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Pilot Study of an Individually Tailored Educational Program by Mail to Promote Healthy Weight in Chinese American Children

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Abstract

PURPOSE—To test the feasibility and impact of an individually tailored educational intervention to promote healthy weight in Chinese American children (ages 8–10).

DESIGN—A pre- and post-test study (N = 57) using standardized instruments to measure children's usual food choices, knowledge of nutrition and physical activity needs, and time spent engaging in physical and sedentary activities.

RESULTS—We found improvement after the intervention in all three areas.

PRACTICE IMPLICATIONS—Healthcare providers need to provide parents and children with specific recommendations regarding children's weight statuses, dietary intake, and levels of activity.

Search terms

Children; Chinese American; individually tailored; obesity; weight management

The U.S. Department of Health and Human Services (USDHHS) has declared obesity prevention to be a top research priority. At risk for overweight and overweight in children are defined as a body mass index (BMI) greater than the 85th and 95th percentiles, respectively, based on age- and sex-specific BMI growth charts (Centers for Disease Control and Prevention [CDC], 2000). Childhood obesity has affected many ethnic groups, including Chinese Americans. Recent data indicate that 31% of Chinese Americans ages 6–11 years have a BMI greater than the 85th percentile (Tarantino, 2002). Several physical and psychosocial health problems are associated with childhood obesity, including cardiovascular disease, sleep disorders, type 2 diabetes mellitus, low self-esteem, and social withdrawal.

Chinese Americans are at a higher risk of developing cardiovascular disease and type 2 diabetes mellitus and at lower BMI than are non-Hispanic Whites, possibly because of genetic differences in body composition and metabolic responses (Tan, Ma, Wai, Chew, & Tai,

2004). Despite the public efforts to reduce the prevalence of childhood obesity, studies suggest that children's consumption of sweetened beverages and the time spent on sedentary activities (i.e., TV and computer time) has increased (Chen & Kennedy, 2005; St-Onge, Keller, & Heymsfield 2003). Developing feasible and inexpensive programs that focus on preventing obesity and promoting healthy lifestyles in early childhood is essential to avoid long-term, adverse comorbidities, especially in Chinese Americans. An individually tailored mail health promotion and healthy weight management intervention that requires minimal contact time seems to be a novel approach to combat this epidemic.

Numerous interventions have been employed in the last two decades to help overweight children reduce their fat mass and maintain a healthy weight (Baranowski, Cullen, Nicklas, Thompson, & Baranowski, 2002; Caballero et al., 2003). Interventions using postal mail have had some success in promoting physical activity and improving dietary intake in adults and children (Boutelle, Dubbert, & Vander Weg, 2005; Davis & James, 2007; Sherwood et al., 2006). Printed educational materials are frequently used in primary care and community settings. One strategy for enhancing the benefits of a mailing program is to personalize the educational materials so that they target the specific needs of the individual. Additionally, intervention programs utilizing a family-based approach to prevent or treat obesity can more successfully help children maintain a healthy weight compared with programs that do not involve children's families (Flynn et al., 2006).

Few studies report the feasibility and efficacy of health promotion and weight management intervention in children delivered through postal mail, particularly in Chinese Americans. Although it is assumed that parents understand their children's BMI and dietary and activity habits, our clinical observations and previous study suggest that parents tend to underestimate their children's relative weight and overestimate their activity level (Chen, Kennedy, Yeh, & Kools, 2005). Therefore, we proposed a study to examine the feasibility and efficacy of an individually tailored intervention delivered through postal mail on the improvement of Chinese American children's obesity-related health behaviors (such as physical activity and food preference), their knowledge, and their BMI over 6 months. We also examined the impact of the intervention on mothers' knowledge regarding their children's dietary and activity needs.

