Motivational Versus Social Cognitive Interventions for Promoting Fruit and Vegetable Intake and Physical Activity in African American Adolescents

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ABSTRACT

Strategic self-presentation (motivational intervention [MI]) is a theoretical approach that is distinct from social cognitive theory (SCT). Specifically, strategic self-presentation involves increasing motivation by creating cognitive dissonance and inducing shifts in self-concept by generating positive coping strategies during a videotaped session. Fifty-three healthy African American adolescents were randomized to a SCT + MI, SCT-only, or an education-only group for increasing fruit and vegetable (F&V) intake and physical activity. The SCT + MI and SCT-only groups received a 12-week SCT program. Students in the SCT + MI group also participated in a strategic self-presentation videotape session. Participants completed 3-day food records, completed measures of self-concept and self-efficacy, and wore an activity monitor for 4 days at pre- and posttreatment. Both the SCT + MI (2.6 ± 1.4 vs. 5.7 ± 2.2, p < .05) and the SCT-only (2.5 ± 1.2 vs. 4.8 ± 2.4, p < .05) groups showed greater increases in F&V intake from pre- to posttreatment as compared with the education-only group (2.3 ± 1.0, vs. 3.3 ± 2.1, p > .05). There were no significant time or group effects for any of the physical activity measures. Correlation analyses revealed that only the SCT + MI group showed that dietary self-concept (r = .58, p = .67, p < .05) and dietary self-efficacy (r = .65, p = .85, p < .05) were significantly correlated with posttreatment F&V intake and change in F&V intake, respectively. These findings suggest that the change in F&V intake in the SCT + MI group resulted from strategic self-presentation, which induced positive shifts in self-concept and self-efficacy.

(INTRODUCTION

Hypertension affects approximately 43 million people nationwide (1), and African American children are 1.5 times as likely to develop essential hypertension and cardiovascular disease (CVD) complications in early adulthood as compared with White youth (2). Increasing evidence indicates health behaviors, such as diet modification and physical activity, may strongly influence the development and progression of CVD (3). Specifically, research has demonstrated that increasing physical activity is helpful in controlling hypertension in African Americans (4). Furthermore, a number of clinical trials have demonstrated that a healthy diet results in overall favorable decreases in coronary heart disease among African Americans (5–7). Research among adolescents, however, suggests that a substantial number of adolescents are not eating an adequate amount of fruits and vegetables (F&V) (8–10) or engaging in adequate levels of physical activity (11). Thus, adolescence is an ideal time to target health promotion efforts to prevent the development of essential hypertension and CVD in early adulthood. The purpose of this study was to compare the efficacy of two theoretical-based interventions on promoting healthy diet and physical activity changes in African American adolescents.

Bandura’s social cognitive theory (SCT) conceptualizes multiple influences on behavior, with a primary focus on cognitive and social factors (12). With respect to cognitive factors, behavioral control comprises expectancies about outcome values and self-efficacy (confidence in personal ability). The theory assumes that personal factors, environmental events, and behavior are interacting and reciprocal determinants of one another. According to Bandura, individuals who adopt challenging goals and are confident (have high self-efficacy) about performing a desired behavior attain their goals more effectively as compared with individuals with little confidence in their ability to perform the desired behavior.

Several large community-based trials have evaluated the effects of SCT interventions on promoting healthy diet and physical activity changes in children. The Child and Adolescent Trial on Cardiovascular Health (CATCH) (13–15) demonstrated sig-
significant effects for the SCT intervention on improved knowledge, intentions, self-efficacy, dietary behavior, and perceived social reinforcement for healthy food choices after 3 years. Intermittent effects for perceived self-efficacy were also observed for increasing physical activity. The Dietary Intervention Study in Children (16) involved 663 preadolescent children with elevated lipids. After 3 years of an SCT intervention, the children showed significant reductions in total calories from saturated fat as compared with the usual care group. In general, these community-based programs provide evidence that an SCT approach is effective in altering dietary habits in certain age groups of children and adolescents.

Strategic self-presentation is a motivational intervention (MI), which is distinct from SCT in that it involves increasing motivation by creating cognitive dissonance (inconsistency between attitudinal beliefs and behavior) and inducing shifts in the self-concept through strategic self-presentation (17,18). The literature on strategic self-presentation is based on early research on role-play and commitment (19–22), cognitive dissonance theory (23–26), and self-perception theory (24). It is based on the proposition that one’s public displays shape a person’s private self. That is, how we present ourselves to others has a powerful influence on how we come to conceive of ourselves and subsequently behave (27). Findings from several decades of experimental research have demonstrated that public self-presentation has a strong influence on private self-appraisal, which in turn influences behavior (21,22,24,28–31). Two general processes are involved in creating this “carry-over effect.” First, cognitive dissonance theory proposes that inconsistencies between self-perceptions and behaviors can be reduced by changing one’s perceptions to be consistent with outward behavior (24,25,32,33). These new self-perceptions (evaluations) in turn maintain the new behavior. Second, research based on self-perception and biased scanning theory (29,34) shows that public self-presentation draws attention to existing congruent beliefs, making these particular beliefs more vivid, salient, primed, or magnified; these beliefs then carry over to subsequent self-evaluations and behaviors. Both dissonance and self-perception theories posit a shift in self-concept, which matches the publicly displayed behavior that it then maintains.

