

RESEARCH ARTICLE

Promoting Fitness and Safety in Elementary Students: A Randomized Control Study of the Michigan Model for Health

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ABSTRACT

BACKGROUND: In elementary grades, comprehensive health education curricula have demonstrated effectiveness in addressing singular health issues. The Michigan Model for Health (MMH) was implemented and evaluated to determine its impact on nutrition, physical fitness, and safety knowledge and skills.

METHODS: Schools (N = 52) were randomly assigned to intervention and control conditions. Participants received MMH with 24 lessons in grade 4 and 28 more lessons in grade 5 including material focusing on nutrition, physical fitness, and safety attitudes and skills. The 40-minute lessons were taught by the classroom teacher who received curriculum training and provided feedback on implementation fidelity. Self-report survey data were collected from the fourth-grade students (N = 1983) prior to the intervention, immediately after the intervention, and 6 weeks after the intervention, with the same data collection schedule repeated in fifth grade. Analysis of the scales was conducted using a mixed-model approach.

RESULTS: Students who received the curriculum had better nutrition, physical activity, and safety skills than the control-group students. Intervention students also reported higher consumption of fruits; however, no difference was reported for other types of food consumption.

CONCLUSION: The effectiveness of the MMH in promoting fitness and safety supports the call for integrated strategies that begin in elementary grades, target multiple risk behaviors, and result in practical and financial benefits to schools.

Keywords: comprehensive school health education; coordinated school health; Michigan Model for Health; elementary school health education; nutrition; physical fitness; school safety.

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The health of the student population in the United States has been recognized for some time as a basic aim of the educational system.^{1,2} One reason for health being a foundation for education is that it is widely accepted that health and learning are linked.³⁻⁵ Beyond the logical assertion that if a student is unable to be in school, learning is hampered,

school health education programs have been shown to improve academic achievement.⁶⁻⁸ A healthy and safe school environment that provides risk prevention efforts can contribute to improved health and academic outcomes.^{5,9} During the past 20 years, the lack of physical activity and the high prevalence of overweight and obese school-aged children has been recognized as

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a major risk factor for both short-term and long-term health consequences for this age group.¹⁰

A healthy and safe school environment is a key component of the coordinated school health program. The environmental component includes among other things the physical, psychosocial, and cultural climate. The building, grounds and surrounding neighborhoods, supporting and building self-esteem in students and staff, as well as positive interpersonal relationships are all part of the healthy school environment.¹¹ Students attending schools with a safe and positive environment may be less likely to experience violence, or succumb to pressure to use alcohol, tobacco, and other drugs.¹² A healthy and safe school environment is also supported by the other 7 components of a coordinated school health program. An environment that provides for sufficient physical activity and proper nutrition, along with a strong health education curriculum can be instrumental in improving student academic outcomes.¹²

National, state, and local laws and policies regulate much of the school environment;¹³ yet, students still become victims of violence at school. During the 2007-2008-school year, an estimated 2 million crimes were reported at public schools.¹⁴ Nansel et al¹⁵ found 30% of 6th- to 10th-grade students in their study had been involved in bullying. The 2005 Youth Risk Behavior Survey found during the previous year that nearly 36% of students had been in a physical fight at school.¹⁶

Thus far, health curricula have had a modest effect in reducing violence. A recent review of 25 studies that examined the role of the school environment on reducing violence found a relationship between the school's environment and school violence. Owing to the complexity of the studies, the nature, and strength of the relationship was not well clarified.¹⁷ An earlier meta-analysis of 26 studies of school-based violence prevention programs found no significant effect in reducing aggression and violence. The analysis did find a modest effect for single-approach (curriculum-only) programs. The single-approach programs were able to have a mild positive effect on reducing violence in children and adolescents.¹⁸

Healthy eating behaviors and regular physical activity are important components to a healthy lifestyle and the prevention of many chronic diseases.¹⁹ Diet and physical activity have been associated with reduced risk for cardiovascular disease,²⁰ hypertension,²¹ cancer,²² and diabetes.²³ These conditions lead to the premature death of more than 1.25 million people a year in the United States.²⁴ Dietary habits and a sedentary lifestyle are recognized as major contributors to the risk of these diseases. There is evidence that the behaviors related to the predisposing factors for cardiovascular disease begin in early childhood, although the symptoms may not manifest until late adulthood.^{25,26}