Studies examining the effects of culturally sensitive, individually tailored behavioral interventions that focus on a child's health (diet and physical activity/inactivity) and involve the family are warranted. These types of interventions have not been previously reported or applied to Chinese American children. To address this important gap in the literature, we tested the feasibility and efficacy of an individually tailored intervention through postal mail that uses printed educational materials to promote healthy behaviors and healthy weight management in Chinese American children. We hypothesized that our intervention would improve the mothers' knowledge of nutrition and activity needs, the children's food choices and levels of physical activity, and influence the rate of weight gain.

The study is based on the Ecological Model of Childhood Obesity Prevention, developed by Davison and Birch (2001). The Ecological Model of Childhood Overweight was derived from the ecological system theory (EST) and numerous empirical research studies in the area of childhood overweight. The EST emphasizes critical and important "interaction" between the individual's characteristics and an environment in which a person is embedded and the context in which a person is situated. This model highlights the multidimensional interaction between the child, family, and entire community. We tailored an interventional approach to the needs of the child that focused on obesity-related health behavior modifications within the context of the family and their environment and culture.

Methods

A pre- and post-test design using a convenience sampling technique was used to examine the feasibility and efficacy of an individually tailored educational program via postal mail. Children in the study completed questionnaires regarding their levels of physical activity, usual food choices, knowledge of nutrition, and knowledge about physical activity at baseline, and at 1 and 6 months after baseline assessment. The mothers completed questionnaires regarding their demographic information, levels of acculturation, and knowledge regarding their children's nutritional and physical activity needs.

Upon approval from the University of California, San Francisco Committee on Human Research, 8- to 10-year-old children who self-identified as Chinese and their mothers were invited to participate in this study. Participants were recruited from Chinese community sources and after-school programs in the San Francisco Bay Area. Recruitment flyers and ads were posted and distributed at each study site. If parents were interested in taking part in this study, they contacted research assistants via phone or mail. The research assistants described the study to potential participants and gave them introduction letters and research consent forms to take home. Mothers who were interested in the study signed and returned the consent forms, providing their names and contact information to the research team. Children and parents were informed that they could refuse to participate or withdraw from the study at any time. Data were collected between November 2005 and December 2006.

Intervention and Study Procedure

After parental consent and children's assent were obtained, mothers and children completed sets of questionnaires, and research assistants measured the children's weights and heights. At baseline assessment, each child completed questionnaires regarding their daily food intake (total caloric, fat, protein, carbohydrate, vegetable, and fruit intake) and reported physical activity. Data were analyzed individually to provide information on each child's dietary intake and number of hours spent engaging in active and sedentary activities. All enrolled mothers were mailed one educational package to their homes. Mothers received reports on their child's weight, height, whether their child was overweight or normal weight, dietary intake, and time spent on various physical activities, including whether they were active or sedentary (e.g., television and computer viewing). Follow-up assessments were conducted at 1 and 6 months post intervention (see Figure 1). The reports informed mothers of their children's dietary intake and compared this information to current recommended age-appropriate dietary intake. Recommendations were also provided for healthy lifestyles and dietary intake (see Table 1).

Mothers also received several educational materials on nutrition, physical activity, and healthy weight maintenance based on the baseline assessment of their children's weight statuses, dietary intake, and physical activity levels. The materials were written in both English and Chinese. For instance, if the child reported a high percentage of fat intake and a low level of physical activity, materials sent to the parents included information on ways to reduce fat intake, make smart food choices, and increase physical activity. These educational materials were adapted from materials developed by the CDC, American Heart Association (AHA, 2007), American Diabetes Association (ADA, 2006), Joslin Diabetes Center Asian (2006), and the researchers of this study. Materials were modified to be compatible with Chinese and Chinese American culture. The educational materials were written in both English and Chinese and were adapted to reflect the health practices of Chinese and Chinese Americans. To ensure the materials were culturally appropriate, a pilot test with a small group of Chinese and Chinese American parents was conducted. The pilot study supported the appropriateness of the materials and methods of delivery for Chinese and Chinese Americans with third-grade reading levels. Parents were instructed to follow the recommendations and share information with their children. Two weeks after the educational materials were mailed out, researchers called the

mothers to ensure they received and understood the information and answered any questions the parents had regarding the information and recommendations. The researchers are bilingual and bicultural, and information presented to the mothers was in Chinese and English.