Research has also provided strong evidence for the contingent role of commitment when using the self-presentation paradigm to produce behavior change (22,25,26). In classical studies on changing dietary habits, Lewin (20,35) and Radke and Kliasurich (36) showed that groups of housewives and students who publicly agreed to change their dietary habits were more likely to do so (immediately and long term) than those who were individually lectured and who made no commitment or decision to change. Similar decisional processes using dissonance techniques have also been demonstrated in studies with sixth graders and other young children (37,38). Commitment to a particular identity or course of action, when freely given, is crucial for self-evaluative change because it engages the self and grounds the presentational display in public social reality (25,26,30). Thus, individuals who freely choose to commit themselves publicly to a particular identity (“I eat healthily”) and a course of action (e.g., eating 6–8 servings of F&V a day) should be more likely to do so than individuals who only hold such beliefs privately.

Previous research has demonstrated that this motivational approach is effective for changing health behaviors, such as dietary modification and physical activity, in adult populations. In a clinical trial by Axsom (39) and Axsom and Cooper (40), an MI was used to facilitate weight loss in 52 overweight participants. The results demonstrated greater weight loss occurred for the high- versus low-motivation condition or control participants, and this difference significantly increased over a 6-month follow-up and was maintained at a 1-year follow-up. Furthermore, Wankel, Yardley, and Graham (41) randomized 238 adult women to either a motivational treatment or control condition for increasing physical activity. The motivational treatment significantly improved program attendance as compared with the control group. These studies indicate that an MI may have a strong impact on the initiation and maintenance of health behaviors.

Several other theoretical perspectives can be compared and contrasted with strategic self-presentation. Relapse prevention theory (RPT) (42) includes identifying high-risk situations, practicing coping skills, cognitive change to avoid turning slips into relapse, incorporating pleasant activities into one’s lifestyle, and self-reward. Strategic self-presentation is distinct from RPT in several ways. Although the focus of RPT is on maintaining behavioral change in “high-risk” situations, strategic self-presentation focuses primarily on initiating behavior change through cognitive dissonance strategies. Furthermore, RPT has primarily been used for eliminating addictive behaviors, such as smoking and drug abuse, whereas strategic self-presentation focuses primarily on positive strategies, which may or may not be connected with high-risk addictive behaviors. Both strategic self-presentation and RPT do, however, use coping strategies as a means for creating change or promoting maintenance of a desirable behavior. Although RPT models promote practice of such coping strategies in response to high-risk environmental situations, strategic self-presentation may use positive coping strategies as a daily part of everyday living, regardless of high-risk situations encountered.

Motivational interviewing is another theoretical approach, which involves the use of a therapeutic method for assisting individuals to work through their ambivalence about behavior change (43). In contrast to motivational interviewing, the strategic self-presentation approach is a directive approach, which engages individuals in presenting themselves within the context of positive change, regardless of their ambivalence. Motivational interviewing and strategic self-presentation may be similar, however, in that both models’ ultimate goal is to get the individual to see the importance and relevance of taking on a more positive lifestyle after overcoming barriers.

This study expands on past work by comparing the effects of an SCT + MI, SCT-only, or education-only program on increasing F&V intake and physical activity in African American adolescents. Specifically, we hypothesized that students assigned to SCT + MI would show greater improvements in F&V
intake and physical activity at posttreatment than those in the SCT-only or education-only program. In addition, we predicted that change in F&V intake and physical activity in the SCT + MI group (vs. SCT-only or education-only) would result from strategic self-presentation that would induce positive shifts in self-concept and self-efficacy.

METHOD

Participants
The study protocol was approved by the Committee on the Conduct of Human Research of Virginia Commonwealth University. Written informed consent was obtained from each participant and his or her parent. Healthy African American adolescents (11–15 years) were recruited from three middle schools in the Richmond, Virginia, inner-city area. We targeted 11- to 15-year-olds because our previous research demonstrated that this age group had the cognitive ability to comply with our cognitive behavioral intervention (44). Students who were enrolled in Team-Up, an after-school intramural sports program, were allowed to enroll in our program. The total number of participants in Team-Up was approximately 50 students per school; however, because this was a pilot study for feasibility reasons (i.e., available staff and resources), approximately 20 students from each school were eligible to enroll in the program on a first-come-first-serve basis. Only normotensive adolescents who did not have preexisting CVD or chronic disease and who were not currently taking medications participated in the study. All participants were within 30% of ideal weight for their height. The final sample consisted of 53 African American adolescents (see Table 1).