Studies support that early health behaviors and preferences can lead to important life trajectories with respect to ideal weight and active lifestyles.²⁷

Since 1980, the prevalence of overweight school-aged children has nearly tripled.²⁸ Nearly one-fourth of children ages 2-5 years are overweight and obese.^{29,30} Among children 6-11 years of age the percentage has increased from 11% to 15%, and among 12- to 19-year-olds, it has increased from 11% to 18%.³¹ The rate of those children and adolescents who are overweight and obese is a consequence of individual factors, as well as social, cultural, and environmental factors.³² The modifiable behavioral determinants related to being overweight and obese include diet, physical activity, and sedentary behaviors. Poor patterns of eating and other health-risk behaviors are established in early childhood. For example, diets that include sweetened beverages have been associated with increased caloric intake and a decrease in the consumption of milk. This single dietary shift has implications for a number of nutritional changes. The shift in the type and amount of beverages consumed has led to inadequate amounts of calcium, vitamin A, phosphorus, folate, and magnesium in children and youth.⁵

It has long been recognized that daily exercise and healthy eating behaviors are preventive factors in weight-related chronic health disorders.³³ Because public schools provide access to more than 53 million children and adolescents from all socioeconomic status groups,³⁴ schools provide a logical placement for prevention efforts by providing access to healthy foods and can provide the necessary instruction that would enable individual students to make healthy decisions. Furthermore, US Centers for Disease Control and Prevention (CDC) guidelines specifically address the importance of school programming for modifying physical activity and dietary behaviors of school-aged children.³⁵ The school's role in nutritional behaviors can be addressed at several levels. In 2004, more than half of all schools offered a school breakfast and lunch program.³⁶ In addition, 91.2% of all districts provided elementary school health instruction that included at least 1 of 14 health topics and more than half of all districts adopted a policy requiring elementary schools to address (among other topics) nutrition and dietary behaviors and physical activity and fitness.³⁷

Since its development in 1985 the Michigan Model for Health, a comprehensive health curriculum for kindergarten through grade 12, has demonstrated effectiveness in reducing a variety of specific problems and related risk behaviors, such as drug abuse,³⁸⁻⁴⁰ human immunodeficiency virus infection/acquired immune deficiency syndrome (HIV/AIDS),⁴¹ and poor nutrition,⁴² and in promoting social and emotional health,⁴⁰ character development, and positive school climate.⁴³ The purpose of the current

study was to determine the extent to which a comprehensive prevention approach previously found effective in addressing specific health needs of students can simultaneously impact multiple health issues, specifically the skills, attitudes and behaviors related to nutrition, physical activity, and safety.

METHODS

Program

As part of a larger project examining the Michigan Model for Health (MMH), a comprehensive health education curriculum for kindergarten through grade 12, this study focused on outcomes of the nutrition, physical fitness, and safety lessons for grades 4 and 5. The curriculum was based upon principles of the Health Belief Model and Social Learning Theory in which several important cognitive, attitudinal, and socio-emotional factors converge to enhance health-promoting behavior.⁴⁴ The MMH utilizes a prevention approach to facilitate skills-based learning through 20-50-minute lessons. The lessons incorporate a variety of teaching and learning techniques, skill development and practice, and building positive lifestyle behaviors in students and families. Overall, the fourth-grade curriculum consists of 25 lessons on social and emotional health; alcohol, tobacco, and other drugs; safety, and nutrition and physical activity. In fifth grade, there are 28 lessons across the same health topics. Lessons on personal health and wellness are also part of the fifth-grade curriculum, but were not included in the larger study in order to maintain consistency in topics across grades. HIV prevention lessons were available in both grades, but excluded from the larger study because several participating schools did not have district approval to teach that topic at the elementary level.

