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The Interaction Model of Client Health Behavior as a Conceptual Guide in the Explanation of Children's Health Behaviors

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Abstract This study used the Interaction Model of Client Health Behavior (IMCHB) as a conceptual guide to explain the correlates of children's diet and physical activity and explore the relationships of sex with their diet and physical activity of the school-aged child. A descriptive correlational study was conducted on 371 fifth-grade students and their parents. Information on the family's demographics, health experience, social influence, and environmental resources was collected, as well as data on the children's intrinsic motivation, cognitive appraisal, and affective response to food/physical activity. Children's self-reports on diet and physical activity were collected, as were parents' self-reports on health habits. Food preferences and diet self-efficacy explained the most variance in diet behavior for girls and boys. Girls scored healthier on food preferences and diet self-efficacy than did boys, but no difference was detected in their diet behavior. Girls participated in more low-intensity physical activity, but boys participated in more high-intensity physical activity than did girls. Findings provide strong support for the use of the IMCHB to explain children's diet but weak support for the explanation of children's physical activity. Further study of additional factors predictive of physical activity is indicated.

Key words: children, diet and physical activity, Interaction Model of Client Health Behavior.

Patterns of diet and physical activity affect physiologic risk factors for cardiovascular disease (CVD) (Shea, Basch, & Irigoyen, 1991; American Heart Association, 1998), which kills more Americans than any other disease (American Heart Association, 1998; Satcher, 1997). An increasing emphasis has been placed on the development of positive health habits early in life, because physiological risk factors for CVD remain stable over time from childhood into adulthood (Thomas, Groer, & Droppleman, 1993; Kelder, Perry, Klepp, & Lytle, 1994). The development of these risk factors largely depends on the initiation of health-compromising behaviors such as poor diet, lack of physical activity, and cigarette smoking (Perry et al., 1990). The research suggests that interventions to promote a healthy lifestyle should begin prior to sixth grade, before behavioral patterns are resistant to change (Perry, Klepp, & Sillers, 1989; Perry et al., 1990; Kelder et al., 1994). The purpose of this study was to identify those variables that influence the school-age child's enactment of diet and physical activity.

The National Health and Nutrition Examination Study (NHANES II) is a major source of dietary data on children. The NHANES II researchers found that diets of children in the United States were high in fat and cholesterol content (Kimm, Gergen, Malloy, Dresser, & Carroll, 1990). Confirming those results, Thompson and

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Dennison (1994) found that more than 80% of children in the United States consume an excess of total fat, saturated fat, and cholesterol than is recommended. Poor eating habits in childhood can lead to obesity, as well as to high cholesterol levels (Harrell & Frauman, 1994).

Indeed, the prevalence of obesity among children and adolescents nearly doubled in the time interval between NHANES II (1976–1980) and NHANES III (1988–1994), increasing from an estimated 7% to 11% among children aged 6–11 years and from an estimated 5% to 11% among adolescents aged 12–19 years. Initial estimates from the most recent data collected, NHANES 1999, indicate that obesity may be increasing to even higher levels, with 13% of children aged 6–11 years and 14% of adolescents aged 12–19 years determined to be overweight (National Center for Health Statistics, 1999).

Disturbingly low levels of physical activity in children have also been documented (Pender, 1996). Recent reports have estimated that only 20% of children who exercise do so at energy levels that are beneficial to health (U.S. Department of Health and Human Services, 1996). Physical activity declines almost 50% during the childhood and adolescent years, with girls becoming increasingly more sedentary than boys (Rowland, 1990).

Behavioral research on children's diet and physical activity is at an early stage of development. For nurses to make a contribution, a strong conceptual basis for testing, refining, and expanding knowledge development in health promotion is essential.

THEORETICAL FRAMEWORK

In an effort to incorporate each client's individual differences into a systematic and comprehensive structure that examines the multiple determinants of health behaviors, the Interaction Model of Client Health Behavior (IMCHB) was developed by Cox (1982). The IMCHB is organized by three major elements: client singularity (individual characteristics), client–professional interaction, and health outcome. The client singularity and health-outcome elements guided this study.

Client singularity consists of background variables (e.g., demographic characteristics, social influence, health experience, and environmental resources), intrinsic motivation, cognitive appraisal, and affective response. Health outcome includes five components: utilization of health care services, clinical health status indicators, severity of health care problem, adherence to the recommended care regimen, and satisfaction with care. The outcome of the IMCHB is health behavior or a health state resultant from that behavior (Cox, 1982). In the present study, children's health behaviors were selected as the clinical health status indicators. Specifically, diet and physical activity were the behaviors that were addressed (Fig. 1).

