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Computer-Mediated Intervention Tailored on Transtheoretical Model Stages and Processes of Change Increases Fruit and Vegetable Consumption Among Urban African-American Adolescents

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Abstract

Purpose—To examine the efficacy of an intervention based on the transtheoretical model (TTM) for increasing fruit and vegetable consumption among economically disadvantaged African-American adolescents.

Design—Pretest-posttest quasi-experimental study.

Setting—Youth services agencies located in New York, New Jersey, and Pennsylvania. Agencies were assigned to computer intervention (CIN) and nonintervention control study arms.

Subjects—A total of 507 African-American adolescents ages 11 to 14 years.

Intervention—Youths in the CIN arm completed four 30-minute intervention sessions tailored on TTM stages and processes of change.

Measures—Self-reported fruit and vegetable consumption and stages, pros, cons, and self-efficacy for consumption.

Analysis—Intervention effects were examined with analysis of covariance models that were controlled for demographic variables and baseline measures of each outcome. Chi-square analyses were used to examine between-arm differences in youths' stage progressions.

Results—After adjustment by covariates, pros ($p < .025$) and fruit and vegetable consumption ($p < .001$) varied significantly with study arm. Youths in the CIN arm had higher pro scores and fruit and vegetable consumption than controls. More youths in the CIN arm than in the control arm progressed to later stages and maintained recommended intake levels ($p < .05$).

Conclusions—A TTM-based intervention can increase fruit and vegetable intake and effect positive changes in TTM variables related to intake among economically disadvantaged African-American adolescents.

Keywords

Fruit and vegetable consumption; Transtheoretical Model; African-Americans; Adolescents; Dietary Intervention; Prevention Research; Manuscript format: research; Research purpose: intervention testing; Study design: quasi-experimental; Outcome measure: cognitive, behavioral; Setting: local community; Health focus: nutrition; Strategy: education; skill building/behavior change; Target population: youth; Target population circumstances: geographic location; race/ethnicity

PURPOSE

Substantial epidemiologic evidence supports the protective role of fruits and vegetables in the prevention of cancer.¹ Despite the health benefits of a diet rich in fruits and vegetables, fewer than one fourth of African-American adolescents consume the minimum five recommended daily servings and, like U.S. adolescents from other racial/ethnic groups, their average intake decreases with income.² Although African-Americans comprise a modest 13% of the U.S. population, cancer incidence and mortality rates are higher among African-Americans than they are among members of any other U.S. racial and ethnic group.^{3,4} Their low fruit and vegetable intake and high cancer incidence suggest that economically disadvantaged African-American adolescents would benefit from intervention to increase fruit and vegetable consumption.

The transtheoretical model (TTM) provides a theoretical framework for developing interventions to modify a variety of health behaviors.⁵ The model comprises four constructs: (1) *stages of change*, the temporal readiness to modify health behavior; (2) *decisional balance*, the relative importance of the perceived pros and cons of change; (3) *situational self-efficacy*, confidence in one's ability to modify the behavior across positive social, negative affect, and difficult situations; and (4) *processes of change*, the experiential and behavioral strategies individuals use to progress through the stages of change.⁶ These constructs are organized according to the three dimensions of the TTM: the temporal dimension, or stages of change; the dependent variable dimension, which includes behavior, decisional balance, and self-efficacy; and the independent variable dimension, or processes of change.

According to the TTM, in order for health behavior change to occur, different processes need to be employed at different stages.⁵ By understanding which processes are effective at which stages, intervention content can be matched to the needs of individuals who are at different points in the change process. The delivery of stage-tailored change processes, in turn, promotes movement through successive stages and effects improvements in health behavior, decisional balance, and self-efficacy.

The TTM has been applied to the cessation of such negative behaviors as smoking, cocaine abuse, and delinquent behavior, and to the acquisition of such positive behaviors as safer sex practices, sunscreen use, and regular exercise.⁷⁻⁹ Dietary applications of the model include fat intake, weight control, consumption of dairy products, and fruit, vegetable, and grain intake.⁶ The TTM has been effective in predicting fruit and vegetable consumption in diverse adult populations.¹⁰⁻¹⁷ Moreover, TTM-based interventions have been successful in increasing fruit and vegetable consumption among African-American adults.¹⁸⁻²⁰ Despite the success of the model with adults, there are no TTM-based interventions for increasing fruit and vegetable intake among economically disadvantaged African-American adolescents.