The intervention was implemented in classrooms in the intervention buildings over a 12-week period in grade 4 and 14-week period in grade 5 during a normal class period (of 40-50 minute) by the classroom or health teacher. Each teacher received a 12-hour curriculum training with follow-up support provided as needed. The training and support were based upon the model used by the organization that publishes and distributes the MMH materials. Additional 2-hour training on the purpose, objectives, and school-level activities of the evaluation study was provided to teachers in both the intervention and control schools. The evaluation training for intervention-school teachers was provided in conjunction with the curriculum training. All participating teachers completed the curriculum and evaluation training.

Evaluation Design, Data Collection, and Management

A randomized-control design was used in this study. Schools were randomly assigned to experimental and

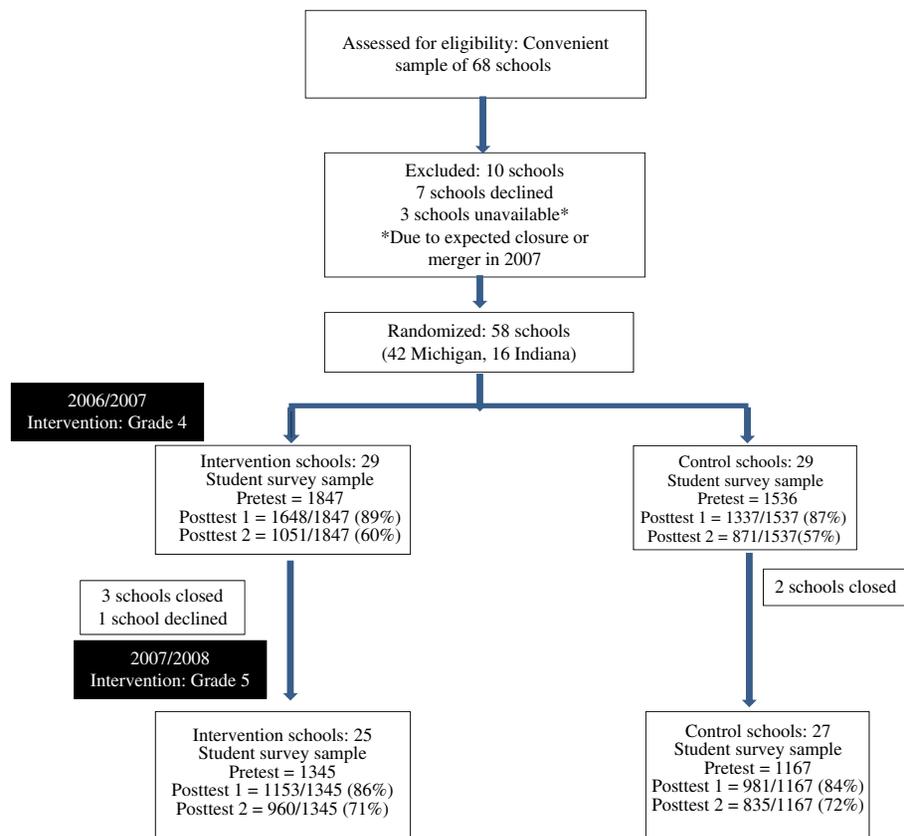
control groups using a simple random sampling procedure from Predictive Analytic Software version 18.⁴⁵ Figure 1 shows the study design and participation. The study used pretest-posttest control group with multiple posttests, and students were followed longitudinally to evaluate student outcomes. Following approval from university and state institutional review boards, a convenience sample of 66 schools was recruited in year one and assessed for eligibility by regional health coordinators, state education and health department employees, and the study researchers. Buildings were excluded ($N=10$) from participation if they (1) had less than 30 students in fourth and fifth grade to guard against low statistical power; (2) had not implemented the MMH, any other health education curriculum, or a Coordinated School Health Program in the year preceding the study; (3) were not willing to delay implementation of any health education curriculum during the 2 years if randomly assigned to the control condition; or (4) they expected or planned to close or merge during the time of the study.

