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## Efficacy of a Brief Image-based Multiple Behavior Intervention for College Students

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### Abstract

**Background**—Epidemiologic data indicate most adolescents and adults experience multiple, simultaneous risk behaviors.

**Purpose**—To examine the efficacy of a brief image-based multiple behavior intervention (MBI) for college students.

**Methods**—A total of 303 college students attending a southeastern university were randomly assigned to: 1) a brief one-on-one tailored consultation with goal plan; or 2) standard care print material, with three-month post-intervention data collected.

**Results**—Significant MANOVA omnibus group by time MANOVAs were performed for six groupings of health behavior measures. Significant group by time interactions were found on alcohol consumption,  $F(4,278)=3.42$ ,  $p=.01$ , marijuana use,  $F(5,277)=2.75$ ,  $p=.02$ , and health-related quality of life,  $F(5,277)=2.87$ ,  $p=.02$ , in favor of college students receiving the brief intervention. ANOVAs were performed for another four single-measure health behaviors, with participants in the intervention group getting more sleep,  $F(1,281)=9.49$ ,  $p=.00$ , and driving less after drinking alcohol,  $F(1,266)=5.25$ ,  $p=.02$  than those in the control group over time.

**Conclusions**—A brief image-based multiple behavior intervention may be useful in influencing a number of critical health habits and health-related quality of life indicators of college students.

### Keywords

Brief intervention; multiple behavior intervention; image; college students; drug use; health quality of life

## Introduction

College students are exposed to a range of health risks that increase their chances for developing future chronic diseases, injury, and significant social problems. For example, national survey data on substance use show 84.5% of undergraduates drank alcohol in the previous year, 41.0% used tobacco products, and 30.1% used marijuana.<sup>1</sup> In addition, many college students fail to meet nationally recommended nutrition and physical activity guidelines.<sup>2-4</sup> Furthermore, U.S. college students experience greater stress than their younger counterparts.<sup>5,6</sup> Finally, research indicates that students do not get adequate sleep during their college years,<sup>7,8</sup> and that this lack of sleep is associated with a range of health and academic problems.<sup>9-11</sup> All totaled, attending college represents a period not only for personal and intellectual development, but also a time of increased risk for future morbidity, mortality, and injury from multiple health behaviors.<sup>12</sup>

To date, the bulk of behavioral medicine interventions developed for individuals have addressed single risk behaviors, belying the epidemiological data indicating that most adolescents and adults experience multiple, simultaneous risk behaviors.<sup>13</sup> Interest in multiple behavior intervention (MBI) research and practice has been growing,<sup>14-16</sup> however, even given concerns that MBIs could overwhelm participants, cost too much, be excessively lengthy, or fail to address any single behavior in sufficient depth to have a significant outcome.<sup>17</sup>

Research on brief interventions indicates they can influence a range of health behaviors (e.g., Dunn, Deroo, & Rivara, 2001; Little et al., 2004; Patterson, Shaw, & Semple, 2003),<sup>18-20</sup> in addition to enhancing health and quality of life outcomes (Clark, Hampson, Avery, & Simpson, 2004; Lisson, Ridrigue, Reed, & Nelson, 2005).<sup>21,22</sup> Because brief interventions are time limited, they are potentially cost effective, efficient, and transportable.<sup>23</sup> Despite criticisms that multiple behavior interventions can overwhelm participants or fail to sufficiently address any single behavior enough to affect a significant outcome, some research has suggested that brief interventions can impact multiple risk-taking behaviors among adolescents.<sup>24</sup>

A number of studies have identified social and self-image factors as important to the development and maintenance of health behaviors among youth.<sup>25-27</sup> One mechanism by which image is thought to affect health behavior is through interpersonal social comparison processes in which young people compare themselves to social image prototypes/stereotypes of a typical peer who engages in a specific health behavior like drinking alcohol or exercising.<sup>28-32</sup> Another mechanism by which image may influence health behavior is

through intrapersonal self comparison processes where an individual compares his/her current self with a possible future desired self.<sup>33-36</sup> Recently a number of studies have suggested that brief interventions targeting both social and self images may simultaneously influence health risk (e.g., alcohol use) and health promoting behaviors (e.g., physical activity) among adolescents and young adults.<sup>37-39</sup>

