

Long-term Student Outcomes of the Integrated Nutrition and Physical Activity Program

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ABSTRACT

Objective: To examine the long-term effects of the Integrated Nutrition and Physical Activity Program (INPAP), a school-based nutrition education program.

Design: Quasi-experimental design comparing intervention and comparison cohorts at 3–6 years after delivery of the INPAP intervention on nutrition- and physical activity-related outcomes.

Setting: This study was conducted in 1 school district in a low-income rural county of ~15,000 residents in south-central Colorado.

Participants: In second grade, intervention and comparison cohorts included 173 (fall 2000) and 190 (fall 1999) students, respectively. Approximately 60% of these students completed assessments in eighth grade.

Interventions: INPAP is an experiential school-based nutrition education program, grounded in social cognitive theory and Piaget's cognitive development theory and adapted for use in a rural setting.

Outcomes: Nutrition and physical activity knowledge, self-efficacy, attitudes and behaviors, body mass index.

Analysis: Wilcoxon signed rank test, chi-square test for proportions, and *t* test for means.

Results: Long-term effects were observed in nutrition-related knowledge and attitudes but not self-efficacy or behavior change. The effects that did occur were attenuated over time.

Conclusion and Implications: This study found that INPAP implemented in elementary school had limited lasting effects by the end of middle school, a time when students have increased autonomy to make food choices.

Key Words: nutrition education, child, overweight, elementary school, rural, physical activity (*J Nutr Educ Behav.* 2013;45:635–642.)

INTRODUCTION

School-based nutrition education programs have the opportunity to play a vital role in improving children's health and in preventing later adult chronic diseases. Increased consumption of fruits and vegetables can decrease one's risk of obesity^{1–6} and related chronic illnesses, including type 2 diabetes⁷ and the 2 most common causes of death in the United States (US), heart disease⁸ and cancer.^{9–11} Unhealthy eating practices¹² and physiological processes of diet-

related chronic diseases begin in childhood and tend to persist into adulthood.¹³

In the last 4 decades, the obesity rate for children ages 6–11 years has more than quadrupled and more than tripled for adolescents ages 12–19 years.¹⁴ In 2007–2008, approximately one third (31.7%) of children and adolescents aged 2–19 years were overweight (85th–95th body mass index [BMI] percentile for age) or obese (BMI > 95 percentile for age).¹⁵ Childhood overweight and obesity have been linked with early

coronary heart disease¹⁶ and premature death in adults.¹⁷ Thus, establishing healthy eating patterns in children is essential for the prevention of the most common causes of premature death.

In the 2010 school year, > 31.7 million US children participated in the National School Lunch Program on a daily basis.¹⁸ Of these children, approximately one half (47%) also participated in the School Breakfast Program,¹⁹ meaning that they were eating 2 meals a day at school. As such, schools are an important setting to promote healthy eating practices, and school-based nutrition education programs are positioned to reach low-income children who are at high risk for overweight and obesity.

The Integrated Nutrition and Physical Activity Program (INPAP) is the rural "sister" program to the Integrated Nutrition Program (later adapted and named the Integrated Nutrition Education Program [INEP]), which is a nutrition education

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program that was developed by education and nutrition specialists and implemented and tested in an urban school setting.^{20,21} The children's intervention blends social cognitive theory (SCT) with Piaget's cognitive development theory.²¹ Social cognitive theory has been commonly applied to nutrition education because it addresses personal and environmental factors as well as the behavior itself.²² The limitation of SCT in school-based research is that the theory itself does not directly address how children learn, a prevailing concern of educators and a means by which educators may select or disregard the plethora of nutrition education products presented to them. Piaget's cognitive development theory gives rise to a developmentally and age-appropriate instructional approach, based on the cognitive characteristics of the preoperational and concrete operational stages of development that are applicable to elementary-aged children.²³ It was believed that blending the 2 theories would maximize the likelihood of behavior change, while at the same time strengthen the educational experience of the children and increase teacher adherence to the curriculum. From SCT, the intervention addressed personal factors by having each child take an active role in food preparation and food tasting, in goal setting, and in small-group work involving peer communication, self-talk, and sharing ideas and thoughts with others. It addressed environmental factors through take-home messages and parent night events to influence the home environment. Lastly, it focused on the behaviors themselves by targeting simple and consistent messages (eg, "Eat more fruits and vegetables"; "Be more active") and reinforcing them in multiple ways. Tenets of cognitive development theory were translated in classroom activities through the making and eating of food (reliance on the senses and the attainment of skills), emphasizing foods instead of nutrients, de-emphasizing serving sizes, and giving "eat more fruits and vegetables" rather than "don't eat unhealthy foods" messages (reliance on concrete instead of abstract or complex messages). The INPAP was adapted from the INEP by adding local foods and recipes.²²