The remaining 58 schools (42 from Michigan, 16 from Indiana) were randomly assigned to a group that implemented the MMH, (the intervention group), or a group that did not implement the MMH (the control group). Schools and teachers in both the intervention and control groups received an incentive to participate in the study, including a stipend and free curriculum materials and training. The control school teachers did not receive the curriculum or training until after completion of the study. Students received no incentive for participation.

A self-report questionnaire was developed to assess demographics as well as knowledge, skills, attitudes, and behaviors associated with the units of the MMH implemented in this study (ie, nutrition, physical activity, and safety). A total of 3591 students were eligible to participate in the study. Of those, 3416 (or 95%) received parental consent to participate. The pretest questionnaire, which was completed by 3383 (or 94%) of the eligible students, was administered in classrooms by project staff members who were blind to treatment condition and trained to use a standardized protocol. Within 1 week after the pretest, teachers in the intervention condition implemented the curriculum with their students. Project staff conducted a posttest within 1 week after the conclusion of instruction and a delayed-posttest 5 to 6 weeks after the instruction was completed. The data collection procedures were repeated during the second year of study.

Each testing session lasted approximately 40 minutes. To ensure consistency in administration within classrooms, the same project staff person was assigned to administer the questionnaire to the same classroom for all 3 tests conducted during the school year, which occurred in 89% of

Figure 1. Design of and Participation in the Michigan Model for Health Intervention, 2006/2007 and 2007/2008.



classrooms in fourth grade and 93% of classrooms in fifth grade.

Prior to the fifth-grade intervention, 5 schools had closed and 1 intervention school declined to participate, resulting in a final sample of 25 intervention schools and 27 control schools, and a total of 2513 students pretested in the subsequent intervention year. The immediate posttest was completed by 2134 students and the follow-up posttest was completed by 1795 students. There were no significant differences ($p < .05$) between the intervention and control groups in response rates for any time of measurement. Data from all 6 times of measurement were edited within occasion for response errors and within and across occasions for logic edits. The faulty data were removed and data sheets were prepared to account for the missing data during statistical analysis with a mixed-model approach.

Participants

During the first year, 2581 fourth-grade students in 68 school buildings were recruited to participate in the study and were followed through to the completion of the students' fifth-grade year.

Missing Data

Students who did not complete any questionnaires in fourth grade ($N = 387$) or fifth grade ($N = 919$) were not included in the evaluation sample for 2 reasons: (1) they were presumed to receive only 1 year of the intervention, which is inconsistent with the philosophy of comprehensive health education programs to provide multiple years of instruction to reinforce and build upon previous material and affect long-term behavioral change;⁴⁶ and (2) accounting for all missing data points for a given intervention year, which comprised half of all measurement occasions, was considered an inappropriate data analytic strategy.⁴⁷

Missing outcome data for the evaluation sample were accounted for by using a mixed-model approach in Predictive Analytic Software version 18.⁴⁵ A mixed-model approach has additional benefits for multilevel designs in which a student-level intervention is randomized and administered at the school level. For this study, students could have up to 2 (out of 6) missing data points, but no more than 1 missing data point in each grade, thereby ensuring the student was enrolled at the same school for at least part of the school year in both the fourth and fifth grades.

Attrition Effects

As mentioned earlier, a number of pretested students from fourth grade were not available for study in fifth grade ($N=919$) and were excluded from the evaluation sample for programmatic and statistical reasons. Therefore, it was important to assess the potential impact of this attrition group on interpretation of the study findings. Fourth-grade pretest demographic and outcome scores for this group were compared with those of students who completed all fourth- and fifth-grade tests ($N=749$). Using a chi-square test of association for the student demographic and outcome variables, attrition was not significantly associated with treatment ($\chi^2=0.01$, $df=1$, $p=.934$) and age ($\chi^2=2.20$, $df=5$, $p=.821$), but was associated with sex ($\chi^2=12.74$, $df=1$, $p\leq.001$) and ethnicity ($\chi^2=16.86$, $df=2$, $p\leq.001$). Two-year attention was lower for boys than girls (41% vs. 49%, respectively), and African Americans and other minorities exhibited lower attrition rates than Caucasians (36%, 43%, and 49%, respectively). Attrition analyses of the outcome variables showed some significant differences ($p < .05$, 2-tailed). Students not retained through the fifth-grade intervention reported lower health skills (nutrition and safety) and attitudes (nutrition) than retained students. There were no differences between retained and nonretained students in safety, nutrition, or physical activity behaviors ($p < .05$, 2-tailed).

