NUTRITION KNOWLEDGE AND DIETARY PRACTICES OF A SELECT GROUP OF ADULT MALES WITH EMPHASIS ON THE DEVELOPMENT AND VALIDATION OF THE KNOWLEDGE TEST INSTRUMENT

by

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ABSTRACT

Thirty-eight adult males, 25 to 35 years and employed in a local insurance company, participated in a study designed to test the relationships between nutrition knowledge, dietary practices, and other attribute variables. Extensive work was done on the development and validation of the nutrition knowledge test. The research instruments included a 30-item multiple-choice nutrition knowledge test, a three-day food record, a 23-item forced-choice test to measure internal-external locus of personality control, and a 13-item biographical and food habit questionnaire. The nutrition knowledge score was based on a 26-item version of the test (KR20 = 0.69) and the dietary practice score was based on the intake of 9 nutrients and two levels of energy and in relation to the Canadian Dietary Standard (revised 1975). The level of nutrition knowledge of the group was low. The mean score on the nutrition test was 38 percent. Misconceptions about balanced food selection existed and there was a low level of knowledge in the area of food composition and nutrient sources and weight control. In the area of cardiovascular health, the group answered more correctly about vegetable oils and good health than about hydrogenated forms of these oils. As a group, the intake of nutrients and energy generally met or exceeded the recommended Canadian levels and the distribution of kilocalories in the diet was close to the recommended proportions. At least one-third of the nutrients were consumed away from home. The majority of the adult males were classified as internally-controlled, most of the subjects consulted newspapers or magazines for their nutrition information and shared the responsibilities for meal planning and/or preparation with someone else. Nutrition knowledge was significantly and negatively related to dietary practices ($p < 0.043$) and there was a significant difference ($p < 0.013$) between the nutrition knowledge scores of the sole planner and/or preparer of meals on a regular basis and the sole planner on an occasional basis.

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I. INTRODUCTION

Extensive research has been devoted to discovering what factors influence food habits and why food habits are difficult to change. The difficulty of this task is apparent if one considers the powerful social and cultural dimensions of food as described by Todhunter (1973):

> Food is prestige, status and wealth -- a mark of what one can afford to buy...It is a means of communication and interpersonal relations, such as an 'apple for the teacher,' or an expression of hospitality, friendship, affection, neighborliness, comfort and sympathy in time of sadness or disaster. It symbolizes strength, athleticism, health and success. It is a means of pleasure and self-gratification and a relief from stress. It is feasts, ceremony, rituals, special days and nostalgia for home, family and the 'good old days.' It is an expression of individuality and sophistication, a means of self-expression and a way of revolt. Most of all, it is tradition, custom and security.

Thus the same author writes, it is "...easier to talk about man's food habits today and how they originated than it is to understand the complex interacting physical, economic, political, social and psychological, emotional and technological factors that have produced them and that permit or prevent change" (Todhunter, 1973).

Efforts to uncover the cultural, social, personal and situational factors that influence food choices have proceeded from descriptive papers in the 1940's to the 1960's (Mead, 1943; Eppright, 1947; Pumpian-Mindlin, 1954; Lee, 1957; Moore, 1957; Fathauer, 1960) to more recent research with or without the statistical correlation of isolated

demographic factors and/or attitudes and values to dietary quality (Wilhelmy et al., 1950; Boek, 1956; Fox et al., 1970; Steelman, 1976; AuCoin et al., 1972; Coughenour, 1972; Walter, 1973; Suter and Barbour, 1975; Cosper and Wakefield, 1975; Hertzler and Owen, 1976; Schafer, 1978). Finally, the complex interactions of both external and internal influences on food habits have been recognized and various hypothetical models have been constructed in recent years (Sims and Morris, 1974; Caliendo and Sanjur, 1978; Krondl and Lau, 1978) in attempts to explain the reasons underlying food behaviors so that nutrition education endeavors would be more profitable. Statistical analyses applied to segments of the model have been undertaken in order to strengthen the predictive nature of the models.

Nutrition knowledge, an internal influence on food habits, plays a part in the hypothetical models described by Krondl and Lau (1978) and in the path model constructed by Caliendo and Sanjur (1978). Earlier than this, however, the importance of nutrition knowledge had been recognized, and several studies had been conducted to assess the level of nutrition knowledge of different groups. The application of research of this type to the understanding of food habits is evident when nutrition knowledge has been correlated with dietary practices. This corresponds to the general viewpoint held that nutrition information is useful only to the extent that it is applied.

A more rigorous approach to interpreting the relationship between knowledge and food practices involves an evaluation of the methods to assess these variables, in particular, nutrition knowledge. Confidence in the outcomes of the research follows from using instruments that yield reasonably valid and reliable results. Nutrition knowledge

has been measured in the literature in various ways and it is only recently that emphasis has been placed on the research methodology. Similarly, in the following review, the methodology used to assess nutrition knowledge, an internal influence on food habits, will be emphasized.