Beginning in 2000, 173 second grade students received the adapted INPAP curriculum, which primarily aimed to increase fruit and vegetable consumption and intensify physical activity levels by targeting simple and consistent messages and reinforcing them in multiple ways. It was administered by a local resource teacher trained by the Denver-based INEP.^{24,25} In the following school year (2001–2002), the resource teacher implemented the lessons in third grade with the same cohort of students, now 1 year older. Students received 28 lessons (18 focused on nutrition and 10 focused on physical activity) in each grade. As with the INEP, the INPAP lessons comprised nutrition and physical activity components that were developmentally appropriate for elementary schoolchildren and included: (1) hands-on food preparation and classroom cooking, (2) tasting activities, (3) cooperative learning, and (4) integration of science, math, and literacy core content standards into the lessons. As previously mentioned, the primary behavior change targets of INPAP were increasing fruit and vegetable consumption and increasing physical activity levels, but because fruits and vegetables are often not eaten in isolation but rather as part of a meal or a particular recipe, secondary targets were woven into the curriculum, including reducing fat intake and increasing consumption of whole grains. In addition, a secondary targeted behavior related to physical activity was reducing the amount of time spent engaging in watching television (TV).

A study was undertaken in 1999 to assess the short-term effectiveness of INPAP. In this study, 3 cohorts were identified: (1) students who started the second grade in the fall 1999 and did not receive the INPAP intervention (the comparison cohort), (2) students who started second grade in 2000 and received the INPAP intervention from a resource teacher for 2 consecutive years (the resource teacher cohort, referred to here as the intervention cohort), and (3) students who began second grade in 2001 and received the INPAP curriculum delivered by a classroom teacher. The third cohort (the classroom teacher cohort) was not

followed up for long-term outcomes and is not included in the current study. Surveys adapted for children aged 7 years were administered in the classroom at the beginning and end of second and third grade.²⁴

The short-term findings for INPAP were encouraging. Second-grade children who received the INPAP intervention from a resource teacher significantly improved over the course of the school year in every nutrition and physical activity indicator measured, including the ability to identify healthy foods, self-efficacy for food preparation and eating "5 A Day," and attitudes about physical activity and TV watching.²⁴

With evidence for short-term effectiveness of INPAP and very little existing literature on the long-term effects of school-based nutrition education programs, the current study was designed to determine if early indicators of effectiveness of INPAP would persist over time. It was hypothesized that, between fourth and eighth grades, students receiving the INPAP curriculum from a resource teacher (compared with the cohort of children without the curriculum) in second and third grades would have greater knowledge of dietary and physical activity guidelines (mediating outcome); have more positive attitudes toward fruits and vegetables and physical activity (mediating outcome); have greater self-efficacy in reading/preparing a recipe, identifying foods with fat, preparing fruits and vegetables, and preparing and choosing a healthy snack (mediating outcome); have greater outcome expectations (mediating outcome); report greater consumption of fruits and vegetables; report greater levels of physical activity; report less TV viewing; and have lower BMIs.

METHODS

Study Design

A quasi-experimental design compared students who started second grade in the fall of 1999 and did not receive the INPAP intervention (comparison cohort) with a cohort of students who began second grade in 2000 who received the INPAP curriculum delivered by a resource teacher for 2 consecutive years (intervention

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