Children completed questionnaires regarding their usual food choices, physical activity/inactivity times, and knowledge about nutrition and physical activity at 1 month and 6 months after baseline assessment and returned them in sealed envelopes within 2 weeks. At the 6-month follow-up, researchers measured the children's weights and heights. Mothers completed questionnaires regarding their knowledge of their children's nutrition and physical activity needs at baseline and at the 1- and 6-month follow-ups. Children completed their questionnaires in English.

Parental Measures

Family information (FI)—This 12-item parent questionnaire includes parent(s)' and children's ages, parents' weights and heights, parents' occupation(s), family income, and parents' levels of education. Parents were also asked if a physician had ever diagnosed them, their siblings, their mothers, or their fathers with hypertension, stroke, hyperlipidemia, atherosclerosis, or diabetes. The questionnaire was written at a third-grade reading level and took approximately 5 min to complete. The FI has been used in our previous studies to demonstrate adequate reading levels (Chen & Kennedy, 2005; Chen et al., 2005). Mothers completed this questionnaire at baseline.

Child's activity level—The Family Eating and Activity Habits Questionnaire (FEAHQ) was used to monitor the environmental factors and family behaviors associated with children's weight (Golan & Weizman, 1998). This questionnaire is completed by the parents. It has four subscales: *activity level subscale* (4 items) that measures frequency with which the parent, spouse, and child engage in physical and sedentary activity; *stimulus exposure subscale* (8 items) that measures presence and visibility of snacks, sweets, cakes, and ice cream in the home and boundaries of a child's autonomy in buying or taking these foods; *eating related to hunger subscale* (4 items) that measures the person in the family who initiates eating; *eating styles subscale* (13 items) that measures whether parent, spouse, or child eats while standing at the open refrigerator, while watching TV or doing homework, when experiencing stress, and between meals. Scores were calculated separately for each member of the family, with higher scores reflecting poor eating and activity behaviors. Content validity was assessed by including experts in various fields of health and health behaviors research while concurrent validity was evaluated by comparing families of obese children with families of normal-weight children ($p < 0.05$). The FEAHQ has an established internal consistency (range 0.78–0.88) with an adequate test-retest reliability of 0.78–0.90 (Golan & Weizman).

Knowledge related to children's dietary and physical activity needs—The researchers developed a seven-item questionnaire to examine parents' knowledge regarding their children's nutritional and physical activity needs. Questions were adapted from the U.S. Department of Agriculture (USDA) lessons regarding dietary guideline and MyPyramid (USDA, 2006). Sample questions included the following: "How many servings of vegetables and fruits does your child need each day?" "What type of milk is best for your child?" "How much time in a day does your child need to participate in an aerobic activity to keep his/her heart healthy?" Parents received 1 point for each question they answered correctly. The total score ranged from 0 to 7, with the reliability coefficient for the total score being 0.92 (Cronbach's α -statistic).

Children's Measures

Body mass index (BMI)—BMI is determined by dividing body mass in kilograms by height in meters squared (kg/m^2). Research assistants measured each child's body weight and height; the children wore lightweight clothes and no shoes. The 214 Road Rod portable stadiometer, which has an excellent graduation of 1/8 inch (0.1 cm), was used to measure stature. Children were instructed to have their head positioned in the Frankfort Plane, take a breath in and measure the stretch height. The 840 Bella Digital Scale was used to measure body mass; it has a graduation of 0.2 lbs (100 g). Before measuring each child, the research assistants calibrated the instruments based on instructions provided by the manufacturers. Weight and height were measured at baseline and at the 6-month follow-up.