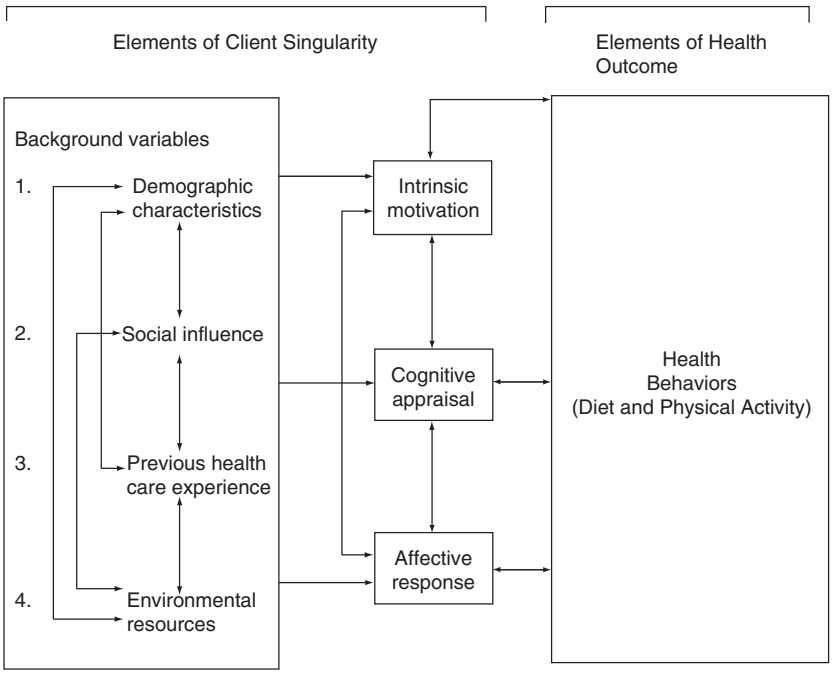

Figure 1. Conceptual Guide to Explain Children's Health Behaviors. Adapted from the Interaction Model of Client Health Behavior (Cox, 1982).

Support for the IMCHB is evidenced by an inquiry of community-based elderly persons that explained 54% of the variance in their health status and 47% of the variance in their well-being (Cox, 1986). Additionally, a study of military personnel found that 25% of the variance in health risk and 47% of the variance in health status were explained by the model (Troumbley & Lenz, 1992). The model was also validated for an adolescent population with an investigation of sexual decision-making among rural adolescent females (Locke & Vincent, 1995). Demographics, social influence, environmental resources, and cognitive appraisal explained 31% of the variance in premarital intercourse.

In the only previous comprehensive study that utilized the IMCHB to predict determinants of school-aged children's health behaviors, Farrand and Cox (1993) examined two of the three major elements—client singularity and health outcome. The model accounted for 53% of the variance in girls' self-reported behavior and 63% of the variance in boys' self-reported behavior. A problem with the study, however, was that the researchers measured six different healthy and risky behaviors as a single dependent variable. The summative score was used to represent an index of total health-promotion behaviors for the child. There, however, may not be a "globally healthy lifestyle;" at least one study showed children to be at risk of some unhealthy behaviors but not for others (Terre, Drabman, Meydrech, & Hsu, 1992). It is probable that children's health behaviors may be domain specific.

The purpose of this investigation was to identify those variables that influence the school-age child's enactment of diet and physical activity. Specific objectives were (1) to use the IMCHB as a conceptual guide to explain the correlates of children's diet and physical activity and (2) to determine the contributions of sociodemographic variables, health experiences, family influence, intrinsic motivation, cognitive appraisal, and affective response to children's diet and physical activity. The study also examined the relationship of sex with diet and physical activity.

SUBJECTS AND METHODS

Design

The research was a descriptive correlational study of the diet and physical activity of the school-age child. A cross-sectional design was used. The operationalization of the IMCHB was done specifically with the client singularity and health-outcome elements (Table 1).