In initial research, we examined the utility of the TTM for understanding and predicting fruit and vegetable consumption among economically disadvantaged African-American adolescents.²¹ Findings revealed that youths were predominantly distributed across three stages of change (precontemplation, contemplation/preparation, and action/maintenance).

Consistent with the TTM, fruit and vegetable intake, pros, and self-efficacy increased across stages. Cons were initially higher than pros in precontemplation and contemplation/preparation, and they then decreased in action/maintenance. Experiential and behavioral processes of change were used less often in precontemplation and contemplation/preparation than in action/maintenance. The success of the model with economically disadvantaged African-American adolescents led to the development of a TTM-based intervention to increase fruit and vegetable intake in this population.

The TTM-based intervention program is tailored on TTM stages and processes of change. Youths in pre-contemplation, contemplation/preparation, and action/maintenance stages of change complete intervention sessions that incorporate processes of change strategies relevant to their stage. The purpose of this study was to determine whether the delivery of stage-tailored change processes would promote movement through successive stages and effect positive changes in fruit and vegetable consumption, as well as pros, cons, and self-efficacy for consumption in a sample of economically disadvantaged African-American adolescents.

METHODS

Design

The study was conducted in 27 youth services agencies located in urban areas of New York, New Jersey, and Pennsylvania. Youth services agencies were private nonprofit organizations that provided human services, such as school dropout prevention, recreation, educational tutoring, computer literacy training, and youth club activities. Outcome data were collected using a quasi-experimental research design. Nine pairs of agencies matched on the size of their youth population were randomized to one of two conditions: computer intervention (CIN) and control. Of the remaining agencies, one served a disproportionately large youth population compared with the others and was assigned to the control arm to guard against the potential loss of participants in this arm. The eight other agencies were assigned to the CIN arm.

Following the assignment of sites to study conditions, youths in CIN and control arms were administered pre-tests under the direction of trained research staff. Two weeks after pretesting, youths in the CIN arm completed the intervention in four onsite 30-minute weekly sessions. Youths in the control arm participated in regular programs offered at collaborating sites. Two weeks after intervention, youths in the CIN and control arms completed posttests.

Sample

Selection criteria for study participation were African-American ethnic/racial heritage and age of 11 to 14 years. Following institutional review board approval, eligible youths enrolled in after school programs at participating sites provided assent and obtained informed written consent from a parent or guardian. For their participation, youths received a \$20 honorarium. Pretests were completed by 549 informed and consenting youths. Of this number, 507 youths (92%) completed posttests. Common reasons for the 0.08 attrition rate included youths' sporadic attendance at community-based sites and their discontinuation of after school program involvement. The sample of 507 youths had a mean age of 12.44 years and was 61% female and 15% Hispanic. Although the socioeconomic status of youths was not measured, more than four fifths (87%) of participants came from communities in which 20% or more of families had incomes below the federal poverty level.²² There were 117 youths in the CIN arm and 390 youths in the control arm.

Measures

Coded for confidentiality, participants completed an outcome battery at pretest and posttest measurement occasions. The battery contained demographic items for determining youths'

age, gender, and ethnicity. TTM variables and fruit and vegetable consumption were assessed using previously validated scales that were included in the battery.^{21,23}

Perceived Pros and Cons of Fruit and Vegetable Consumption—The perceived pros and cons of fruit and vegetable consumption were assessed via two scales: an 18-item measure that queried youths' perceptions of the benefits of eating five or more daily servings of fruits and vegetables ($\alpha = .91$), and a 14-item scale that assessed youths' perceptions of barriers to consuming five or more daily servings of fruits and vegetables ($\alpha = .85$). Youths were asked to rank items in each measure with respect to their decision to consume or not consume five or more daily servings of fruits and vegetables using five-point Likert scales ranging from 1 (not important) to 5 (very important). Item ratings were summed to derive total scale scores. Higher scores indicated endorsements of the perceived pros and cons of consuming five or more daily servings of fruits and vegetables.