Instrumentation

For a larger study, a paper-and-pencil, self-report questionnaire was developed to assess demographics as well as knowledge, skills, intentions, and behaviors associated with the lessons of the MMH. This report focuses on measures from the questionnaire that assessed health promoting skills, attitudes, and behaviors related to nutrition, physical activity, and safety.

The measures were comprised of scales and items of adequate validity and reliability based upon their use in previous studies of health education or prevention. Health-promoting skills, physical activity, healthy nutrition, and safety skills were measured using selected-response items developed from the State Collaborative on Assessment and Student Standards (SCASS) - Health Education Assessment Project (HEAP)⁴⁸ and usually adapted to align more closely to the MMH curriculum. Scales used to measure physical activity and nutritional behaviors were adapted from the Youth Risk Behavior Survey. Where appropriate, internal consistency reliabilities are reported for the scales using the entire fourth-grade pretest sample, and test-retest reliabilities are used for individual items based upon a 12-week test-retest interval using the control-group pretest and

immediate posttest sample. Virtually all scales/items reached conventionally acceptable levels of internal consistency reliability ($\alpha \geq .70$) or test-retest reliability ($r \geq .30$).⁴⁹

Nutritional, Physical Activity, and Safety Skills

Content and face validity for items measuring nutritional and physical activity skills were established by SCASS-HEAP. Any items adapted for this study were reviewed for face validity by an advisory team comprised of researchers with expertise in health literacy, the authors of this study, and state- and regional education and community health experts who serve on a statewide steering committee charged with revising the MMH. For all health-promoting skill items, respondents were asked to choose the correct answer among four alternatives. A total of 7 items were used to measure the health skills (nutritional: $\alpha = .56$; physical activity: $\alpha = .75$; safety: $\alpha = .64$). An example stem for a nutrition item is: "You are working on a big project for school. The project is due tomorrow. Which afternoon snack would be the MOST healthful for you to pick?" An example stem for physical activity item is: "Do you play on any sports teams or take classes like karate or dance? Count the things you are doing now or did in the past 30 days." An example stem for safety item is: "You are home alone when the doorbell rings. It is someone who wants to check the phone. Which of the following would be the safest thing for you to say or do in this situation without opening the door?"

Implementation Fidelity

Teachers in the intervention schools implemented the MMH using a standardized protocol in which the lessons were taught in the same order, with no more than 3 lessons taught in the same week. Every 2 weeks throughout the program period, teachers in the intervention schools completed an online survey to report the number and type of lessons taught and whether they needed support in preparing for or teaching the lessons. The online implementation survey was completed by 96% of fourth-grade teachers and 92% of fifth-grade teachers, who reported having taught 92% of the lessons in fourth grade and 94% in fifth grade. In addition, one teacher in each building was designated to assist other teachers as well as monitor implementation to ensure the lessons were taught as designed and within the expected time frame. Over 90% of these teachers reported that teachers were implementing the curriculum with fidelity and were provided adequate support as needed.

Data Analysis

Assessment of baseline equivalence was performed to test for evidence of successful randomization of

schools to the intervention and control conditions. This analysis involved comparing baseline (fourth-grade pretest) scores between the intervention and control groups on several school-level and student level demographic variables and all student outcome variables. Analysis of the average percentage across school-level demographic variables and average scores on student-level outcome variables was conducted using t-test for independent samples. Pearson chi-square was used to test for differences in proportion of racial/ethnic and sex groups reported by the students on the questionnaire.

Tests of intervention effectiveness involved 2 different analytic techniques, based upon the type of dependent variables. Analysis of continuous variables involved using a mixed model approach. When applying general linear models (GLM) to analyze longitudinal data, one generally underestimates the standard errors of the impacts and therefore may erroneously assume statistical significance. A mixed-model approach effectively handles this problem as well as others inherent in longitudinal data, such as varying times between observations, unequal groups at each data point over time, and the need to control for the effects of potentially confounding independent variables.⁵⁰ These advantages make mixed models more appropriate than the more conventional repeated measures analyses used in longitudinal studies.