Sample

Children ($n = 371$) enrolled in the fifth grade of four separate school districts in the southeastern United States, and their parents, comprised the sample. The

TABLE 1. *Interaction Model of Client Health Behavior (IMCHB) Element Measurement Approach*

IMCHB elements	Study variables	Measures
Client singularity		
Demographic characteristics	Child's age	Modified Family Profile
	Child's sex	
	Parental marital status	
Social influence	Family function	Family APGAR Child Form
	Parental health habits	Health Habits Scale
Health Experience	Child health	Modified Family Profile
	Parent health	
Environmental resources	Financial difficulty	Modified Family Profile
	Parental educational level	
Intrinsic motivation	Child's diet self-efficacy	CATCH HBQ Children's Dietary Self-Efficacy Scale
	Child's physical activity self-efficacy	CATCH HBQ Children's Physical Activity Self-Efficacy Scale
Cognitive appraisal	Child's health perception	Child's Self-Rating of Health Status
Affective Response	Food preferences	Hearty Heart Food Preference Questionnaire
	Feelings toward exercise	CHIC II Attitudes Toward Exercise-Self Scale of the YHS
Health outcome		
Health behaviors	Child's diet	CATCH HBQ Food Behavior Scale
	Child's physical activity	CHIC II Physical Activity Checklist of the YHS

Note. CATCH, Child and Adolescent Trial for Cardiovascular Health; CHIC, Cardiovascular Health in Children and Youth; HBQ, Health Behavior Questionnaire; YHS, Youth Health Survey.

four districts were selected to ensure a more diverse sample and to provide a cross-section of sex, socioeconomic status, and health experiences. Permission to select potential subjects through the public schools was obtained from the school administration. Prior to contacting potential participants, approval was obtained through the College of Nursing's Human Subjects Review Committee and, subsequently, by The University of Tennessee Institutional Review Board.

Procedure

A pilot test of all instruments was conducted to ensure that the procedures were clear and that the items were understandable. Tools were piloted with a group of 12 fifth-grade children in a simulated classroom environment. The time needed for instruction and completion of the instruments was determined from the pilot procedure. Piloting was also conducted with eight adults to determine clarity of instruction and the usability of the Family Profile and the Health Habits Scale (HHS) for parents. The Family Profile was revised based on questions encountered and the general reaction of the sample to the questions.

In each case, presentation of the study was given by the investigator to the elementary principals. A written abstract of the study, as well as copies of the instruments, was circulated before the presentation. With approval of the principals, the individual teachers were advised of the study and appointment for presentation to the fifth-grade classrooms was arranged. Subsequently, a letter inviting participation, along with parental consent forms and the two scales (Modified Family Profile and HHS) for the parents, was given to children by the classroom teachers and sent home with the children. For those families who agreed to participate, one parent completed the instruments at the home. Assent of the children was obtained in the classroom after their parents had signed an informed consent. The child surveys were administered on a group basis. Verbal and nonverbal cues were used to identify misunderstanding and to provide clarification and encouragement. Students who chose not to participate were teacher occupied during the test administration. The protocol for survey administration helped ensure the integrity of the data-collection process and protect against a positive response bias. The physical activity and diet behavior scales were measured prior to other scales. This arrangement minimized the potential for students to base their behavioral responses on what they thought was healthy.

The measures addressing each construct within the context of the IMCHB model are as follows:

1. *Demographic characteristics*: Child's age and sex and marital status of parents as measured by the parent's responses on a modified Family Profile (Farrand, 1991).
2. *Social influence*: Family function as measured by the child's responses on the (child) form of the Family APGAR (Austin & Huberty, 1989) and parental health habits as measured by the parent's score on the HHS (Williams, Thomas, Young, Jozwiak, & Hector, 1991).
3. *Health experience*: Family health (child's health and parent's health) as measured by the parent's responses on the modified Family Profile (Farrand, 1991).
4. *Environmental resources*: Parent's educational level and family's financial difficulty as measured by the parent's responses on the modified Family Profile (Farrand, 1991).
5. *Intrinsic motivation*: Health motivation as measured by the child's scores on the Children's Dietary Self-Efficacy Scale (CDSS) and the Children's Physical Activity Self-Efficacy Scale of the Child and Adolescent Trial for Cardiovascular Health (CATCH) Health Behavior Questionnaire (HBQ).
6. *Cognitive appraisal*: Self-rating of general health as measured by the child's perceived health status.
7. *Affective response*: Preference for food as measured by the child's scores on the Hearty Heart Food Preference questionnaire and feelings toward exercise as measured by the Attitudes Toward Exercise-Self Scale of the Youth Health Survey (YHS).
8. *Clinical health status indicators*: Self-reports of diet and physical activity.
9. *Diet*: Diet as measured by the child's scores on the Food Behavior Scale of the CATCH HBQ.
10. *Physical activity*: Physical activity as measured by the child's scores on the Physical Activity Checklist of the YHS.