Self-Efficacy for Fruit and Vegetable Consumption—Self-efficacy for fruit and vegetable consumption was measured using a 17-item scale that queried youths' belief in their ability to eat fruits and vegetables in positive social, negative affect, and difficult situations ($\alpha = .86$). Positive social situations are social interactions that elicit positive feelings (e.g., while having a good time with friends at a party). Negative affect situations involve negative events accompanied by feeling bad (e.g., when arguing with someone close and feeling sad). Difficult situations are those in which it is challenging to eat fruits and vegetables (e.g., when only junk food is readily available). Youths were presented with statements beginning with the phrase "I am confident in my ability to eat fruits and vegetables when" and followed by a specific situation (e.g., "I have to prepare meals for myself"). Youths rated their degree of confidence using five-point Likert scales ranging from 1 (not confident) to 5 (very confident). Item ratings were summed to derive a total scale score. Higher scores indicated confidence in the ability to eat fruits and vegetables across the situations described.

Stages of Change and Fruit and Vegetable Consumption—States of change and fruit and vegetable consumption were assessed using the staging measure and algorithm developed by the Cancer Prevention Research Center for the 5 A Day initiative.²³ The scoring algorithm was modified to classify youths into precontemplation, contemplation/preparation, and action/maintenance stages. Youths who reported consumption of fewer than five daily servings were classified into one of two stages based on their interest in increasing their intake: precontemplation (not considering eating five or more daily servings of fruits and vegetables within the next 6 months) or contemplation/preparation (considering eating five or more daily servings of fruits and vegetables within the next 6 months). Youths who reported consumption of five or more daily servings of fruits and vegetables were classified in action/maintenance regardless of the duration of the behavior. Fruit and vegetable consumption was measured using the first item in the staging measure. This item asked, "About how many servings of fruits and vegetables do you usually eat each day?" Response options ranged from zero to six or more servings.

Intervention

The TTM-based intervention program provided youths with four 30-minute sessions of CD-ROM-mediated intervention content. All users completed an introductory session, which oriented them to the program and addressed the health benefits of consuming five or more daily servings of fruits and vegetables. A staging measure built into the session classified users into precontemplation, contemplation/preparation, or action/maintenance. Users' stage classification determined which group of three additional intervention sessions they would complete.

Three groups of three 30-minute, stage-tailored sessions were developed, each employing processes of change strategies relevant to the different stages of change. Users in precontemplation completed sessions that incorporated consciousness raising, dramatic relief, and environmental reevaluation processes for enhancing awareness of lower-than-recommended intakes and promoting acceptance of the need for dietary change. An example of a consciousness-raising change strategy included in this group of sessions was to increase users' awareness of their intake by having them complete an assessment that provided personalized feedback regarding the number of daily servings of fruits and vegetables they were in the habit of eating.

Users in contemplation/preparation were exposed to self-reevaluation and self-liberation strategies for increasing confidence in the ability to increase intake, resolve ambivalence regarding commitment to act, and facilitate the development of specific plans for modifying dietary behavior. An example of a self-liberation change strategy included in this group of sessions was to help users take steps toward increasing their intake by having them set a daily fruit and vegetable goal and develop a 1-week menu and action plan for reaching the goal.

Reinforcement management, helping relationships, counterconditioning, and stimulus control processes for helping users sustain recommended intake levels were delivered in sessions for users in action/maintenance. An example of a helping relationships change strategy included in this group of sessions was to encourage users to team up with another person who was also interested in maintaining intake and to develop a "buddy contract" identifying strategies for giving each other support. Processes of change definitions, sample interventions, and illustrative examples of corresponding change strategies used in our program are summarized in Table 1.