One study evaluating brief image-based multiple behavior interventions for college students showed a consultation and contract strategy alone and in combination significantly enhanced frequency of moderate physical activity and exercise, consumption of foods containing healthy fats, the quantity and quality of one's sleep, frequency of riding with someone drinking alcohol, use of self-control behaviors to avoid or limit drug consumption, as well as indicators of health-related quality of life over a one-month period.<sup>39</sup> Unlike previous adolescent studies,<sup>37,38</sup> however, the image-based intervention targeting college students did not influence substance use, and suffered from a number of limitations including a brief follow-up, a relatively small sample, and lack of a comparison group.

The current trial was designed to further examine the potential of a brief, image-based multiple behavior intervention on college student health promoting and risk behaviors, while addressing the previous study's limitations. In particular, this paper presents the results of a randomized trial evaluating the efficacy of a brief, image-based multiple behavior intervention compared against a standard care control for influencing risk behaviors (i.e., alcohol, cigarette, and marijuana consumption and problems) and health promoting behaviors (i.e., exercise, nutrition, sleep, stress management) as well as health quality of life, among a sample of college students three-months post-intervention.

## Methods

### Participants

A total of 303 college students attending a mid-sized southeastern university were recruited throughout the fall of 2006 to participate in this trial. During baseline data collection, a computer error resulted in the loss of four participants' data, yielding 299 usable surveys. The majority of participating students were female (59.5%), with a mean age of 19.2 years old ( $SD=1.12$ ). The majority of the sample was Caucasian (71.6%), followed by African American (12.7%). Nine percent (8.7%) reported being Hispanic. Most participants lived in a co-ed residence hall (44.8%), or off-campus housing (38.5%). (See Table 1).

### Design and Procedures

Students aged 18-21 years who were currently enrolled at the target university and who visited the campus medical services center were eligible for this trial. Students attending the medical center were recruited to participate in a study evaluating a new health promotion program titled Project Fitness. Posters and flyers were placed in the center announcing the new study. Students were asked to complete a registration sheet so that research staff could call them to schedule an appointment to provide a complete description of the study purpose and risks. Additional announcements were made on the university's weekly student update email, and by distributing flyers in selected undergraduate health courses and common areas throughout campus. Students were paid \$20 for participating in each of two data collections.

Participants were randomly assigned to receive either a brief tailored consultation and fitness goal plan, or standard care print materials as they presented for appointments with a fitness specialist (i.e., trained bachelor's level research staff). All fitness specialists received a two-day training that included demonstrations, role-playing with other research personnel, feedback from research staff, and take-home practice on how to implement the consultation and goal plan. The quality of consultation and goal plan implementation was ensured by

using a standardized implementation protocol, with randomly selected intervention sessions audio-taped to monitor implementation quality across interventionists.

After providing written consent, all students completed a brief paper-and-pencil health behavior screen, and then the baseline survey via a secure online computer program in a quiet office on campus. Immediately after the collection of baseline data, participants were provided with one of the two interventions, and then completed an online feedback questionnaire on the acceptability of the interventions. Participants were contacted 11 weeks after their initial appointment in order to schedule the follow-up survey at week 12 (three months post-intervention). A total of 283 students completed the post-intervention data collection for a response rate of 93%. The university's institutional review board approved the research protocol prior to implementing the study.

## Interventions

**Fitness Behavior Image Screen**—Participants in both groups were first asked to complete the Fitness Behavior Screen, a nine-item instrument designed to elicit responses on selected health behaviors addressed in the consultation and goal plan. The items asked participants about their physical activity, exercise, diet, sleep, stress management habits, gender, and their alcohol and cigarette use, as well as their desire to achieve selected images, using primarily yes and no response items. Responses were used to tailor consultation messages to each participant's specific health habits.