In all cases, the models took the general form of the measures nested within student and school with the four factors—treatment condition, sex, time, and ethnicity—having main effects and interactions, and with time as a repeated measure. This approach allows for the error term and parameter estimates to control for intraclass correlations (ICCs) among students within schools and generally provides for a more conservative test of the hypothesis when a positive ICC is present.⁵¹

RESULTS

Demographics

The final evaluation sample consisted of 1983 students (mean age at fourth grade = 9.56 years, $SD = .67$) who were followed longitudinally in fourth and fifth grade at 52 public schools in Michigan and Indiana that were characterized as urban (28%), rural (31%), and suburban (41%). The sample was 54% boys and 46% girls, and the racial/ethnic composition of the sample was 54% white, 38% African American, and 8% of other or mixed ethnicity. On average, participating schools had 40% of students who were economically disadvantaged, based upon eligibility for federally funded free or reduced-priced lunch programs. The final sample represented 52 school buildings and had a median enrollment of 356

students. The total number of classroom teachers in this study was 321.

Baseline Group Equivalence

There were no significant baseline differences ($p > .10$, 2-tailed) in the average percentage of fourth-grade students as a proportion of building enrollment; the composition of race/ethnicity, sex, or economic disadvantage; or the average percentage of students proficient in math and reading based upon state standardized tests. Student-reported data for sex, race/ethnicity, and all outcome variables revealed no statistically significant baseline differences between the intervention and control groups ($p > .10$, 2-tailed).

Nutritional Skills

A significant intervention effect was found in students' nutritional behaviors ($F[53,213.47] = 2.32$; $p = .04$) (Figure 2). Further analysis found that nutrition behaviors varied by food type. A significant difference was found for the consumption of fruits ($F[51,445.33] = 3.55$; $p = .003$) (Figure 2). However, nonsignificant intervention effects for the consumption of vegetables ($F[51,470.13] = 1.07$, $p = .38$), low-fat milk ($F[51,301.43] = 1.82$, $p = .11$), soda ($F[53,325.83] = 0.66$, $p = .65$), and French fries ($F[53,351.23] = .86$, $p = .51$) were found. A significant decrease in the consumption of vegetables ($F[51,470.13] = 2.82$, $p = .02$) and low-fat milk ($F[51,301.43] = 4.58$, $p < .001$) occurred in both groups, whereas the consumption of French fries ($F[53,351.23] = 5.15$, $p \leq .001$) increased significantly in both groups. No significant change in the consumption of soft drinks ($F[53,325.83] = .64$, $p \leq .67$) for either group was found.