Analysis

To facilitate comparisons with prior TTM research, pro, con, and self-efficacy scores were converted to standard *T* scores (mean: 50, SD: 10). Descriptive statistics were used to report youths' demographic characteristics, stage of change, and fruit and vegetable consumption. Between-arm differences in baseline measures of TTM variables and fruit and vegetable consumption were assessed using two-tailed *t*-tests for independent samples for continuous variables and χ^2 tests for categorical data. The effects of software intervention on fruit and vegetable consumption, pros, cons, and self-efficacy were examined with analysis of covariance (ANCOVA) models that were controlled for gender, age, ethnicity, and baseline measures of each outcome. Chi-square analyses were performed using posttest stage of change data for groups of youths classified in precontemplation, contemplation/preparation, and action/maintenance stages at study entry. Analyses examined between-arm differences in youths' posttest stage classification.

RESULTS

At baseline, the largest proportion of youths was classified in contemplation/preparation (55%), followed by pre-contemplation (33%) and action/maintenance (12%) stages. Participants' mean (SD) level of consumption at study entry was 2.54 (1.48) servings.

Baseline measures of TTM variables and fruit and vegetable consumption did not differ by arm. After adjustment by covariates, fruit and vegetable consumption ($F_{1, 501} = 26.62$; $p < .001$) and pros of change ($F_{1, 501} = 5.08$; $p < .025$) varied significantly with study arm (Table 2). Group means revealed that youths in the CIN arm had higher mean intake (mean: 3.25 servings, SD: 1.50 servings) and pro scores (mean: 51.80, SD: 9.89) than youths in the control arm (mean: 2.46, SD: 1.39 servings, and mean: 49.21, SD: 9.89 servings, respectively). Relative to youths in the control arm, greater proportions of youths in the CIN arm moved from

precontemplation to contemplation/preparation and action/maintenance stages ($\chi^2_2 = 13.85$, $p < .001$), and from contemplation/preparation to action/maintenance stages ($\chi^2_2 = 8.10$, $p < .05$) from pretest to posttest measurement occasions (Table 3). Moreover, a greater proportion of CIN-arm youths than control-arm youths in action/maintenance remained in this stage following intervention ($\chi^2_2 = 7.00$, $p < .05$).

DISCUSSION

Summary

This purpose of this study was to examine the effects of a TTM-based intervention on fruit and vegetable consumption, and pros, cons, and self-efficacy for consumption among economically disadvantaged African-American adolescents. Youths who interacted with the program increased their intake about 38% more than control-arm youths. This represents an average increase of 0.9 daily servings of fruits and vegetables, an amount larger than the average increase reported in a meta-analytic review of dietary intervention outcome studies.²⁴ Moreover, CIN-arm youths evidenced greater increases in the perceived pros of eating five or more daily servings of fruits and vegetables than control-arm youths. In addition, greater percentages of youths in the CI arm than in the control arm progressed to later stages of change and maintained the target behavior of eating five or more daily servings of fruits and vegetables. Positive program effects on fruit and vegetable consumption, pros, and stages of change support the utility of the TTM for guiding the development of our intervention program.

TTM-based interventions for African-American adults have also been successful in increasing fruit and vegetable intake.^{18–20} A difference between our program and programs for adults is the tailoring approach used. Programs for adults have drawn from TTM stages, decisional balance, and self-efficacy constructs to deliver personalized messages and feedback tailored on respondents' preintervention intake, perceptions of the pros and cons of change, and self-efficacy for consumption. Our program tailored content on TTM stages and processes of change. Findings provide preliminary support for the utility of this approach. Although both tailoring schemes produced positive intake changes in the samples studied, conclusions regarding the relative efficacy of these approaches must await further research.

Adolescent dietary interventions tailored on TTM processes of change have produced positive dietary changes.^{25,26} However, the programs developed by Frenn and colleagues used processes of change appropriate for youths in preaction stages of change. Our program used change processes relevant to youths in both preaction (i.e., precontemplation and contemplation/preparation) and action (i.e., action/maintenance) stages. Positive program effects were observed among youths in each stage. The replication of effects across stages lends credibility to study findings. Moreover, findings demonstrate that youths can benefit from exposure to intervention strategies matched to their motivational readiness to modify dietary behavior. The focus of many dietary interventions is on increasing intake among individuals with low levels of consumption. Our findings show that youths who are consuming five daily servings of fruits and vegetables can also benefit from intervention to help them sustain this behavior.