Usual Food Choices—This 14-item survey was part of the Health Behavior Questionnaire developed for The Child and Adolescent Trial for Cardiovascular Health study (CATCH). This survey asked about usual food choices (behavior) in a forced-choice format that focuses on low-fat and low-sodium foods. It measured usual food selections and what types of food a child eats most of the time. Children were given a choice between two foods and asked which one they eat more often. Sample questions are "Which foods do you eat most of the time: hot dog or chicken? Frozen yogurt or ice cream?" A higher score indicated more healthy food choices. Validity was obtained by including expert review and focus group pilot testing done by the CATCH study team. The α -coefficient for internal consistency in the original study was 0.76 (Edmundson et al., 1996).

Dietary knowledge—This 14-item survey also was part of the Health Behavior Questionnaire developed for the CATCH study. It measures children's knowledge regarding healthy food choices. Children were asked to identify which food was "better for your health." Samples of two choices included "whole wheat or white bread" and "frozen corn or canned corn." Content validity was examined by including expert review and focus-group pilot testing from the CATCH study. This survey has a reported internal consistency ranging from α -coefficients of 0.76–0.78 (Edmundson et al., 1996). A higher score indicates more accurate dietary knowledge.

Physical activity knowledge—This five-item questionnaire was developed by the researcher to assess children's knowledge regarding physical activity. Items were adapted from recommendations from the USDA (2006) and AHA (2007) regarding dietary guidelines, MyPyramid, and children's health. Sample questions included the following: "How much aerobic activity is required for a healthy heart?" "How many hours a day should a child watch television or play video games?" The reliability coefficient for internal consistency with the sample of children in this study was 0.65. Children received 1 point for every question they answered correctly. The total score was used as a dependent variable for analysis. A higher score indicates more accurate knowledge about physical activity needs.

Data Analysis

Descriptive statistics were calculated initially for demographic characteristics and all major study variables. We used *t*-tests to examine any differences in variables between overweight (BMI > 85th percentile based on CDC growth chart) and normal-weight children as well as between subjects who provided follow-up data and those lost to follow-up. To assess the potential efficacy of the intervention, mixed-effect models were used to estimate average pre-/post-changes in BMI, health behaviors, and health knowledge in Chinese American children in the sub-sample of children with at least one follow-up visit. Outcomes from the baseline, 1- and 6-month visits were included in this analysis as repeated measures, using a random effect for each child to account for within-subject correlation of the outcomes. Baseline weight status (overweight vs. normal weight) was included as a covariate in all models. We also assessed

potential interactions between this factor and time, as a measure of whether baseline weight status predicts improvement. The interaction was statistically significant only in the model for BMI and was omitted from models for other study outcomes. All analyses were performed in Stata 9.0, with 0.05 set as the required level of significance.

Results

Descriptive Data

Fifty-seven children and their mothers enrolled in the study at baseline. Baseline characteristics of the complete sample are shown in Table 2. The mean age of the children was 8.8 ($SD = 0.8$) years. Twenty-nine of the children were boys, and 20 were at risk for overweight or overweight with average BMI of 18.3 ($SD = 3.8$) (see Table 3). Average maternal age was 40 ($SD = 7.1$) years, and the average number of years of education was 14 years ($SD = 4.9$). No statistically significant differences were found in baseline variables between overweight and normal-weight children or between children who provided follow-up data and those lost to follow-up.

Longitudinal Analysis

Forty-two children and their mothers (74%) completed baseline, 1- and 6-month follow-up measures and were included in the longitudinal analysis (see Table 3). Baseline overweight status was associated only with higher scores on the usual food choice scale. Over time, statistically significant improvements were observed in most study outcomes, including usual food choices, physical activity time, and nutrition and activity knowledge. BMI declined significantly among children who were in the overweight category at baseline ($p = 0.01$) (see Figure 2). No significant changes in parental knowledge about their children's nutrition and physical activity needs were noted as a result of the intervention (data not shown).