**Consultation and Goal Plan**—After participants completed the screen and baseline survey, those assigned to receive the one-on-one consultation were provided with scripted messages by the fitness specialist using a consultation protocol. Consultations lasted approximately 25 minutes. The consultation was based on the Behavior-Image Model,<sup>39</sup> an emerging paradigm for planning multiple behavior interventions. The Model uses gain framed messages to illustrate how health promoting behaviors promote salient social and self-images, and loss framed messages to show how health risk behaviors interfere with image outcomes and achievement of health promoting habits. Image-based gain and loss framed messages are hypothesized to activate prototypes and future self-images, thereby coupling and motivating multiple behavior change within single, brief interventions. The consultation protocol provided tailored content addressing each of the health behaviors in the screen and their relation to salient image achievement. PowerPoint slides were shown at designated points in the consultation to reinforce key images and health behaviors using colorful text and illustrations.

At the conclusion of the consult, the fitness specialist provided participants with a one-page goal plan. The goal plan was also based on the Behavior-Image Model<sup>39</sup> as well as research indicating that the selection of self-concordant goals reflecting one's image or aspirations facilitates behavioral change.<sup>40,41</sup> The plan included fitness recommendations which reiterated the key points of the consultation, and coupled salient images to target behaviors. For example, one recommendation was to participate in moderate physical activity for at least 30 minutes on most days of the week if you want to be a more physically active young adult. Then, students were asked to select at least one goal from each of four behavior groups to improve in the next week, including: 1) increase physical activity & exercise, 2) decrease alcohol use, 3) decrease cigarette use, or 4) increase other fitness behaviors (i.e., nutrition, stress management, and sleep).

**Standard Care Control**—The control consisted of a commercial brochure titled “Fitness”.<sup>42</sup> The brochure included information about the benefits of being fit including characteristics of people who are physically fit, the three components of fitness, the FIT

method (Frequency, Intensity, Time), and an action plan and commitment form to identify habits to start, stop, and keep. Participants assigned to this condition were asked to take time to read the brochure in the quiet, private office. After reading the brochure, students completed the on-line feedback questionnaire.

## Measures

The updated Fitness & Health Survey<sup>43</sup> was used to collect data on alcohol, cigarette, and marijuana consumption, alcohol and drug problems, driving after drinking, exercise behaviors, nutrition habits, sleep quantity, frequency of using stress management techniques, and five areas of health quality of life. The instrument was first pilot tested on a sample of college students to ensure a psychometrically sound and highly readable instrument for the target population, and to develop standardized procedures for administering the questionnaire. An earlier version of this instrument was successfully employed in a previous multiple behavior health intervention trial among college students.<sup>39</sup> The most recent instrument was implemented online using a secure server through SurveyMonkey.com.<sup>44</sup>

Health risk behaviors measured included alcohol, cigarette, and marijuana use items adopted from standard youth substance use instruments and research,<sup>45-48</sup> including four measures of length of use, 30-day frequency, 30-day quantity, and 30-day heavy use for alcohol (Alpha=.85), cigarettes (Alpha=.89), and marijuana (Alpha=.93). Heavy use for alcohol was defined as 5 or more drinks in a row if a male and 4 or more drinks in a row if female, whereas heavy use for smoking was a pack or more of cigarettes, and heavy use for marijuana was getting really high or stoned from marijuana. An 18-item measure of alcohol and drug problems experienced during the past 30-days was included (Alpha=.98). In addition, a single measure of driving after drinking alcohol was adopted from prior epidemiologic studies.<sup>49,50</sup>