Limitations

The use of a self-selected sample limits the generalizability of study findings. Youths electing to participate in the study may have differed from economically disadvantaged African-American adolescents in other youth services agency settings. The quasi-experimental study design limits the internal validity of findings. Youths in the CIN and control arms did not differ on baseline measures of TTM variables and fruit and vegetable consumption, a finding that increases our confidence that outcome changes among CIN-arm participants were due to

intervention and not some other factor. Although the short-term effects of intervention were studied, research is needed to determine the sustainability of observed effects over time.

Significance

This is one of the first studies to examine the efficacy of a TTM-based intervention for increasing fruit and vegetable consumption among economically disadvantaged African-American adolescents. Participants' mean intake at study entry confirmed the need for effective interventions to increase consumption in this population. Findings revealed that exposure to an intervention tailored on TTM stages and processes of change can increase intake, promote forward movement through the stages of change, and strengthen endorsements of the pros of change among economically disadvantaged African-American adolescents. Health professionals designing programs to promote fruit and vegetable consumption in this population should address the differential needs of youths who may not yet be ready to increase their intake (those in precontemplation), youths who are considering modifying their intake in the near future (those in contemplation/preparation), and those who face the day-to-day challenges of maintaining recommended intake levels (those in action/maintenance). The delivery of strategies geared toward youths at these different points in the process is an effective approach for promoting positive dietary change.

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References

1. Van Duyn MAS, Pivonka E. Overview of the health benefits of fruit and vegetable consumption for the dietetics professional: selected literature. *J Am Diet Assoc* 2000;100:1511–1521. [PubMed: 11138444]
2. Krebs-Smith SM, Cook A, Subar AF, et al. Fruit and vegetable intakes of children and adolescents in the United States. *Arch Pediatr Adolesc Med* 1996;150:81–86. [PubMed: 8542012]
3. American Cancer Society. Cancer facts and figures for African Americans 2005–2006. [Accessed May 26, 2006]. Available at: <http://www.cancer.org/downloads/STT/CAFF2005AACorrPWSecured.pdf>
4. National Cancer Institute. Age-adjusted incidence rates and 95% confidence intervals: SEER 13 registries for 1998–2002. [Accessed May 20, 2005]. Available at: <http://www.seer.cancer.gov>
5. Prochaska JO, Velicer WF. The transtheoretical model of health behavior change. *Am J Health Promot* 1997;12:38–48. [PubMed: 10170434]
6. Greene GW, Rossi SR, Rossi JS, et al. Dietary applications of the stages of change model. *J Am Diet Assoc* 1999;99:673–678. [PubMed: 10361528]
7. Prochaska JO, Velicer WF, Rossi JS, et al. Stages of change and decisional balance for 12 problem behaviors. *Health Psychol* 1994;13:39–46. [PubMed: 8168470]
8. Horowitz S. Applying the transtheoretical model to pregnancy and STD prevention: a review of the literature. *Am J Health Promot* 2003;17:304–328. [PubMed: 12769045]
9. Spencer L, Pagell F, Hallion ME, Adams TB. Applying the transtheoretical model to tobacco cessation and prevention: a review of the literature. *Am J Health Promot* 2003;17:7–71. [PubMed: 12271754]
10. Greene GW, Fey-Yensan N, Padula C, et al. Differences in psychosocial variables by stage of change for fruits and vegetables in older adults. *J Am Diet Assoc* 2004;104:1236–1243. [PubMed: 15281040]
11. Henry H, Reimer K, Smith C, Reicks M. Associations of decisional balance, processes of change, and self-efficacy with stages of change for increased fruit and vegetable intake among low-income African-American mothers. *J Am Diet Assoc* 2006;106:841–849. [PubMed: 16720125]
12. Brug J, Glanz K, Kok G. The relationship between self-efficacy, attitudes, intake compared to others, consumption, and stages of change related to fruit and vegetables. *Am J Health Promot* 1997;12:25–30. [PubMed: 10170431]