Discussion

Our study showed the majority of participants provided follow-up data, suggesting that an individually tailored intervention via postal mail is feasible in this population. Qualitative data from talking to mothers in the study also suggest that an intervention that is individually tailored via mail is preferred as sometimes it is difficult for families and children to attend any classes to learn about children's health and how to improve their children's health and health behaviors. Given the high financial cost of running an individual or group consultation program for behavioral change and weight management, an individually tailored program by mail can involve more families who may not otherwise be able to participate due to lack of time or money, and at lower total cost. From public and health promotion and disease prevention perspectives, this type of intervention can reach more target populations with reasonable cost and resources. In addition, busy primary care clinics can utilize such a program to promote healthier lifestyles in patients at each visit and between follow-up visits.

In this 6-month study, overweight children decreased their BMI significantly after the individually tailored educational intervention. For children of most ages, BMI increases annually by about 1 unit (Hill, Wyatt, Reed, & Peter 2003). Overweight children in our pilot study reduced their BMI on the average of 1.25 units ($SD = 1.68$) whereas normal-weight children gained an average of 0.81 unit ($SD = 1.51$) over the 6-month study period. Given the average BMI increased for most children by 1 unit, our data suggest this mailing intervention is a feasible and effective intervention for overweight management in Chinese American children. However, the results can be better supported using a randomized clinical trial with a control group.

In addition to the BMI improvement, all children in this study demonstrated increases in their levels of physical activity, their abilities to make healthy food choices, and their knowledge of nutrition and physical activity. Thus, an educational program via mail suggests an effective and feasible intervention for improving Chinese American children's health behaviors and knowledge about preventing childhood obesity. This study also found that overweight children benefited more than normal-weight children in the area of BMI and usual food choices. In addition, although not statistically significant, overweight children showed greater increases in their physical activity than normal-weight children, especially at the 6-month follow-up. This is an important step to healthy lifestyles and healthy weight management for children, especially because overweight children's knowledge about making better food choices and being physically active can have a lifelong impact on their health and weight. More importantly, at the 6-month follow-up, BMI scores decreased significantly in the overweight children in this study. However, as the study did not have a comparison control group, the changes in their behaviors may also be explained by other factors rather than the intervention, such as an increase in the awareness of childhood obesity issues through the school and community.

This intervention allowed parents to learn about the current health practices of their children and encouraged them to teach their children to improve their eating and activity habits. Findings indicate that the intervention did not change parents' knowledge of their children's nutrition and physical activity needs. However, parents' mean scores suggest an initial improvement in knowledge that was lost by the 6-month follow-up. Our results imply the need for booster educational sessions for parents to help solidify initial gains that may be made. In addition, it would be interesting to learn whether parents themselves changed any behaviors or their BMI scores after the intervention. Although this intervention is tailored to the children's needs and information parents are asked to share with their children, parental role models are important and possible factors in explaining the changes of behaviors and BMI in children. Future research should include the assessment of parents' obesity-related health behaviors and BMI over time.

In contrast to the lack of effect on parents' knowledge, results revealed that the intervention did improve children's knowledge of nutrition and activity. These findings are consistent with Hyman and associates' study on dietary intervention, which included tailored assessment and feedback (Hyman, Ho, Dunn, & Simons-Morton, 1998). Their study suggested that a mail and phone intervention can reach low-income people who could not attend a dietary class and documented reduction in serum cholesterol levels. The discrepancies seen in the children's and mothers' levels of knowledge are not well understood. It is possible that children learned knowledge regarding physical activity and nutrition at school or through media because there has been a lot of attention given to childhood obesity prevention. Although mothers were asked to share the information with their children, it is uncertain whether they shared the information.

By providing individually tailored recommendations to parents and children, all of the children in this study, regardless of their weight, were motivated to increase their physical activity time significantly (from 9.6 hr each week at baseline to 11.6 hr each week at the 6-month follow-up). Some studies have suggested that printed educational materials can raise awareness of the importance of physical activity but not actually change behaviors (Bauman et al., 2003; Marcus, Owen, Forsyth, Cavill, & Fridinger, 1998). However, our findings are similar to those of Humpel, Marshall, Iverson, Leslie, and Owen (2004), who found that printed materials, alone or in conjunction with brief telephone support, increased the amount of time adults reported walking for the sake of exercise.