Measures

Demographics, family health, financial difficulty, and parental educational level

These variables were assessed using a modified version of the Family Profile that was developed by Farrand (1991) for her dissertation study of a child's sociocultural and intrapersonal characteristics that contribute to his/her awareness of health and form the basis for positive health behaviors. Three questions were deleted that were unnecessary for the purpose of the study discussed in this article but were helpful in answering her research question. The Modified Family Profile that was completed by

parents in this inquiry totaled five items. In addition, a panel of experts determined that another question would elicit more honest responses than asking for the family's total income, as on the original Family Profile. Demographic data collected included the child's age and sex, as well as the parent's marital status and educational attainment. Family health was assessed by the child's health status (as evaluated by the parent) and the parent's health status by rating the child's health and his/her health on a four-point Likert scale, ranging from excellent (1) to poor (4). Financial difficulty was determined by asking the parent the amount of financial difficulty that the family was currently experiencing as little (1), moderate (2), or great (3). Parental educational level was measured by the self-reported years of schooling from 0 (none) to 18+ years (graduate or professional degree).

Family function

The child's perception of family function was measured by the Family APGAR Child Form that features five closed-ended questions and a three-point, Likert-type scale. Response choices were "Almost always (3), Some of the time (2), and Hardly ever (1)." The items were summed for a total score. This tool, developed by Austin and Huberty (1989) for those 8 years and older, is based on the original Family APGAR (Smilkstein, 1978) and reflects the functional components of adaptability, partnership, growth, affection, and resolve. For this sample of students, Cronbach's α was 0.74.

Parental health habits

The parent self-reported on the HHS, a brief checklist developed on two different samples of adults ($n = 1519$ and $n = 763$). The HHS consists of five positive health items (e.g., exercise) and five negative items (e.g., smoking) (Williams et al., 1991). Subjects indicate their participation level by checking one of the following categories: never (0), rarely (1), periodically (2), regularly (3), or always (4). The score is computed by subtracting the response weightings for the five negative behaviors from the response weightings for the five positive behaviors.

Diet self-efficacy

The children's self-confidence in their ability to choose lower fat, lower sodium foods rather than high-fat or high-sodium alternative foods was measured by the CDSS of the HBQ. The HBQ was developed and piloted during Phase 1 of CATCH, a school-based, longitudinal CVD risk factor intervention that was implemented for 3 years among children in 96 schools (Edmundson et al., 1996). The 15-item stems began with "How sure are you …?" The response format was a three-point, Likert-type scale with the options of "not sure," "a little sure," or "very sure." Items run in a positive direction, responses are summed, and higher scores indicate higher self-efficacy. For example, students were asked, "How sure are you that you could eat fresh fruit instead of a candy bar?" (Parcel et al., 1995). For the sample of students in the current study, Cronbach's α was 0.82.

Physical activity self-efficacy

The children's self-confidence in their ability to participate in physical activity was measured by the Physical Activity Self-Efficacy Scale, a subscale of the HBQ (Edmundson et al., 1996), and includes five items in which students are asked if they are "not sure," "a little sure," or "very sure" that they can do such things as "keep up a steady pace without stopping for 15–20 minutes." Items run in a positive direction, responses are summed, and higher scores indicate higher self-efficacy. For the sample of students in this investigation, Cronbach's α was 0.71.

Child's health perception

Self-ratings of health enable children to combine the objective information they have regarding their health with a personal evaluation of the information (Maylath, 1990). The child was asked to respond to the statement, "I believe that my health is ……" by choosing the answer that most closely described him/her (excellent, good, fair, or poor). Responses run in a negative direction, and a higher score indicates higher self-rating of health.

Food preferences

The Hearty Heart Food Preference Questionnaire, developed following focus group discussions with third- and fourth-grade students (Perry, Mullis, & Maile, 1985), consists of two groups of 18 food pair pictures. The students identify which food in each pair they like the most. Food preferences for fat (10 items), salt (three items), and complex carbohydrates (five items) are tested. A few items on the original instrument were modified for the current study to reflect more contemporary preferences (e.g., frozen yogurt rather than ice milk). In the current study, the Cronbach's α was 0.69. Polit and Hungler (1995) contend that if a researcher is only interested in group-level comparisons, then coefficients higher than 0.60 are sufficient. Thus, this is an acceptable alpha value.

Feelings toward exercise

Students' feelings about exercise were measured by the Attitudes Toward Exercise-Self Scale—a subscale of the YHS that was developed for the Cardiovascular Health in Children and Youth (CHIC II) study, a school-based

longitudinal study to assess and track cardiovascular risk factors (Gilmer, Speck, Bradley, Harrell, & Belyea, 1996). Students choose a response to each statement from a four-point Likert scale ranging from "strongly agree" to "strongly disagree," which are coded from 1 to 4, respectively. Examples include "Exercise takes too much of my time" and "I like to exercise." Several items are reverse scored so that all items run in a positive direction. Responses are summed, and higher scores indicate more positive attitudes toward exercise (Gilmer et al., 1996). A few items on the original instrument were deleted for the current study, after careful review by an expert panel, because of concerns regarding the "response burden" on fifth-graders. The alpha remained acceptable (0.74) for a six-item scale with fifth-grade students.