Procedure
African American adolescents were recruited into the after-school program (Team-Up) from three participating middle schools prior to randomization. After student recruitment, but prior to the start of the study, these three schools were randomized so that one school was assigned to the SCT + MI, one school was assigned to the SCT-only intervention, and one school was assigned to the education-only group (see details of the interventions discussed later).

Demographic and Baseline Measures
Demographic and baseline measures were obtained on each participant, including sex, age, family socioeconomic status, parent’s education level, weight (kg), height (cm), and blood pressure (BP) during each of the assessments (baseline, posttreatment). The parents indicated their total annual family income on a scale ranging 1 (< $10,000), 2 ($10,000–$19,999), 3 ($20,000–$29,999), 4 ($30,000–$39,999), 5 ($40,000–$49,999), 6 ($50,000–$59,999), 7 ($60,000). To assess parental level of education, respondents indicated the highest level of education that the head of the household (the person who financially supported the family) had completed: 1 (less than eighth grade), 2 (eighth grade), 3 (some high school), 4 (high school graduate), 5 (some college), 6 (college graduate), 7 (professional or graduate school). Weight (kg) and height (cm) were measured using a standard hospital balance beam scale. Casual BP was measured by a trained technician with a Dinamap BP apparatus (Model 8100; Critikon, Tampa, FL).

SCT Measures
Diet and exercise self-efficacy measures. Dietary and physical activity self-efficacy were measured with the Self-Efficacy for Eating and Exercise Behavior Scale developed by Sallis, Pinski, Grossman, Patterson, and Nader (45). Participants reported how confident they were that they could make dietary and physical activity changes consistently for at least 6 months. The scale includes three factors: preventing relapse, target behaviors, and behavioral skills on a 30-item scale ranging from 1 (very unsure I can) to 6 (very sure I can). Sallis et al. (45) showed that the Self-Efficacy for Eating and Exercise Behavior Scale has a modest test–retest reliability ranging from 0.43 to 0.64 and an adequate internal consistency ranging from 0.85 to 0.93. For our study sample, the reliability coefficients were 0.95 for the Eating Habits Self-Efficacy scale and 0.96 for the Exercise Self-Efficacy scale.

Motivational Theoretical Measures
The following measures, adapted from a study by Eitel and Friend (17) and Leake, Friend, and Wadhwa (18), were shown to be effective in demonstrating mediational influences on self-reports of health-related behavioral change. Two related subscales were developed based on motivational theory: a Self-concept scale and a Motivational scale. Each subscale was assessed using a Likert-type scale ranging from 1 (strongly disagree) to 6 (strongly agree). Higher scores were associated with more positive self-concepts and greater reported levels of motivation. The following measures were developed and tested in several pilot studies conducted by Wilson and colleagues (46,47).

Self-concept. Participants indicated their attitudes about their “health self-concept” concerning the importance of increasing F&V intake and physical activity. A total of 12 questions were asked, with 6 items pertaining to self-concept toward increasing F&V intake and 6 items pertaining to increasing their physical activity behaviors. Examples of diet-related self-concept items include “I take a lot of pride in eating healthy” and “I am not the kind of person who likes to eat junk food.” Examples of physical-activity-related self-concept items include “Exercising regularly is a very important part of my everyday life” and “It upsets me when I do not exercise regularly.” The average of the 6 dietary items and the average of the 6 physical activity items for each scale were calculated for the data analyses. Reliability coefficients were .88 for the F&V self-concept scale and .63 for the physical activity self-concept scale (46). Each scale was correlated with the Lifestyle Profile Scale, an already-validated scale, which contains items on nutrition and physical activity habits. Correlations with the Lifestyle Profile Scale were .20 to .41 (p < .05) for the F&V and physical activity scales, respectively. For our study sample, the reliability coefficients were 0.50 for the F&V self-concept scale and 0.71 for the physical activity self-concept scale.
Motivation. Participants reported how motivated they were to change their diet and physical activity behaviors. A total of 12 items were assessed, with 6 pertaining to F&V intake and 6 to physical activity motivation. Examples of the diet-related motivational items include "I am very excited about eating more fruits and vegetables on a daily basis" and "I make it a priority to make sure that I eat healthy everyday." Examples of the physical activity motivational items include "I am very involved in making sure that I get plenty of exercise each day" and "I am involved in planning a daily exercise program." The average of the 6 dietary items and the average of the 6 physical activity items were calculated for the data analyses. Reliability coefficients were 0.59 for the F&V motivation scale and 0.70 for the physical activity motivation scale (46). Each scale was also correlated with the Lifestyle Profile Scale. Correlations with the Lifestyle Profile Scale were .43 to .44 (p < .05) for the F&V and physical activity scales, respectively. For our study sample, the reliability coefficients were 0.53 for the F&V motivation scale and 0.78 for the physical activity motivation scale.