Interestingly, children in this study also reported an increase in the amount of time they spent engaging in sedentary activities (from 5.08 hr each week at baseline to 6.66 hr each week at the 6-month follow-up). Because sedentary activity time for the children in this study was quite

low (45 min/day), the increase in sedentary activity (57 min/day) could reflect a normal increase in television viewing and computer game playing time in general pediatric populations. Also, this may reflect increasing computer access with age. Yet, it is not known with certainty why children increased their time spent engaging in sedentary activity at the same time that they also increased their amount of physical activity. In addition, it is not known whether other behaviors (such as sleep, time spent eating, socialization, and study) decreased when physical and sedentary activity times increased. Future studies are planned to examine sedentary behavioral changes over time in this population.

Identifying interventions that promote healthy behaviors and healthy weight in children is critical because of the prevalence of childhood obesity in Chinese American children. Due to the difficult nature of weight control and weight management in obese adults, preventing overweight in young children is a smart strategy for combating the obesity epidemic. Further support for this approach comes from studies indicating that overweight in young childhood tends to persist into middle childhood and adulthood (Magarey, Daniels, Boulton, & Cockington, 2003; Whitaker, Wright, Pepe, Seidel, & Dietz, 1997). This study provides a first insight into an intervention that promotes healthy behaviors and healthy weight management in Chinese American children.

Limitations

Although this study is one of the first to examine the feasibility and efficacy of a mailed individually tailored education intervention program, we acknowledge several limitations. Because of the lack of a control group, it is unclear that the changes over time were directly linked to the intervention. In addition, convenience sampling limits generalizability and poses the possibility that children and families who participated in this study were more aware of health issues related to physical activity and obesity and had healthier lifestyles than those who declined or dropped from participation. Furthermore, because the study used only self-reported measures of children's usual food choices and active and sedentary activities, errors in measurement may have occurred. Use of observation techniques and physiological measures of physical activity (such as heart rate monitor and accelerometer) may enhance the reliability and validity of study results. It is important to examine the true behavioral changes rather than just knowledge or attitude changes because the behavioral changes are the keys to preventing adverse health consequences related to poor health behaviors and obesity. In addition, although families and children completed the follow-up measures, they were not different in baseline characteristics compared to those who withdrew; families who completed the follow-up measures might have stronger motivations than those who withdrew from the study.

Future studies would have wider applicability if they included more diverse and larger samples and used randomized control designs to examine the impact of this type of intervention over longer periods of time.

How Do I Apply These Findings to Nursing Practice?

Despite the study's limitations, the results provide new information on the use of printed educational materials to prevent childhood obesity in this fast-growing minority population in the United States. Our study found that an individually tailored program via mail helps reduce BMI scores in overweight children and improve children's levels of physical activity, usual food choices, and knowledge of nutrition and physical activity within a 6-month period of time. Findings suggest that it is a feasible and effective intervention for improving Chinese American children's health behaviors and knowledge regarding the prevention of childhood obesity.

As the world experiences increased transmigration, nurses are working with patients from increasingly different ethnic and cultural backgrounds. Healthcare providers should promote awareness of childhood obesity, in part by including parents in their children's healthcare visits and providing parents and children with specific recommendations regarding children's weight statuses, dietary intake, and levels of activity and inactivity. Culturally appropriate written recommendations can be developed and distributed to families and children who face the issues of poor health behaviors and unhealthy weight issues.