Diet

The child's usual food consumption was measured by the HBQ diet behavior scale. The 14 items specifically addresses usual food choices (behavior) in a forced-choice format, focusing on lower fat or lower sodium food options. Students are asked which of the two paired foods they eat more often, i.e., "What foods do you eat most of the time, cookies or apples?" Comparable foods are presented, with one of the two foods more heart healthy than the other (Edmundson et al., 1996). The items within the scale are summed to produce a score and divided by the number of items answered to produce an average of healthy food choices. Cronbach's α was 0.63 for this sample of fifth graders.

Physical activity

The child's physical activity was evaluated by the Physical Activity Checklist—a subscale of the YHS. It is a frequency checklist of 32 activities (sedentary and nonsedentary) based on the Minnesota Leisure Time Activity Questionnaire. Each activity was independently coded by two exercise physiologists with a metabolic equivalent (MET) level of 2, 3, 5, or 8. The METs were used to establish the relative intensity of activities. For example, television was assigned a MET of 2 (very low), video games a MET of 3 (low), baseball a MET of 5 (moderate), and basketball a MET of 8 (vigorous). Activity level was examined by asking how many times each activity was done for more than 15 min the past week. The frequency choices are "not at all," "1 or 2 times," "3–5 times," and "6 or more times" (Gilmer et al., 1996). The instrument was piloted with 205 students at two schools in North Carolina. The investigators stated that further work was needed to refine the instrument, as construct validity was weak.

This author contends that the survey incorporates a relative weighting scoring system, which makes it difficult to interpret the meaningfulness of the results. The child is asked to check how many times he/she spent more than 15 min doing an activity the past week. If a child plays basketball one or two times per week, he/she is given credit for playing 1.5 times, and this is multiplied by the 8 METs assigned to basketball (so he/she accumulates 12 points). If another child, however, plays video games three times per week, he/she is given credit for playing four times per week, and this is multiplied by the 3 METs assigned to video games (so he/she accumulates 12 points). Theoretically, a child could play approximately 30 min of basketball in a week and accumulate the same number of points as another child who played video games for 45 min in a week. Further work is needed to refine the instrument so that it adequately meets the purpose of measuring physical activity of different intensities.

For this reason, two scores for the Physical Activity Checklist were computed for each child. Those activities assigned METs of 2 (very low) and 3 (low) were designated as the dependent measure, very-low-to-low-intensity physical activity, and scored as such. Similarly, those activities assigned METs of 5 (moderate) and 8 (vigorous) were designated as another dependent variable, moderate-to-vigorous physical activity, and scored as such. For this sample of students, Cronbach's α was equal to 0.65 for the Very Low to Low Intensity Physical Activity subscale (composed of 14 items) and 0.77 for the Moderate to Vigorous Physical Activity subscale (composed of 18 items).

Statistical Analysis

Analysis of the data was completed using the SPSS statistical package. Descriptive analysis was conducted on the total sample for all major study variables. This included measures of central tendency and variance to determine the distribution of responses on the variables. The data were examined to assure that the statistical assumptions of linearity, homogeneity of variance, independence, and normal distribution were met. The independent samples' t test and the Mann–Whitney test (when indicated) were performed to compare the means of boys and girls on the self-report measures of intrinsic motivation, cognitive appraisal, affective response, diet, low-intensity physical activity, and high-intensity physical activity.

The relationships proposed in the IMCHB were systematically explored within the data set. Variance partitioning was performed using multiple regression to

explore the importance of variables in the explanation of diet and physical activity. The health-outcome variables were regressed on the client singularity variables to determine the effects of those variables on the school-age child's diet and physical activity. In addition, separate regression models were produced for girls and boys to explore the relationship of sex with diet and physical activity.

RESULTS

The majority of the children (68.2%; $n = 253$) were 11 years old. Another 27% ($n = 100$) were 10 years old, while only 3.5% ($n = 13$) were 12 years old and 1.3% ($n = 5$) did not report their ages. Both sexes were well represented in the sample, as 47.4% ($n = 176$) of participants were boys and 52.6% ($n = 195$) were girls.