Health promoting behaviors measured included exercise, nutrition habits, sleep habits, and use of stress management techniques. Five exercise behavior measures were adopted from past research,<sup>49,51</sup> and included length of exercising, 30-day vigorous exercise, 30-day moderate exercise, 7-day strenuous exercise, and 7-day moderate exercise (Alpha=.84). Three measures of nutrition habits were based on dietary guidelines from the U.S. Department of Health and Human Services and U.S. Department of Agriculture,<sup>52</sup> and included past 30-day servings of fruits and vegetables, numbers of times eating foods containing healthy carbohydrates, and numbers of time eating foods containing healthy fats (Alpha=.81). Sleep was measured with one item of the number of hours usually slept each night during the past 30 days, taken from prior research on sleep patterns.<sup>53-55</sup> Frequency of five techniques used to relieve stress in the past 30-days was adopted from a health promotion scale for adolescents.<sup>56</sup>

Health-related quality of life was measured using five items. These assessed the number of days during the past 30-days that physical health, mental health, spiritual health, and social health was not good, and the number of days that poor health of any kind kept one from doing their usual activities (Alpha=.73). These measures were adopted from research on health-related quality of life among adolescents.<sup>57</sup>

## Data Analysis

All analyses were performed using SPSS version 13.0.<sup>58</sup> Baseline measures were compared across treatment group using chi-square tests for categorical variables, and independent sample t-tests for continuous variables. Repeated measures MANOVAs and ANOVAs were used to test intervention effects over time. Repeated measures MANOVAs were performed to more efficiently address the multiple health behaviors targeted by the intervention. This

approach creates a new dependent variable maximizing group differences, while controlling for Type I error resulting from performing individual tests on multiple dependent variables. Repeated measures ANOVAs were used to examine temporal effects on single behavior health measures. Effect sizes were calculated using Cohen's *d* statistic<sup>59</sup> based on standard deviations of baseline and post-intervention scores within treatment groups.

## Results

### Baseline and Attrition Analyses

Characteristics of participants at baseline by treatment group are shown in Table 1. No significant differences were found on any of the socio-demographic, substance use, or other health behavior measures between groups. Sixteen participants were lost to attrition (5%), with no differences in attrition between treatment groups. Significantly more students who dropped out of the study received mostly B grades (rather than A grades) on their last report card ( $X^2(3)=18.83$ ,  $p=.001$ ), reported a family alcohol or drug problem ( $X^2(3)=6.53$ ,  $p=.01$ ), and used marijuana in the past 30 days ( $X^2(3)=4.07$ ,  $p=.04$ ), than those who did not drop out.

### Response and Intervention Implementation Fidelity

To determine the likelihood of participants responding to questions on the outcome survey in a socially desirable manner, students were asked about their willingness to provide honest answers to questions about their alcohol and drug use and other health habits. At baseline, 92.6% strongly agreed and 7.4% agreed that they were willing to give honest answers to questions on the survey, with none disagreeing or strongly disagreeing, indicating little probable influence of social desirability. In addition, to estimate the extent to which responses may have been unreliable due to participant lying or other factors, we included a bogus/fake drug (i.e., zanaflex) among the list of substances that students were asked whether they used in the past 30-days. No one reported using the bogus drug, suggesting that widespread error due to lying or sloppy completion of the data collection instrument was unlikely.

To assess implementation fidelity, we collected feedback from participants immediately after administration of each intervention using a computer based, self-administered questionnaire. These data showed that participants who received the consultation and goal plan rated the intervention significantly better than those who received the standard care control on eight of nine measures of acceptability and potential efficacy,  $p's<.05$ .

### Outcome Analysis

Estimated marginal means and standard errors of health behavior measures are shown by group and time in Table 2. Omnibus repeated measures MANOVAs were performed for six groupings of health behavior measures. These analyses were significant for group by time interaction on alcohol consumption,  $F(4,278)=3.42$ ,  $p=.01$ , marijuana use,  $F(5,277)=2.75$ ,  $p=.02$ , and health-related quality of life,  $F(5,277)=2.87$ ,  $p=.02$ .