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References

- American Diabetes Association (ADA). Diabetes prevention. 2006. Retrieved January 5, 2008, from <http://www.diabetes.org/home.jsp>
- American Heart Association. Children's Health and fitness. 2007. Retrieved January 3, 2008, from <http://www.lensaunders.com/wp/?p=191>
- Baranowski T, Cullen KW, Nicklas T, Thompson D, Baranowski J. School-based obesity prevention: A blueprint for taming the epidemic. *American Journal of Health Behavior* 2002;26(6):486–493. [PubMed: 12437023]
- Bauman A, Armstrong T, Davies J, Owen N, Brown W, Bellew B, et al. Trends in physical activity participation and the impact of integrated campaigns among Australian adults. *Australian and New Zealand Journal of Public Health* 2003;27:76–79. [PubMed: 14705272]
- Boutelle KN, Dubbert P, Vander Weg M. A pilot study evaluating a minimal contact telephone and mail weight management intervention for primary care patients. *Eating and Weight Disorders* 2005;10:e1–e5. [PubMed: 16682848]
- Caballero B, Clay T, Davis SM, Ethelbah B, Rock BH, Lohman T, et al. Pathways: A school-based, randomized controlled trial for the prevention of obesity in American Indian schoolchildren. *American Journal of Clinical Nutrition* 2003;78(5):1030–1038. [PubMed: 14594792]
- Centers for Disease Control and Prevention (CDC). National center for health statistics. 2000. Retrieved January 15, 2008, from <http://www.cdc.gov/nchs/products/pubs/pubd/hestats/overwght99.htm>
- Chen J, Kennedy C. Factors associated with obesity in Chinese-American children. *Pediatric Nursing* 2005;31:110–115. [PubMed: 15934563]
- Chen J, Kennedy C, Yeh C, Kools S. Risk factors for childhood obesity in elementary school-age Taiwanese children. *Progress in Cardiovascular Nursing* 2005;20:96–103. [PubMed: 16030409]
- Davis AM, James RL. A novel, individually tailored, letter-based intervention for the prevention of overweight among children. *Southern Medical Journal* 2007;100:1177–1178. [PubMed: 17984753]
- Davison KK, Birch LL. Childhood overweight: A contextual model and recommendations for future research. *Obesity Reviews* 2001;2(3):159–171. [PubMed: 12120101]
- Edmundson E, Parcel GS, Perry CL, Feldman HA, Smyth M, Johnson CC, et al. The effects of the child and adolescent trial for cardiovascular health intervention on psychosocial determinants of cardiovascular disease risk behavior among third-grade students. *American Journal of Health Promotion* 1996;10(3):217–225. [PubMed: 10163302]

- Flynn MA, McNeil DA, Maloff B, Mutasingwa D, Wu M, Ford C, Tough SC. Reducing obesity and related chronic disease risk in children and youth: A synthesis of evidence with 'best practice' recommendations. *Obesity Reviews* 2006;7(suppl 1):7–66. [PubMed: 16371076]
- Golan M, Weizman A. Reliability and validity of the family eating and activity habits questionnaire. *European Journal of Clinical Nutrition* 1998;52(10):771–777. [PubMed: 9805227]
- Hill J, Wyatt H, Reed G, Peter J. Obesity and the environment: Where do we go from here? *Science* 2003;299:853–855. [PubMed: 12574618]
- Humpel N, Marshall AL, Iverson D, Leslie E, Owen N. Trial of print and telephone delivered interventions to influence walking. *Preventive Medicine* 2004;39:635–641. [PubMed: 15313106]
- Hyman DJ, Ho K, Dunn JK, Simons-Morton D. Dietary intervention for cholesterol reduction in public clinic patients. *American Journal of Preventive Medicine* 1998;15:139–145. [PubMed: 9713670]
- Joslin Diabetes Center. Asian American Diabetes Initiative. 2006. Retrieved January 15, 2008, from <http://aadi.joslin.harvard.edu/>
- Magarey AM, Daniels LA, Boulton TJ, Cockington RA. Predicting obesity in early adulthood from childhood and parental obesity. *International Journal Obesity Related Metabolic Disorders* 2003;27(4):505–513.
- Marcus BH, Owen N, Forsyth L, Cavill NA, Fridinger F. Physical activity interventions using mass media, print media, and information technology. *American Journal of Preventive Medicine* 1998;15:362–378. [PubMed: 9838978]
- Sherwood NE, Jeffery RW, Pronk NP, Boucher JL, Hanson A, Boyle R, et al. Mail and phone interventions for weight loss in a managed-care setting: Weigh-to-be 2-year outcomes. *International Journal of Obesity (London)* 2006;30:1565–1573.
- St-Onge MP, Keller KL, Heymsfield SB. Changes in childhood food consumption patterns: A cause for concern in light of increasing body weights. *American Journal of Clinical Nutrition* 2003;78:1068–1073. [PubMed: 14668265]
- Tan CE, Ma S, Wai D, Chew SK, Tai ES. Can we apply the National Cholesterol Education Program Adult Treatment Panel definition of the metabolic syndrome to Asians? *Diabetes Care* 2004;27(5):1182–1186. [PubMed: 15111542]
- Tarantino, R. Addressing childhood and adolescent overweight. San Francisco, CA. Paper presented at the NICOS meeting of the Chinese Health Coalition; 2002 Sep.
- United States Department of Agriculture (USDA). Steps to a healthier you. 2006. Retrieved January 10, 2008, from http://www.mypyramid.gov/global_nav/media_press_release.html
- Whitaker RC, Wright JA, Pepe MS, Seidel KD, Dietz WH. Predicting obesity in young adulthood from childhood and parental obesity. *New England Journal of Medicine* 1997;337(13):869–873. [PubMed: 9302300]