II. REVIEW OF LITERATURE

A. DEVELOPMENT AND VALIDATION OF TESTS

In any research project in which data are collected, not only the adequacy of the research design, but also the quality of the measurement procedures must be considered in order to have a research project of recognizable quality. Few instruments employed in the social sciences meet all the criteria of an ideal measuring instrument: relevance, reliability, validity, and sensitivity (Selltiz et al., 1976). A variety of factors, some relatively stable, some transitory, affect the scores obtained on any measuring instrument. These factors contribute to either constant (systematic or biasing) errors or random (variable) errors. Two stable characteristics of individuals which are of immediate concern to researchers are: the tendency to give a favorable picture of oneself (social desirability influence) and the tendency to agree or disagree with statements regardless of their context (acquiescent response set). Nevertheless it is possible to increase the validity and reliability of a test instrument by reducing the errors of measurement.

A test administered with the purpose of obtaining an assessment of an individual's nutrition knowledge is subject to errors which can be reduced to a minimum if specific procedures are used. The assessment of validity and reliability become important in this instance. Validity, that is, the accuracy with which an instrument measures what it is

supposed to measure can be investigated by either a practical or pragmatic approach or indirectly by construct validation procedures. In the former case, validity is judged in terms of accuracy of predictions of the criterion based on the test results. For example, a scholastic achievement test may be validated by comparing scores on the test with grade point averages (GPA's), the criterion. If there is no correlation, the test may not be valid in predicting GPA's. It should also be considered that validity pertains to the results of a test, is a matter of degree -- not all or none, and is specific to some particular use and group (Gronlund, 1976). In addition, "...validity depends on the purpose for which a test is used, the group with which it is used, and the skill with which it is used; and test validity may deteriorate as the test is used repeatedly" (Ebel, 1965).

Next to validity, reliability is the most important characteristic of evaluation results (Gronlund, 1976). Thus, in order to be valid, a test must be reliable, that is, a test must be consistent in whatever it measures. It has been stated that "reliability is a necessary, but not a sufficient condition for validity" (Kerlinger, 1973; Gronlund, 1976). A detailed explanation of how to estimate, interpret, and improve test reliability is provided by Ebel (1965). Similar to the discussion of validity, the properties of reliability should not be overlooked. Reliability refers to the results obtained; test scores are not reliable in general, rather they are reliable or generalizable over different periods of time, over different samples of questions, over different raters etc.; is necessary but not sufficient; and reliability is primarily statistical in nature (Gronlund, 1976).

An explanation of some of the research terminology is important for the interpretation of nutrition knowledge studies. "Validation" refers to the total process of determining the validity and the reliability of test instruments, since reliability goes "hand-in-hand" with validity. Content validity is described as "the representativeness or sampling adequacy of the content--the substance, the matter, the topics--of a measuring instrument" (Kerlinger, 1973). Content validity differs from "face validity" in that the former requires subject matter expertise, while the latter refers to the appearance of the test to the layman (Martuza, 1977). "A test that appears to be a relevant measure based on superficial examination is said to have face validity" (Gronlund, 1976). The assessment of content validity is generally a subjective process, but requires individuals knowledgeable in the subject matter.

Construct validation is the next step in validation. Kerlinger (1973) places his greatest emphasis on construct validity since "it is probably the most important form of validity from the scientific research point of view." Construct validation concerns the "extent to which test performance can be interpreted in terms of certain psychological constructs" (Gronlund, 1976). According to Gronlund (1976) there is no adequate single method of establishing construct validity. It is simply a matter of accumulating evidence from many different sources. In the "known groups" method, groups of people with "known" characteristics, for example, nutrition knowledge, would have an instrument administered to them following the prediction of the direction of differences (Kerlinger, 1973; Martuza, 1977). Gronlund (1976) has outlined the process of construct validation. First of all, the constructs

presumed to account for test performance should be identified. Secondly, hypotheses regarding test performance from the theory underlying the construct should be set up. Finally, the hypotheses are tested by logical and empirical means and then each hypothesis is tested with each test score. Another method of assessing construct validity which is linked to reliability programs is the use of the corrected item--total correlation. In this method, each test item is correlated with the total test score; however, one major difference in this approach is that the total score is assumed to be valid. Then the extent that an item measures the same thing as the total score does, to that extent the item is valid (Kerlinger, 1973).

Coinciding with validity is the necessary, but not sufficient condition of reliability. Test reliability has been operationally defined as the coefficient of correlation between scores on two equivalent forms of a test for a specified group of examiners or subjects (Ebel, 1965). The higher the coefficient, the more consistently the test measures what it is supposed to measure. Formula approaches to the assessment of test reliability have been employed to overcome some of the limitations involving test-retest methods or methods requiring the construction of equivalent forms of the test. The Kuder-Richardson formulae provide estimates of the reliability of a single test from a single administration and are employed when single unit weight-rights only scoring is used (Kuder and Richardson, 1937). These are measures of internal consistency, assuming that all items in the test are homogeneous. Information on the difficulty (proportion of correct response) of each item in the test, the variability of the test scores, and the numbers of items in the test are required for this

analysis.