13. Ma J, Betts NM, Horacek T, et al. The importance of decisional balance and self-efficacy in relation to stages of change for fruit and vegetable intakes by young adults. *Am J Health Promot* 2002;16:157–166. [PubMed: 11802261]
14. Campbell MK, Symons M, Demark-Wahnefried W, et al. Stages of change and psychosocial correlates of fruit and vegetable consumption among rural African-American church members. *Am J Health Promot* 1998;12:185–191. [PubMed: 10176093]
15. Ling AMC, Horwath C. Defining and measuring stages of change for dietary behaviors: readiness to meet fruit, vegetable, and grain guidelines among Chinese Singaporeans. *J Am Diet Assoc* 2000;100:898–904. [PubMed: 10955047]
16. Van Duyn MS, Heimendinger J, Russek-Cohen E, et al. Use of the transtheoretical model of change to successfully predict fruit and vegetable consumption. *J Nutr Educ* 1998;30:371–380.
17. de Oliveira MCF, Anderson J, Auld G, Kendall P. Validation of a tool to measure processes of change for fruit and vegetable consumption among male college students. *J Nutr Educ Behav* 2005;37:2–11. [PubMed: 15745650]
18. Campbell MK, Motsinger BM, Ingram A, et al. The North Carolina Black Churches United for Better Health Project: intervention and process evaluation. *Health Educ Behav* 2000;27:241–253. [PubMed: 10768805]
19. Havas S, Anliker J, Damron D, et al. Final results of the Maryland WIC 5-A-Day promotion program. *Am J Public Health* 1998;88:1161–1166. [PubMed: 9702141]
20. Resnicow K, Jackson A, Wang T, et al. A motivational interviewing intervention to increase fruit and vegetable intake through Black churches: results of the Eat for Life trial. *Am J Public Health* 2001;91:1686–1693. [PubMed: 11574336]
21. Di Noia J, Schinke SP, Prochaska JO, Contento IR. Application of the transtheoretical model to fruit and vegetable consumption among economically disadvantaged African-American adolescents: preliminary findings. *Am J Health Promot* 2006;20:342–348. [PubMed: 16706005]
22. US Census Bureau. American fact finder [database]. [Accessed June 21, 2006]. Available at: <http://factfinder.census.gov>
23. Cancer Prevention Research Center. Stages of change (5 A Day). [Accessed June 5, 2005]. Available at: <http://www1.od.nih.gov/behaviorchange/measures/PDF/5daystg.pdf>
24. Ammerman AS, Lindquist CH, Lohr KN, Hersey J. The efficacy of behavioral interventions to modify dietary fat and fruit and vegetable intake: a review of the evidence. *Prev Med* 2002;35:25–41. [PubMed: 12079438]
25. Frenn M, Malin S, Brown RL, et al. Changing the tide: an internet/video exercise and low-fat diet intervention with middle-school students. *Appl Nurs Res* 2005;18:13–21. [PubMed: 15812731]
26. Frenn M, Malin S, Bansal NK. Stage-based interventions for low-fat diet with middle school students. *J Pediatr Nurs* 2003;18:36–45. [PubMed: 12610786]

Table 1
Processes of Change Definitions, Sample Interventions, and Illustrative Program Activities, by Stage