Figure 1.
Study Procedure Flow Chart

Figure 2.
Significant Changes

Table 1

Example of Daily Dietary and Activity Recommendations

Dietary recommendations for your child	
Your child's food intake	
Total calories: 總熱量	
Percentage (%) of fat 脂肪百分比	< 30%
Percentage (%) of protein 蛋白質百分比	30%
Percentage (%) of carbohydrates 碳水化合物百分比	40%
Number of vegetables and fruits 蔬菜和水果的數量	at least 5 se
Moderate activity time 運動的時間	> 60 min
Moderate TV/computer time	< 2 hr
看電視或用電腦的時間	

Table 2

Baseline Characteristics of Study Sample by Overweight Status

		Normal weight (<i>N</i> = 35)	Overweight (<i>N</i> = 22)
Children	Age	8.8 (0.08)	8.8 (0.09)
	BMI	15.97 (1.36)	21.93 (3.62)
	Usual food choices	6.23 (1.46)	7.60 (1.47)
	Physical activity time (hr/week)	9.09 (6.28)	10.55 (6.92)
	Sedentary time (hr/week)	4.21 (4.77)	6.50 (5.05)
	Nutrition knowledge	9.86 (1.50)	9.56 (1.91)
	Activity knowledge	3.31 (1.30)	3.23 (0.97)
Mothers	Age	40.5 (0.48)	39.2 (1.25)
	Years of education	14.8 (0.41)	12.1 (0.72)
	Parent knowledge	4.60 (0.88)	5.00 (1.02)

Note: BMI, body mass index.

Table 3

Effects of Baseline Overweight Status and Time on Child Outcome Measures

Outcome	Predictor	Effect estimate	95% CI	p
Usual food choices	Overweight	1.68	0.89, 2.48	0.0001
	Time	1.21	0.65, 1.78	0.0001
Physical activity time	Overweight	1.95	-1.47, 5.37	0.27
	Time	2.60	0.46, 4.75	0.02
Sedentary time	Overweight	1.78	0.79, 4.34	0.17
	Time	1.68	0.13, 3.22	0.03
Nutrition knowledge	Overweight	0.21	-0.49, 0.91	0.57
	Time	0.82	0.14, 1.51	0.02
Activity knowledge	Overweight	-0.22	-0.68, 0.23	0.34
	Time	0.44	0.08, 0.81	0.02
BMI	Time (normal weight)	0.33	-0.10, 1.1	0.06
	Time (overweight)	-1.24	-1.99, -0.48	0.001

Note: BMI, body mass index.