligence Scale Manual for Third Revision. Houghton, Miffin Co., Boston.

[b]University of Tennessee Child Development Center Diagnostic, Classification, and Coding Manual. July, 1973.

Table 10

Classification systems for mental retardation

Level of Mental Retardation	IQ Scores[a]	Mental Age Range at Adulthood[b]
Borderline	68-83	10 yr. 11 mo. - 13 yr. 3 mo.
Mild	52-67	8 yr. 6 mo. - 10 yr. 10 mo.
Moderate	36-51	6 yr. 1 mo. - 8 yr. 5 mo.
Severe	20-35	3 yr. 9 mo. - 6 yr. 0 mo.
Profound	Under 20	3 yr. 8 mo. - and below

[a]Grossman, H. J. (1961) American Association on Mental Deficiency Manual on Terminology and Classification in Mental Retardation. Garamond, Pridemark Press, Baltimore.

[b]Robinson, H. B., and Robinson, N. M. (1965) The Mentally Retarded Child. McGraw-Hill, New York. June, 1969.

VITA

Kathryn Ann Craig Wall was born in Hohenwald, Tennessee, on January 15, 1947. She attended elementary and junior high schools in Vicksburg, Mississippi, and was graduated from H. V. Cooper High School in that city in 1965. She entered David Lipscomb College in Nashville, Tennessee, and in June, 1969 she received a Bachelor of Science degree in Home Economics. In September of that year she entered a dietetic internship at Vanderbilt University Hospital. She is a registered dietitian and worked at Methodist Hospital in Memphis during 1971 and at the University of Tennessee Child Development Center from January, 1972 - December 1974.

She entered the Graduate School at the University of Tennessee in June, 1971, and received the Master of Science degree with a major in Nu rition in March, 1976. She is a member of the Memphis, Tennessee and American Dietetic Associations, Memphis Area Nutrition Council, Nutrition Today Society, Society for Nutrition Education, American Association on Mental Deficiency and Omicron Nu.

She is married to Thomas Clayton Wall and has one daughter.