Stage/Process	Definition: Sample Interventions	Illustrative Program Activity
Precontemplation		
Consciousness raising	Raising awareness about unhealthy dietary behaviors: feedback, education, confrontation, interpretation, bibliotherapy.	Interactive assessment with feedback for raising users' awareness of the number of daily servings of fruits and vegetables they are in the habit of eating.
Dramatic relief	Experiencing and expressing feelings to help motivate dietary change: psychodrama, role playing, grieving, personal testimonies.	Personal testimonial regarding losing a loved one to cancer, followed by a discussion of lifestyle habits associated with increased cancer risk.
Environmental reevaluation	Assessing the impact of one's unhealthy dietary behavior on others and raising awareness that one can serve as a role model for others: empathy training, documentaries, family interventions.	Vignette depicting a boy who experiments with different strategies for increasing his intake and notices the positive impact his behaviors are having on family members and close friends.
Contemplation/preparation		
Self-reevaluation	Examining how one thinks and feels about oneself with respect to unhealthy dietary behavior: value clarification, exposure to healthy role models, imagery.	Guided imagery exercise for helping users understand the health consequences of not eating enough fruits and vegetables.
Self-liberation	Choosing to act or believe in ability to change dietary behaviors: behavioral resolutions, public testimonies, exposure to multiple alternatives for modifying behavior.	Identification of a daily fruit and vegetable goal and development of a 1-wk menu and action plan for reaching the goal.
Action/Maintenance		
Reinforcement management	Rewarding oneself or being rewarded by others for making dietary changes: contingency contracts, overt and covert reinforcements, positive self-statements, group recognition.	Multimedia presentation addressing strategies for rewarding oneself or being rewarded by others for continuing to eat five to nine daily servings of fruits and vegetables.
Helping relationships	Being open about problems with someone who cares: providing support for healthy behavior, therapeutic alliance, buddy systems.	Development of a "buddy contract" for teaming up with someone else who is interested in maintaining an intake of five or more daily servings of fruits and vegetables.
Counterconditioning	Substituting alternatives for problem behaviors: relaxation, desensitization, assertion, positive self-statements.	Interactive activity for helping users identify problem behaviors that prevent them from maintaining intake followed by a multimedia presentation of healthy replacement behaviors to try instead.
Stimulus control	Avoiding or countering stimuli that elicit problem behaviors: avoidance, environmental reengineering, self-help groups.	Environmental assessment activity for determining characteristics of home, neighborhood, and school environments that may encourage unhealthy eating, followed by a discussion of strategies for changing or handling environmental aspects that are problematic.

Table 2
 Analysis of Covariance of Pros, Cons, Self-Efficacy, and Fruit and Vegetable Consumption

Source of Variance	Adjusted SS	df	MS	F	P
Pros					
Arm	411.96	1	411.96	5.08	0.025
Pretest	8424.48	1	8424.48	103.97	0.000
Age	17.01	1	17.01	0.210	0.647
Gender	0.156	1	0.156	0.002	0.965
Ethnicity	235.79	1	235.79	2.91	0.089
Error	40594.58	501			
Cons					
Arm	36.81	1	36.81	0.443	0.506
Pretest	6177.76	1	6177.76	74.41	0.000
Age	0.097	1	0.097	0.973	0.973
Gender	0.616	1	0.616	0.946	0.946
Ethnicity	51.15	1	51.15	0.433	0.433
Error	41596.13	501			
Self-efficacy					
Arm	88.66	1	88.66	1.09	0.297
Pretest	7187.06	1	7187.06	88.34	0.000
Age	112.29	1	112.29	1.38	0.241
Gender	41.18	1	41.18	0.506	0.477
Ethnicity	3.85	1	3.85	0.047	0.828
Error	40759.29	501	88.66		
Fruit and vegetable consumption					
Arm	49.40	1	49.40	26.62	0.000
Pretest	83.46	1	83.46	44.97	0.000
Age	0.515	1	0.515	0.278	0.599
Gender	2.12	1	2.12	1.14	0.286
Ethnicity	0.001	1	0.001	0.000	0.985
Error	929.76	501			

Table 3
Chi-Square Analysis of Between-Arm Differences in Posttest Stages of Change by Pretest Stages of Change

Pretest Stages of Change	Posttest Stages of Change (%)				χ^2	<i>p</i>
	Precontemplation	Contemplation/Preparation	Action/Maintenance			
Precontemplation						
CIN (n = 37)	27	49	24	13.85	0.001	
Control (n = 132)	52	42	6			
Contemplation/preparation						
CIN (n = 68)	12	72	16	8.10	0.05	
Control (n = 209)	26	66	8			
Action/maintenance						
CIN (n = 12)	8	33	59			
Control (n = 49)	23	57	20	7.00	0.05	