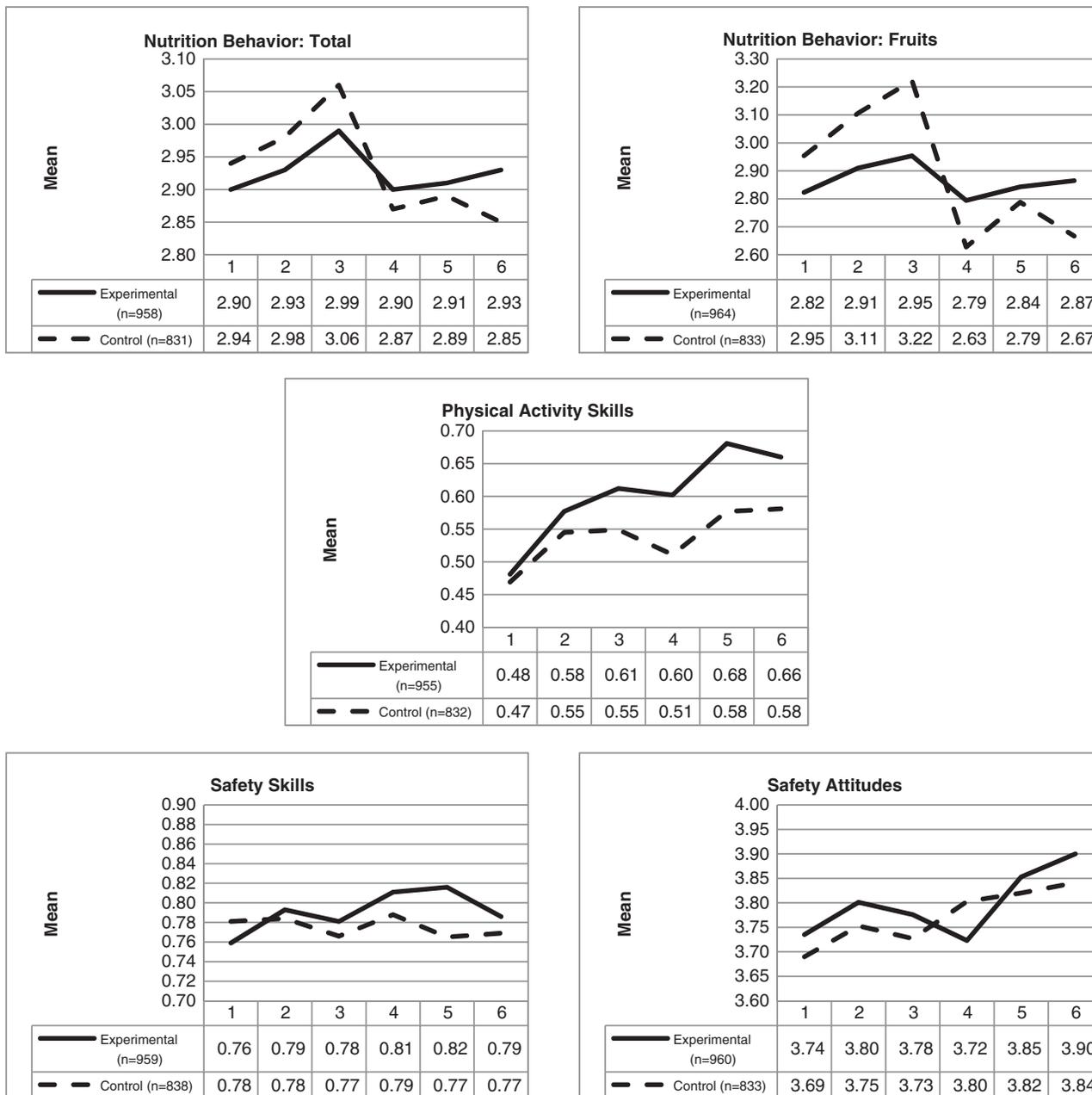
Physical Activity Skills

Student activity, skills, and behaviors were measured using items that asked students about the frequency of physical activity during the past 7 days at school and outside of school times. As Figure 2 shows, a significant intervention effect was found for students' physical activity skills ($F[53,590.79] = 4.42$, $p = .001$). The data also showed that both group had increased scores in their physical activity skills during the 2-year study ($F[53,970.79] = 22.68$, $p \leq .001$). Neither group showed a significant change in physical activity behaviors ($F[51,515.85] = .19$, $p = .96$) or physical activity attitudes ($F[51,433.83] = .90$, $p = .48$).

Safety Skills

Safety skills and attitudes were measured by items that asked about the students' decisions and behaviors at home, online, in public (playgrounds), and at school. A significant intervention effect was found

Figure 2. Mean Scores for Nutrition Behavior, Physical Activity Skills, and Safety Skills and Attitudes by Treatment Condition and Time of Measurement.



in students' safety skills ($F[51,590.77] = 3.73, p = .05$) and improved safety attitudes ($F[51,432.51] = 2.66, p = .02$) (Figure 2). Both the intervention and the control group's students' mean safety attitudes score significantly increase during the 2 years ($F[51,432.51] = 30.82, p \leq .001$).