The score for the student's diet behavior scale was generated by computing the percentage of healthy food choices of the total food choices for each child. The scores for this sample ranged from 0 to 100% healthy food choices. The mean for girls on the diet behavior scale was 43.38% healthy choices, with a standard deviation of 0.2133, while the mean for boys was 40.75% healthy choices, with a standard deviation of 0.2121. There was no significant difference between the means of girls and boys ($t = -1.191$, $p = 0.234$).

The scores for the very-low-to-low-physical-activity scale can range from 0 to 204. Scores for this group ranged from 14 to 171. The mean for girls was 80.76, with a standard deviation of 27.33. The mean for boys was 74.38, with a standard deviation of 27.66. There was a significant difference between boys and girls ($t = 2.233$, $p = 0.026$), with girls reporting more low-intensity physical activities than boys.

Scores for moderate-to-high-physical-activity participation can range from 0 to 684. Scores for this group ranged from 15 to 501. The mean for girls was 154.62, with a standard deviation of 91.53. The mean for boys was 179.38, with a standard deviation of 103.28. There was a significant difference between boys and girls ($t = -2.448$, $p = 0.015$), with boys reporting more moderate-to-high physical activities.

Table 2 summarizes the contributions of the independent variables to diet for girls on the basis of their standardized partial regression coefficients. The amount of variance explained is 45.5%. Food preferences and diet self-efficacy are the only significant predictors of the dependent variable. Table 3 summarizes the contributions of the independent variables to diet for boys on the basis of their standardized partial regression coefficients. The amount of variance explained is 49.6%. Food preferences and diet self-efficacy are the only significant predictors of the dependent variable.

Table 4 profiles the contributions of the independent variables to very-low-to-low physical activity for boys. The amount of variance explained is 12.7%. Parent's self-rating of health (with a negative beta weight) and child's self-rating of health (with a positive beta weight) are the only significant predictors of the dependent variable. The regression model is not statistically significant for the contributions of the independent variables to very-low-to-low physical activity for girls and will not be further discussed or included as a table in this article.

Table 5 summarizes the contributions of the independent variables to moderate-to-high-intensity physical activity for girls. The amount of variance explained is 16.2%, with exercise feelings contributing the most to the total variance in the dependent variable. Parental marital status emerged as having moderate explanatory

TABLE 2. *Contributions of Levels I, II, and III of the Independent Variables to Diet for Girls*

Level	Model	β	t	Significance
III	Food Preferences	0.456	6.816	0.000*
III	Diet Self-Efficacy	0.195	2.893	0.004*
III	Child's Self-Rating of Health	0.101	1.566	0.119
II	Family Function	0.077	1.243	0.215
II	Parental Health Habits	0.090	1.372	0.172
II	Parent Education	0.104	1.631	0.105
II	Financial Difficulty	–0.045	–0.627	0.532
II	Parent's Self-Rating of Health	–0.059	–0.866	0.388
II	Parent's Rating of Child's Health	0.028	0.419	0.675
I	Parental Marital Status	–0.049	–0.749	0.455

*Significant at the 0.01 level [$F = 13.885$, $df = (10, 166)$, $p < 0.001$, $r^2 = 0.455$] (for marital status: 0, not married; 1, married).

TABLE 3. *Contributions of Level I, II, and III of the Independent Variables to Diet for Boys*

Level	Model	β	t	Significance
III	Food Preferences	0.538	8.199	0.000*
III	Diet Self-Efficacy	0.219	3.169	0.002*
III	Child's Self-Rating of Health	−0.060	−0.964	0.337
II	Family Function	0.062	1.045	0.298
II	Parental Health Habits	0.055	0.847	0.398
II	Parent Education	−0.004	−0.066	0.948
II	Financial Difficulty	−0.009	−0.124	0.902
II	Parent's Self-Rating of Health	0.086	1.230	0.221
II	Parent's Rating of Child's Health	−0.097	−1.455	0.148
I	Parental Marital Status	0.008	0.131	0.896

*Significant at the 0.01 level [$F = 15.343$, $df = (10, 156)$, $p < 0.001$, $r^2 = 0.496$] (for marital status: 0, not married; 1, married).