Activity Monitors (Accelerometers)

Objective assessments of physical activity behavior over 4 consecutive days were obtained at baseline and posttreatment using the Computer Science and Applications (CSA) 7164 activity monitor (Shalimar, FL). The CSA 7164 is a uniaxial accelerometer designed to detect vertical acceleration ranging in magnitude from 0.05 to 2.00 Gs, with frequency response of 0.25 to 2.50 Hz. Trost et al. (48,49) recently assessed the validity and interinstrument reliability of the CSA 7164 activity monitor in children ages 10 to 14 years. Consistent with the results of adult studies (50), activity counts were strongly correlated with energy expenditure during treadmill walking and running (Pearson r = .86). The intraclass correlation for two CSA 7164 monitors worn simultaneously was .87, indicating a strong degree of inter-instrument reliability.

Participants were instructed to wear the CSA for 24 hr for 4 consecutive days. Consistent with previous studies, monitors were attached to adjustable belts and worn over the right hip. After collection, stored activity counts were downloaded and saved to an IBM-compatible computer. Minute-by-minute activity counts were uploaded to a QBASIC data-reduction program written by Trost et al. (49) for determination of daily kilocalories, average metabolic equivalent (MET) level and time spent in moderate (3–5.9 METS) and vigorous (6–8.9 METS) activity. Counts were converted to units of relative energy expenditure using the energy expenditure prediction equation developed by Freedson, Melanson, and Sirard (50). This equation, which takes into account age-related differences in metabolic rate, accounted for 90% of the variance in observed MET levels and predicted energy expenditure during treadmill running and walking within ± 1.1 METS.

Dietary Measure

Three-day dietary food records were used to assess each participant’s intake of F&V at baseline and posttreatment. A registered dietitian trained the participants to record their intake using food models and common household measures. This training involved viewing food models and demonstrating serving sizes. The dietitian also checked the food records at each assessment for accuracy. The 3-day food records were coded and entered into the database. The responses were compared with coding using the Minnesota Nutrition Data System for Research (NDS-R) program (51). NDS-R general categories include fruit and fruit products and vegetable and vegetable products. Amounts of fruit, fruit juice, vegetables, and vegetable juice appearing in the NDS-R output files can be compared with the National Cancer Institute–established serving sizes to determine the number of F&V servings. The reliability of the two methods was 0.87. Wilson, Sica, Devens, and Nicholson’s previous studies (52) also demonstrated a positive correlation between daily estimates of F&V intake based on food record estimates and average 24-hr urinary potassium excretion (r = .52, p < .05). Nutrients that were analyzed included daily F&V servings.

SCT Diet and Physical Activity Intervention

The general format for teaching children and adolescents to alter their eating behaviors and physical activity behaviors was based on SCT principles, which included (a) education (b) behavioral skills training, and (c) feedback and reinforcement. The goal of the diet was to increase servings of F&V to 6 to 8 per day. The goal for the physical activity program was to increase aerobic activity to 30 to 60 min/day for 7 days a week by the end of the program and was based on the guidelines for physical standards in adolescents published by Sallis and Patrick (53). Specific strategies were offered to assist with maintaining the goal of increasing physical activity to 30 to 60 min a day for 7 days a week.

The 1st week of the program was devoted to obtaining baseline information on food intake and physical activity behaviors, educating the participants on serving sizes, and monitoring heart rates during physical activity. Participants practiced completing behavioral records and were asked to complete a diet and physical activity checklist for 3 days to bring to the next group session. The focus of the 2nd week was to increase their daily servings of F&V to 6 to 8 and physical activity by 30 to 60 min a day for 7 days a week. Participants were given a list of F&V and were instructed to find things on the list that they enjoyed eating and to try to eat 6 to 8 of these items a day.

Sessions 3 through 12 focused mainly on a variety of behavioral skills for increasing their F&V intake and physical activity behaviors. The behavioral skills were modeled after the CATCH clinical trial (13–15) and included developing a reinforcement (reward) plan, restructuring environmental cues, discussing the importance of positive self-talk and confidence building, discussing issues with respect to increasing social support from family and friends, and discussing the importance of maintaining long-term behavior-change strategies. All participants took part in the after-school intramural sports program, Team-Up, 3 days a week. They also participated in an F&V cooking class, where these principles were emphasized, 1 day a week.
SCT + MI Intervention

Participants who were assigned to the SCT + MI intervention participated in all of the components already described in the SCT intervention. Thirty min of the program were devoted to the SCT principles, and 30 min were devoted to participating in the strategic self-presentation videotapes based on the procedure developed by Friend and colleagues (17,18). This approach may be particularly suitable for altering the behavior of adolescents who may resist change. Because adolescence is a time of increasing autonomy, it is important to acknowledge the need for independence and self-initiated behavior change (54–56). Participants were told that the purpose of this portion of the program was to determine whether adolescents’ diet and physical activity habits could be improved by learning how to cope better with the problems and barriers specific to increasing F&V and physical activity. Their part in the project was to advise other students on how to handle problem situations in a videotaped interview portraying their positive coping strategies for increasing F&V intake and physical activity. To induce self-presentation processes, participants were specifically instructed to portray their successful coping strategies so that beginning students could learn how to successfully cope with changing their diet and physical activity behaviors.