DISCUSSION

The main purpose of this project was to evaluate a comprehensive health education program designed to

increase student nutrition, physical activity, and safety knowledge, behaviors, and skills. There was strong evidence of an intervention effect for students in fourth grade who were evaluated longitudinally through fifth grade. Compared with their control-group counterparts, students in the intervention schools exhibited better physical activity skills, improved nutritional behavior, and improved safety attitudes and skills. The use of an experimental design and demonstration of baseline equivalence supports a

conclusion of a causal effect between the intervention and observed outcomes. It is noteworthy that the outcomes were achieved despite the disproportionate loss of students with poorer health-promoting skills and higher levels of drug use and aggression to attrition than those who were retained, suggesting that the observed effects may be underestimate of the program's effectiveness.

The study included an analysis of behaviors related to specific food types. Previous research has shown that nutritional behaviors among elementary-age children differ by food type.⁵² The results indicated that the curriculum was effective in improving fruit intake among this population. Both groups had a lower consumption of milk and vegetables with a higher consumption of French fries. However, significant change was found for the consumption of soda. These data support the belief that these changes in dietary behaviors are consistent with children as they gain (or are allowed) more freedom when making dietary choices.

Neither group of students showed a change in physical activity attitudes nor behaviors during the 2-year period. The scores for these 2 areas at the pretest indicated already high physical activity attitudes and behaviors. Consequently, a significant improvement may not be probable. Perhaps the more significant implication of these results is that the curriculum prevented a reduction in these 2 areas.

Prior research has demonstrated the effectiveness of the Michigan Model for Health for developing healthy behaviors and producing significant changes in multiple health modalities (skills, behavioral intentions, and behaviors) across a variety of health areas (social and emotional health, substance abuse, and aggression) in the same students.⁴⁰ The current study extends that research and provides first-time empirical evidence concerning the application of the Michigan Model for Health to produce significant changes in nutrition, physical activity, and safety in the same students. More research is needed to determine the durability of these effects as well as the impact of the Michigan Model for Health on additional health behaviors addressed by the program as the students mature.

Limitations

This study has the following limitations. Although schools were randomized into control and intervention groups and the survey specialists were unaware of assignment of schools to these groups, blinding of the classroom teachers was not possible. Consequently, bias may have affected the results. Participating teachers did receive training prior to the start of the study to assure the implementation of the curriculum with fidelity and to assure the collection of the most

objective data possible. However, funding limitations prohibited further process evaluations that would reduce the concern for a Type III error. In addition, the Hawthorne effect, where improvements are the result of increased attention and necessarily due to the invention, is a possibility.

Although attrition rates between the control and experimental groups were similar for all measures, systematically higher attrition across groups for some subpopulations may negatively affect the internal validity of the results as well as their generalizability to the original sample.

Issues related to response rates, attrition of participants, and the missing data provide threats to internal validity of the data. These concerns are inherent in the effort to conduct research within the environment of school systems. Our efforts to minimize these threats were within the parameters of the study and the limitations of the study's resources.

Finally, the instrument in this study collected self-reported data. Typical challenges with self-reported data are inaccurate recall⁵³ and the over-estimation of their capabilities. Bandura⁵⁴ suggests that "... when people error in self-judgment, their efficacy beliefs typically exceed their behavior."^(p46)

IMPLICATIONS FOR SCHOOL HEALTH

The findings suggest that the Michigan Model curriculum can have a positive impact on multiple health behaviors of elementary students. These findings support recommendations of health and education experts for schools to establish a comprehensive approach to improve health promotion and risk prevention. The curriculum can impact students' knowledge, attitudes, and behaviors. These behaviors can be sustained by reinforcement through the health curriculum, as well as, from home, school, and the community.

On a practical level, school administrator should support the alignment of the health education curriculum within the coordinated school health approach. An established comprehensive health education curriculum can improve the health attitudes and behaviors of students. These improvements can begin early and be sustained over time. The findings from this study support theoretical models that advocate for prevention strategies that address multiple, related risk behaviors.^{55,56} In addition, a comprehensive curriculum can reduce the cost and effort of implementing multiple programs that address various health areas.

Human Subjects Approval Statement

This study was approved by the institutional review boards of Madonna University and the Michigan Department of Community Health [419-PHAFMCH(R)].

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