TABLE 4. *Contributions of Levels I, II, and III of the Independent Variables to Very-Low-to-Low Physical Activity for Boys*

Level	Model	β	t	Significance
III	Physical Activity Self-Efficacy	0.061	0.649	0.517
III	Exercise Feelings	0.000	−0.001	0.999
III	Child's Self-Rating of Health	0.182	2.119	0.036*
II	Parental Health Habits	−0.043	−0.506	0.614
II	Family Function	−0.080	−1.001	0.318
II	Parent's Rating of Child's Health	−0.038	−0.440	0.661
II	Financial Difficulty	−0.039	−0.423	0.673
II	Parent Education	0.028	0.324	0.746
II	Parent's Self-Rating of Health	−0.287	−3.141	0.002†
I	Parental Marital Status	−0.017	−0.203	0.840

*Significant at the 0.05 level [$F = 2.277$, $df = (10, 156)$, $p = 0.016$, $r^2 = 0.127$] (for marital status: 0, not married; 1, married).
†Significant at the 0.01 level.

TABLE 5. *Contributions of Levels I, II, and III of the Independent Variables to Moderate-to-High-Intensity Physical Activity for Girls*

Level	Model	β	t	Significance
III	Physical Activity Self-Efficacy	0.016	0.181	0.856
III	Exercise Feelings	0.291	3.281	0.001*
III	Child's Self-Rating of Health	0.141	1.709	0.089
II	Parental Health Habits	0.023	0.284	0.777
II	Family Function	0.022	0.275	0.784
II	Parent's Rating of Child's Health	0.054	0.671	0.503
II	Financial Difficulty	−0.028	−0.318	0.751
II	Parent Education	−0.085	−1.048	0.296
II	Parent's Self-Rating of Health	−0.123	−1.471	0.143
I	Parental Marital Status	−0.207	−2.540	0.012†

*Significant at the 0.01 level.
†Significant at the 0.05 level [$F = 3.219$, $df = (10, 166)$, $p = 0.001$, $r^2 = 0.162$] (for marital status: 0, not married; 1, married).

power relative to girls' participation in moderate-to-high-intensity physical activity. Fifth-grade girls from single-parent homes who have positive feelings toward exercise are more likely to participate in moderate-to-high intensity physical activity than are girls from two-parent homes. It is speculative at this point, but perhaps a single parent must work outside the home for financial reasons and consequently enroll the fifth-grade daughter in after-school programs such as the YMCA. Although the after-school care may be the primary reason that the daughter is enrolled and takes part in these activities, it may help facilitate a girl's physical activity participation.

Table 6 summarizes the contributions of the independent variables to boys moderate-to-high-intensity physical activity. The amount of variance explained is 10.9%. Child's self-rating of health contributes more total variance to the dependent variable than do the other independent variables. The better the boy rated his health, the more likely he participated.

DISCUSSION

The IMCHB has proven to be a useful framework for the study of children's diet behavior in the present investigation. It explained 45.5% of the variance in diet behavior for girls and 49.6% of the variance in diet behavior for boys. The model explained very little of the variance in a child's physical activity, particularly low-intensity activity. Although there were significant correlates for the enactment of physical activity by both sexes, it appears that there may be a missing link in the model regarding the health behavior of physical activity. It is possible that there may be components such as "barriers to exercise," as Trost et al. (1996) suggested, and "facilitators of exercise" that influence whether a child engages in frequent physical activity. More research on children's health behaviors utilizing the IMCHB as a theoretical framework will help determine whether additional constructs need to be added to the model.

This research corroborated previous study findings that most children do not have healthy eating habits (Lewis, Crane, & Moore, 1994; Nicklas, Webber, Johnson, Srinivasan, & Berenson, 1995; Krebs-Smith et al., 1996). The data from this study also corroborated Graham and Uphold's (1992) findings that there were no significant sex differences in diet behavior. Several inquiries, however, found that girls consumed healthier diets than boys (Cohen, Brownell, & Felix, 1990; Kelder, Perry, Lytle, & Klepp, 1995; Parcel et al., 1995). Other investigations determined that girls ate more fruits and vegetables than boys (Baranowski et al., 1995) and that girls ate vegetables daily, while boys did not (Tellijohnn, Durgin, Everett, & Price, 1996). It should be noted that most of the research that found significant sex differences in food consumption was conducted on children older than fifth graders. It is probable that with fifth-grade students (examined in this study), the parents decided what foods were present and eaten in the home and had control over the amount of money and time the child spent at fast-food restaurants.