Strategic self-presentation videotape session. Participants were given the interview questions prior to the actual interview session and instructed to generate several coping strategies (i.e., methods to increase F&V intake and physical activity) they had used as effective solutions for common problems. They were told to include coping responses that involved either actual behavioral strategies or altering their thoughts and feelings. To induce commitment to their public behavior, students were (a) videotaped during an interview session, (b) allowed to view the videotapes during their next session, and (c) given the opportunity to revise their videotapes. The interview consisted of 12 questions about changing diet and physical activity habits: (a) 2 questions about how to stick with the dietary program while out with friends or in a social setting, (b) 2 questions about how to specifically increase fruit and vegetable intake by 6 to 8 servings a day, (c) 2 questions on how to stick with the diet 7 days a week when motivation is low because of competing activities or negative moods, (d) 2 questions about how to develop a physical activity program for days when they are not at Team-Up, (e) 2 questions about how specifically to increase physical activity to 30 to 60 min/day, and (f) 2 questions on how to avoid not engaging in physical activity when the weather is bad or negative moods get in the way. Each question had three parts: (a) presentation of the problem, (b) how the participant personally coped, and (c) any suggestions about how new students might handle the problem.

Comparison Group

Participants assigned to the comparison group also participated in 12 weekly sessions at their middle school. The goal of the comparison group was to maintain a usual diet and physical activity pattern. Students in this program were provided with educational materials about general health-related issues. Students assigned to this group also provided baseline and postprogram measures as outlined.

RESULTS

Participant Characteristics

Table 1 presents demographic and baseline characteristics for the entire sample, separated by group conditions. A series of one-way analyses of variance (ANOVA) and chi-square analyses indicated that the groups differed on sex, percentage of parents married, and baseline diastolic blood pressure (DBP). The comparison group had fewer girl participants as compared with SCT + MI or SCT-only groups (p < .05). A greater number of parents were married for participants in the SCT + MI group as compared with the other two groups (p < .05). DBPs were greater at baseline for the SCT-only group relative to the comparison group (p < .05). No other effects were significant.

F&V Intake and Physical Activity

Table 2 presents baseline daily F&V intake, kilocalories, METS, moderate minutes of activity, and vigorous minutes of activity for the sample, separated by group conditions. A series of one-way ANOVAs indicated that the groups did not significantly differ on any of these variables at baseline.

Of the 53 participants, 39 (SCT + MI, n = 14; SCT-only, n = 14; Comparison, n = 11) provided complete posttreatment measures. The primary reason for attrition was that the students reported no longer having an interest in participating in the study. Thus, the percentage of participants who remained in the program was higher for the SCT + MI than for the SCT-only or the comparison groups (83% vs. 70% vs. 69%, respectively). Table 2 presents the means and standard deviations of the baseline and posttreatment outcomes across condition. A series of repeated measures ANOVAs were performed to determine the effects of the treatment groups (SCT + MI, SCT-only, education-only) on changing F&V intake and physical activity from pre- to post-treatment. No interaction or main effects were significant. There was, however, a significant time effect for F&V intake (p < .03).

<table>
<thead>
<tr>
<th>TABLE 1</th>
<th>Demographic and Baseline Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variables</td>
<td>SCT + MI</td>
</tr>
<tr>
<td>Sex (M/F)</td>
<td>8/9a</td>
</tr>
<tr>
<td>Parents married (%)</td>
<td>53a</td>
</tr>
<tr>
<td>Parent’s education</td>
<td>4 ± 1</td>
</tr>
<tr>
<td>Annual family income</td>
<td>3 ± 2</td>
</tr>
<tr>
<td>Height (cm)</td>
<td>155 ± 8</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>52 ± 9</td>
</tr>
<tr>
<td>SBP (mm Hg)</td>
<td>115 ± 6</td>
</tr>
<tr>
<td>DBP (mm Hg)</td>
<td>56 ± 8a</td>
</tr>
<tr>
<td>HR (bpm)</td>
<td>85 ± 11</td>
</tr>
</tbody>
</table>

Note: Within a given row, values not sharing a common subscript are significantly different at p < .05. Values are expressed as M ± SD unless indicated otherwise. SCT = social cognitive theory; MI = motivational intervention; SBP = systolic blood pressure; DBP = diastolic blood pressure; HR = heart rate; bpm = beats per minute.
### TABLE 2
Daily F&V Intake and Physical Activity Measures at Baseline and Posttreatment