A sophisticated approach to improving test quality is through a six step systematic process of item analysis described by Ebel (1965) and others (Gronlund, 1976; Martuza, 1977). Item analysis is the analysis of subject response to objective test items to yield the two indices of discrimination and difficulty. The index of discrimination is based on the difference between the upper and lower 27 percent of the test group in proportion of correct response and is biased in favor of items of middle difficulty. The index of difficulty expresses the percent of correct responses so that the higher the numerical value of this index, the easier the item. Higher reliability of the test scores occurs when items are concentrated near the midpoint of difficulty. Following item analysis, the next step in constructing a test that yields reliable results is the selection of the best (ie. most discriminating) items for the improved version of the test. According to Ebel (1965), a test containing higher discrimination indices, that is, 0.40 and over is more reliable than a similar test composed of items with lower discrimination indices. Martuza (1977) indicated that the prevailing practice in norm-referenced test construction is to attempt to have items in the 0.30 - 0.70 range. However, on the practical side he stated that there are reasons for including items which are weak discriminators. In addition, Gronlund (1976) also considers the practical viewpoint in saying that "the tentative nature of item analysis should discourage us from making fine distinctions on the basis of indices of difficulty and discriminating power." Preferably items with low indices can be revised to improve their discrimination indices and subsequently be re-analyzed by item analysis.

B. NUTRITION KNOWLEDGE STUDIES

Knowledge of nutrition has been measured, according to the literature, to meet either one or all of three major research objectives. First of all, the level of awareness of the subject matter by several different groups has been examined. Also considered have been food fallacies or misconceptions about foods and nutrition. The assessment of nutrition knowledge in these cases has assisted in the design of effective nutrition education programs. Secondly, nutrition knowledge has been measured in studies termed ex post facto research (Kerlinger, 1973) in which the relationships between nutrition knowledge and other attribute variables such as attitudes, personality, and dietary practices have been investigated. As indicated earlier, these studies usually formed the basis for discussions on factors influencing food habits. Finally, nutrition knowledge has been measured in true experimental research designs employing the pre-post test pattern as an indication of change following nutrition education programs.

Studies assessing nutrition knowledge alone or with demographic characteristics such as age, occupation, and education and those investigating the relationships between nutrition knowledge, dietary practices and other attribute variables in ex post facto research designs will be considered in the following review of literature. Emphasis will be placed on the validity and reliability of the instruments designed to measure nutrition knowledge.

C. THE ASSESSMENT OF NUTRITION KNOWLEDGE AND BELIEFS

Traditionally females have been more involved than males in the buying of food and the preparation of meals. For this major reason

studies have been conducted on the nutrition knowledge of homemakers under the assumption that those homemakers with better nutrition knowledge would plan more nutritious meals. The first studies used open-ended questioning approaches and had limited content of subject matter, while later surveys have employed more sophisticated test instruments and validation procedures.

One of the earliest surveys of nutrition knowledge was undertaken by Young et al.(1956a). Nutrition knowledge of 645 homemakers in Rochester and Syracuse, New York,was assessed by responses to open-ended questions which were related to foods to be included in the daily menu, the definition of a "balanced" meal, and the meaning of the "basic 7", for example. A general assessment of knowledge was based on the number of food groups for which the homemaker could give a nutritionally correct reason for including in the family's meals. Nineteen to thirty percent of the homemakers had minimal knowledge (ie. gave correct responses for 3 or more food groups), while one-third to one-half displayed no evidence of nutrition knowledge (ie. gave no reasons or erroneous ones). Only one quarter could provide a nutritionally meaningful and adequate definition of a balanced diet. To summarize, the younger, better educated, and higher income homemakers had the greatest knowledge. Formal education seemed the most important single factor related to nutrition knowledge. No statistical analyses were conducted on the results or test instruments.

In 1963, Brown et al. (1963) investigated the nutrition knowledge of 81 British housewives by a questionnaire survey in which the respondents were required to suggest two foods which were good sources of the five nutrients: protein, iron, carbohydrate, calcium, and

vitamin C. In addition, they were asked to respond "true" or "false" to 11 sayings on food misconceptions. Acknowledging the limited techniques for assessing knowledge, the authors concluded that, in general, whether their knowledge of nutrition was right or wrong, it had little bearing on the actual choice of foods purchased and consumed.

The nutrition knowledge of 238 mothers of 264 junior high children in Vermont was tested in a study by Morse et al. (1967) using the Kilander Information Test comprising 33 multiple-choice questions covering a wide range of practical information on nutrition and diet. Few details of this test were disclosed except that it had been revised in 1946 and 1957. Knowledge was later related to their education, occupation, and the nutritional status of their children. Those mothers with higher education had higher test scores.

Following this early emphasis on the nutrition knowledge of the homemaker, the importance of assessing the knowledge of other groups has been recognized. Certain individuals, especially those in teaching and health-related professions hold positions whereby the dissemination of nutrition information, whether correct or incorrect is inevitable. Therefore, the nutrition knowledge of nurses, medical students and physicians, physical education majors, and elementary school teachers has been investigated in later research.

A 67 true or false item test including 4 categories of knowledge and deemed appropriate for nurses to know about was used by Harrison et al. (1969). It was pretested on nurses and two control groups; one having no connection with nutrition or medicine, the other consisting of graduate students in nutrition in order to check the ambiguity of