This inquiry determined that the affective response to food (food preferences) was the single most salient contributor to the variance in diet behavior for girls ($\beta = 0.456$, $p < 0.001$) and for boys ($\beta = 0.538$, $p < 0.001$), confirming evidence that food preferences explain much of diet behavior for children (Fisher & Birch, 1995; Domel et al., 1996; Resnicow et al., 1997). Several investigators have confirmed that preference is increased with exposure—tasting or ingestion of food is necessary to learn to accept food (Birch & Fisher, 1995; Birch, Johnson, & Fisher, 1995; Fisher & Birch, 1995). The affective response to food can be shaped by experience. More longitudinal studies on repeated exposures

TABLE 6. *Contributions of Levels I, II, and III of the Independent Variables to Moderate-to-High-Intensity Physical Activity for Boys*

Level	Model	β	t	Significance
III	Physical Activity Self-Efficacy	0.051	0.537	0.592
III	Exercise Feelings	0.094	1.091	0.277
III	Child's Self-Rating of Health	0.202	2.329	0.021*
II	Parental Health Habits	−0.004	−0.051	0.959
II	Family Function	−0.103	−1.278	0.203
II	Parent's Rating of Child's Health	−0.025	−0.280	0.780
II	Financial Difficulty	−0.004	−0.045	0.964
II	Parent Education	−0.072	−0.829	0.409
II	Parent's Self-Rating of Health	−0.167	−1.811	0.072
I	Parental Marital Status	0.123	1.465	0.145

*Significant at the 0.05 level [$F = 1.899$, $df = (10, 156)$, $p = 0.049$, $r^2 = 0.109$] (for marital status: 0, not married; 1, married).

and acceptance patterns among children need to be designed and implemented to determine which interventions successfully increase healthy diet choices. In addition, the intrinsic motivation to eat a healthy diet (diet self-efficacy) was the second most important contributor to the variance in diet behavior for girls ($\beta = 0.195$, $p = 0.004$) and for boys ($\beta = 0.219$, $p = 0.002$), validating other research which found a strong relationship between diet self-efficacy and diet behavior (Parcel et al., 1995; Edmundson et al., 1996).

The data from this study are consistent with those from other research (Kelder et al., 1995; Centers for Disease Control and Prevention, 1996; Crocker, Bailey, Faulkner, Kowalski, & McGrath, 1997) which reported that girls are less active than boys. This investigation also confirmed that girls perform more low-intensity physical activity than boys (Kann et al., 1995; Myers, Strikmiller, Webber, & Berenson, 1996; Harrell, Gansky, Bradley, & McMurray, 1997) and that boys perform more high-intensity activity than girls (Centers for Disease Control and Prevention, 1996; Trost et al., 1996). In this investigation, affective response to exercise (feelings toward exercise) was most important in explaining the variance in moderate-to-vigorous-physical-activity participation for girls ($\beta = 0.291$, $p = 0.001$). In another recent study of elementary school students, the girls reported more individual activities (such as gymnastics and dance), whereas boys reported more team activities such as basketball and football (Faucette et al., 1995). More opportunities need to be provided for girls to participate in noncompetitive lifetime activities (Trost et al., 1996). Enjoyment of the activity for its own sake rather than solely for competition may be one way of encouraging involvement. If children adopt physical activity as a satisfying and rewarding aspect of their lifestyle, then they would, hopefully, maintain this behavior into adulthood.

Child's perceived health status contributed the most to the variance in moderate-to-vigorous-physical-activity participation for boys ($\beta = 0.202$, $p = 0.021$). The better a boy perceived his health, the more likely he participated. Additional research is needed to clarify the role of perceived health status in a boy's participation in moderate-to-vigorous physical activity.

This inquiry provides support for recently published guidelines by the Center for Disease Control (CDC) for schools to promote lifelong healthy eating and physical activity. The report recommends the involvement of communities, administrators, teachers, families, and students as part of a coordinated school health program. In addition, the CDC advises making nutrition education activities fun, as well as emphasizing enjoyable participation in physical activities that are easily done throughout life. Other key principles endorsed are helping young people learn skills that help them eat healthy and be physically active. Last, young people need to be offered repeated chances to practice healthy eating and a diverse range of competitive and noncompetitive physical activities (Center for Disease Control, 2001).

In summary, early-intervention programs that address multiple factors that influence a child's enactment of diet and physical activity are needed. Nurses need to include the children's families in health interventions to successfully promote and maintain positive health outcomes with the school-age population. We need to teach parents to buy and cook a variety of healthy foods and to encourage their children to try healthy alternatives to the high-fat, high-salt diet that is commercially advertised. As health professionals, we must be advocates for school policy changes, such as the purchase and preparation of healthier school meals. Most children eat lunch at their school, and many lower-income children eat both breakfast and lunch at school. Teachers need to be discouraged from using candy as an incentive to good behavior in the classroom. Schools must be encouraged to include physical education as an integral component of the curriculum. The majority of fifth-grade students in this investigation responded that they only had physical education in school once per week. Schools, as well as the entire community, must take responsibility for promoting the healthy physical growth and development of children.

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