<table>
<thead>
<tr>
<th></th>
<th>SCT + MI</th>
<th>SCT Only</th>
<th>Comparison</th>
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</thead>
<tbody>
<tr>
<td><strong>Baseline</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F&amp;V servings*</td>
<td>2.6 ± 1.4</td>
<td>2.5 ± 1.2</td>
<td>2.3 ± 1.0</td>
</tr>
<tr>
<td>Kcals</td>
<td>2655 ± 529</td>
<td>2751 ± 816</td>
<td>2806 ± 975</td>
</tr>
<tr>
<td>METS</td>
<td>2.0 ± 0.2</td>
<td>2.0 ± 0.2</td>
<td>2.1 ± 0.3</td>
</tr>
<tr>
<td>Moderate activity (min)</td>
<td>85 ± 39</td>
<td>98 ± 52</td>
<td>115 ± 52</td>
</tr>
<tr>
<td>Vigorous activity (min)</td>
<td>14 ± 13</td>
<td>8 ± 7</td>
<td>19 ± 15</td>
</tr>
<tr>
<td><strong>Posttreatment</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F&amp;V servings*</td>
<td>5.7 ± 2.2</td>
<td>4.8 ± 2.4</td>
<td>3.3 ± 2.1</td>
</tr>
<tr>
<td>Kcals</td>
<td>2353 ± 493</td>
<td>2818 ± 708</td>
<td>2670 ± 911</td>
</tr>
<tr>
<td>METS</td>
<td>2.0 ± 0.2</td>
<td>2.0 ± 0.2</td>
<td>2.0 ± 0.3</td>
</tr>
<tr>
<td>Moderate activity (min)</td>
<td>77 ± 45</td>
<td>104 ± 50</td>
<td>88 ± 63</td>
</tr>
<tr>
<td>Vigorous activity (min)</td>
<td>10 ± 7</td>
<td>12 ± 12</td>
<td>15 ± 15</td>
</tr>
</tbody>
</table>

_Note._ Values express as M ± SD. F&V = fruits and vegetables; SCT = social cognitive theory; MI = motivational intervention; Kcals = kilocalories; METS = metabolic equivalents.

*SCIT + MI and SCT groups showed an increase from baseline to posttreatment, p < .05.

Follow-up comparisons (paired t tests) indicated that participants in the SCT + MI (p < .02) and SCT-only (p < .01) groups showed a significant increase in F&V intake from pre- to posttreatment. No significant effects were found for the comparison group on F&V intake or any of the physical activity measures. The previously mentioned results remained unchanged after controlling for sex and parental marital status in the analyses. We did not control for DBP, given that there was no correlation with this variable and the outcome measures.

**Mediation variables (self-concept, self-efficacy, motivation).** Table 3 shows the means and standard deviations for change in F&V self-concept, F&V self-efficacy, and F&V motivation across the three groups. Change scores are presented here because we hypothesized that the SCT + MI group would show greater positive shifts in self-concept and self-efficacy than the other two groups. Although both intervention groups showed increases in these measures, there were no significant group differences on these mediational measures for F&V intake.

### TABLE 3
Change in Dietary F&V Theoretical Measures from Pre- to Posttreatment

<table>
<thead>
<tr>
<th>Variables</th>
<th>SCT + MI</th>
<th>SCT Only</th>
<th>Comparison</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-concept F&amp;V</td>
<td>+0.7 ± 0.0</td>
<td>+1.1 ± 3.8</td>
<td>-1.2 ± 6.8</td>
</tr>
<tr>
<td>Motivation F&amp;V</td>
<td>+3.4 ± 4.5</td>
<td>+2.5 ± 4.2</td>
<td>+0.1 ± 4.5</td>
</tr>
<tr>
<td>Self-efficacy (relapse)</td>
<td>+8.2 ± 15.5</td>
<td>+4.5 ± 18.6</td>
<td>+1.9 ± 11.2</td>
</tr>
<tr>
<td>Self-efficacy (F&amp;V)</td>
<td>+5.3 ± 12.6</td>
<td>+7.8 ± 22.1</td>
<td>-2.9 ± 10.5</td>
</tr>
<tr>
<td>Self-efficacy (beh. skills)</td>
<td>+7.6 ± 12.3</td>
<td>+7.4 ± 20.8</td>
<td>+1.6 ± 8.1</td>
</tr>
</tbody>
</table>

_Note._ Values are expressed as M ± SD. All ps = ns. F&V = fruits and vegetables; SCT = social cognitive theory; MI = motivational intervention; beh. = behavioral.

### TABLE 4
Change in Physical Activity Theoretical Measures From Pre- to Posttreatment

<table>
<thead>
<tr>
<th>Variables</th>
<th>SCT + MI</th>
<th>SCT Only</th>
<th>Comparison</th>
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<tbody>
<tr>
<td>Self-concept PA</td>
<td>+1.6 ± 5.4</td>
<td>+1.21 ± 5.7</td>
<td>-1.4 ± 5.2</td>
</tr>
<tr>
<td>Motivation PA</td>
<td>+0.1 ± 6.5</td>
<td>+2.9 ± 6.7</td>
<td>-0.9 ± 4.3</td>
</tr>
<tr>
<td>Self-efficacy (relapse)*</td>
<td>+12.0 ± 18.4</td>
<td>+11.2 ± 37.6</td>
<td>-1.4 ± 4.8</td>
</tr>
<tr>
<td>Self-efficacy (PA)</td>
<td>+8.2 ± 13.6</td>
<td>+1.2 ± 6.6</td>
<td>-4.3 ± 4.6</td>
</tr>
<tr>
<td>Self-efficacy (beh. skills)*</td>
<td>+11.7 ± 18.1</td>
<td>+4.3 ± 11.6</td>
<td>-3.5 ± 5.6</td>
</tr>
</tbody>
</table>

_Note._ Values are expressed as M ± SD. SCT = social cognitive theory; MI = motivational intervention; PA = physical activity; beh. = behavioral.

*SCIT + MI > Control, adjusted for multiple comparisons, ps < .05.

### TABLE 5
Correlations Between Behavior Outcomes of F&V and Mediator Variables

<table>
<thead>
<tr>
<th>F&amp;V Variables</th>
<th>Baseline F&amp;V</th>
<th>Post-F&amp;V</th>
<th>Change Score-F&amp;V</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCT + MI group*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self-concept</td>
<td>.22</td>
<td>.58*</td>
<td>.67*</td>
</tr>
<tr>
<td>Motivation</td>
<td>.03</td>
<td>.46</td>
<td>.61</td>
</tr>
<tr>
<td>Self-efficacy (relapse)</td>
<td>-1.8</td>
<td>.45</td>
<td>.85**</td>
</tr>
<tr>
<td>Self-efficacy (F&amp;V)</td>
<td>-.08</td>
<td>.49</td>
<td>.67*</td>
</tr>
<tr>
<td>Self-efficacy (beh. skills)</td>
<td>.10</td>
<td>.65*</td>
<td>.85**</td>
</tr>
<tr>
<td>SCT only group*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self-concept</td>
<td>.36</td>
<td>.13</td>
<td>.02</td>
</tr>
<tr>
<td>Motivation</td>
<td>.45</td>
<td>.39</td>
<td>.10</td>
</tr>
<tr>
<td>Self-efficacy (relapse)</td>
<td>-.12</td>
<td>.02</td>
<td>-.19</td>
</tr>
<tr>
<td>Self-efficacy (F&amp;V)</td>
<td>.37</td>
<td>-.01</td>
<td>.12</td>
</tr>
<tr>
<td>Self-efficacy (beh. skills)</td>
<td>-.09</td>
<td>.14</td>
<td>.10</td>
</tr>
</tbody>
</table>

_Comparison b:_

<table>
<thead>
<tr>
<th>Variables</th>
<th>Baseline F&amp;V</th>
<th>Post-F&amp;V</th>
<th>Change Score-F&amp;V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-concept</td>
<td>.05</td>
<td>.04</td>
<td>.14</td>
</tr>
<tr>
<td>Motivation</td>
<td>.11</td>
<td>.10</td>
<td>.02</td>
</tr>
<tr>
<td>Self-efficacy (relapse)</td>
<td>.08</td>
<td>-.09</td>
<td>-.03</td>
</tr>
<tr>
<td>Self-efficacy (F&amp;V)</td>
<td>.10</td>
<td>.12</td>
<td>.13</td>
</tr>
<tr>
<td>Self-efficacy (beh. skills)</td>
<td>-.27</td>
<td>-.09</td>
<td>-.11</td>
</tr>
</tbody>
</table>

_Note._ Change score = Posttreatment – Baseline. F&V = fruits and vegetables; SCT = social cognitive theory; MI = motivational intervention; beh. = behavioral.

* _n_ = 14, _b_ _n_ = 11.

*p < .05, **p < .01.
DISCUSSION

Although our original hypothesis was that the SCT + MI intervention would be most effective in producing the desired behavior change, the data from this study indicate that the SCT + MI and the SCT-only interventions were equally effective for increasing F&V intake as compared with the control group. However, a greater proportion of participants in the SCT + MI condition stayed in the 12-week program as compared with the SCT-only and comparison groups. There were, however, no significant group differences for any of the physical activity measures. With respect to our mediational hypotheses, only the SCT + MI group showed significant correlations between posttreatment dietary self-concept and self-efficacy and change in F&V intake. These findings suggest that the change in F&V intake in the SCT + MI group resulted from participating in the strategic self-presentation session, which induced positive shifts in self-concept and self-efficacy. Although the SCT group did show an increase in F&V intake, it is unclear what the mediating variables were in the present study. Because SCT is a comprehensive model, there are a number of unspecified processes that could be accounting for the effects in our study. Further research is needed to more clearly identify what the potential mechanisms underlying the effects of SCT may be.

These study results suggest that applying established social psychological principles to health promotion behaviors has several practical benefits. Specifically, participants who were in the SCT + MI condition demonstrated positive correlations between posttreatment self-concept and self-efficacy and their increase in F&V intake. Few previous studies have demonstrated significant associations between psychosocial mediator variables and health-behavior-change outcomes (57,58). However, Goodrick et al. (59) demonstrated that improvements in binge eating after 6 months of treatment and at 12 months posttreatment were associated with improvements in self-concept and self-efficacy specific to diet. The results in our study are also consistent with other health-related studies, which have demonstrated that strategic self-presentation improved adjustment, depression, and physical symptoms in patient populations (18). Furthermore, Leake et al. (18) found that patients who reported discussing more coping strategies in the strategic self-presentation interview became better adjusted over the course of the 1-month intervention, suggesting that coping strategies may be an important mediator. The role of coping strategies may also suggest that components of Relapse prevention theory are relevant to this theoretical approach. Further research is needed to better understand the role of self-concept, self-efficacy, and coping strategies on sustaining long-term changes in health behaviors (i.e., eating habits) in children and adults.

The SCT-only intervention was also effective in changing posttreatment dietary behaviors. Previous studies that have focused specifically on SCT approaches to increasing F&V intake have demonstrated similar findings. For example, Gortmaker et al. (9) had 1,295 sixth- and seventh-grade students participate in either a school-based SCT intervention for weight loss or no intervention over 2 years. The results showed that the intervention schools versus control schools increased F&V consumption and resulted in a smaller increase in total energy intake. In another adolescent study, Heaney and Thombs (60) found that self-efficacy specific to F&V intake was important in distinguishing between youth with a varied diet and those with a restricted diet. Adolescents who ate more varied diets had higher self-efficacy levels. The findings in the present study demonstrate that self-efficacy specific to F&V intake increased but was not significant for participants in either the SCT + MI or the SCT-only condition. It could be that because of the small sample size employed in our study, there was not enough power to statistically detect these differences.

The change in F&V intake obtained in this study is of clinical significance. Given that the 2010 national objectives (61) advocate at least 5 servings/day of F&V, an increase from 2.6 to 5.7 servings/day for the SCT + MI group and an increase of 2.5 to 4.8 servings/day for the SCT-only group is important. Previous community-based programs have typically shown smaller increases in F&V servings per day (57,58). If these differences could be replicated and sustained in larger community-based studies, this could have a significant impact on decreasing the risk of hypertension, CVD, and cancer.

The lack of findings with respect to the physical activity measures may be attributable to several factors. First, the students at each school were already participating in an after-school intramural sports program. Because they may have already been motivated to engage in physical activity, there may not have been an added effect of the intervention on increasing activity in these participants. This explanation is also consistent with work by Sallis and Owen (11), which suggests that one of the strongest determinants of physical activity is the physical environment. For example, previous research has demonstrated that the convenience of facilities correlates with the frequency of physical activity (62,63). Given that the adolescents in our study had access to an intramural sports program after school, 3 days a week, this factor alone may have contributed to their physical activity levels regardless of the behavioral or MI.

There are several limitations to our study. First, the study incorporated a relatively small sample of adolescents, which may have limited our ability to demonstrate significant differences between the SCT + MI and SCT-only interventions on improving diet and physical activity. Furthermore, given that the groups were quite different at baseline, controlling for these characteristics may not have changed the results because of a lack of power. However, even with this small sample, we were
able to show significant changes in F&V intake across the interventions groups as compared with the control group. Further data are needed, however, to examine these relations in a larger sample of participants and over long-term follow-up to determine the long-range benefits of inducing shifts in self-concept in the motivational as compared with SCT-only conditions. Another limitation of the study was that no objective measure of F&V intake was obtained from the study participants. In addition, the theoretical measures of self-concept and motivation demonstrated only modest reliability coefficients. Although there was no way to verify that the self-reports were accurate in the study, we were able to obtained 24-h urine estimates in a subsample of participants. However, because we did not believe that these data were representative of all participants, because only a relatively small group of adolescents participated, we did not include this data in the present report. The dietary assessment method used in our study, however, has been shown to be highly consistent with urinary assessments of nutrients in a previous study by Wilson and colleagues (52).

In summary, this study did not demonstrate greater increases in F&V intake in the SCT + MI versus SCT-only intervention. However, this is the first preliminary study to show positive correlations between mediational variables, such as self-concept and self-efficacy, and F&V intake in an adolescent population. Given the lack of mediation observed in the SCT condition, we are encouraged by the correlations in the SCT + MI condition between verbal reports of self-concept change and absolute and behavior changes in post-F&V (but no baseline). In fact, this is the first self-presentation study, in either laboratory or field, to show that experimentally induced shifts in self-concept may covary with behavior change. Identifying processes may be important in elicitating and maintaining long-term behavior changes in future interventions. Although there were no significant effects of the intervention on physical activity measures, further research under conditions where access to physical activity is less accessible may prove to be more conducive to the types of interventions employed in this study. Further data is needed to more thoroughly explore the role of self-concept, self-efficacy, and coping strategies as important mediators for inducing long-term health-behavior change. If motivational enhancements (strategic self-presentation) do prove to be effective in long-term maintenance of health-behavior change, this could be a relatively easy protocol to implement in ongoing community-based intervention trials.

REFERENCES