Univariate repeated measures tests showed college students exposed to the brief intervention drank alcohol less frequently,  $F(1,281)=7.47$ ,  $p=.01$ , as well as drank heavily less often,  $F(1,281)=9.54$ ,  $p=.00$ , whereas students receiving the standard care control increased their alcohol use frequency and heavy use over time. The intervention group also used marijuana for a shorter length of time,  $F(1,281)=5.67$ ,  $p=.02$ , used less quantity of marijuana,  $F(1,281)=4.97$ ,  $p=.03$ , and used marijuana heavily less often,  $F(1,281)=5.98$ ,  $p=.02$ , while the control group showed increases in these three measures of marijuana use over time. In addition, brief intervention participants experienced fewer days in which their spiritual



health was not good,  $F(1,281)=6.90$ ,  $p=.01$ , and fewer days in which their social health was not good,  $F(1,281)=9.55$ ,  $p=.00$ , compared to control participants. While no omnibus group by time interactions were found for exercise, a univariate group by time interaction was found for 30-day moderate exercise, with brief intervention participants showing an increase and control participants a decrease in moderate exercise in the past 30 days,  $F(1,281)=4.73$ ,  $p=.03$ . In addition, ANOVAs were performed for another four single measure health behaviors. Participants in the intervention group got more sleep,  $F(1,281)=9.49$ ,  $p=.00$ , and drove less after drinking alcohol,  $F(1,266)=5.25$ ,  $p=.02$  than those in the control group.

MANOVAs also indicated significant time effects for exercise,  $F(6,276)=2.94$ ,  $p=.01$ , nutrition,  $F(3,279)=3.97$ ,  $p=.01$ , and health-related quality of life,  $F(5,277)=4.43$ ,  $p=.00$ . Univariate tests showed increases in 30-day vigorous exercise for participants in both groups,  $F(1,281)=5.96$ ,  $p=.02$ , and increases in the consumption of healthy carbohydrates, but just among control participants,  $F(1,281)=9.88$ ,  $p=.00$ , and healthy fats, but primarily among those participants receiving the intervention,  $F(1,281)=4.14$ ,  $p=.04$ . In addition, students in both treatment groups had fewer days in which their physical health was not good,  $F(1,281)=8.30$ ,  $p=.00$ , fewer days in which their mental health was not good,  $F(1,281)=16.64$ ,  $p=.00$ , and fewer days in which poor health kept them from conducting their usual activities,  $F(1,281)=4.63$ ,  $p=.03$ . Finally, ANOVAs for single measure behaviors indicated significant time effects with fewer alcohol/drug problems among participants in both groups,  $F(1,179)=15.22$ ,  $p=.00$ , increased number of hours of sleep each night for participants in both groups,  $F(1,281)=27.51$ ,  $p=.00$ , and increased use of stress management techniques for participants in both groups,  $F(1,281)=63.25$ ,  $p=.00$ .

Effect sizes were calculated for univariate tests within treatment groups. These effect sizes were generally small, with some approaching medium size. Small effects were found for the brief intervention on alcohol and marijuana behaviors, with reductions on alcohol and marijuana among brief intervention participants that paralleled equal size increases in consumption in the control group. Small effects were also found for the intervention group on reduced driving after drinking, and increased vigorous and moderate exercise. Small effect sizes were found for brief intervention participants on increasing two nutrition habits (i.e., eating healthy carbohydrates and fats), and improving all five measures of health-related quality of life, with the greatest improvements on spiritual, social, and mental health. Larger effects were also found for the intervention group on reductions in alcohol/drug problems, with effects approaching medium size on increases in sleep and stress management. On measures shown to significantly improve over time for both treatment groups, effect sizes were generally two to four times larger for brief intervention participants than for control students.

## Discussion

This trial is only the second to examine the potential of a brief intervention using salient social and self images to affect multiple behavior change in college students. The results indicate that a brief multiple behavior intervention consisting of a screening survey, one-on-one consult tailored to targeted health behaviors, and behavioral goal plan appears to have decreased marijuana and alcohol consumption and driving after drinking, increased sleep and moderate exercise, and improved spiritual and social health-related quality of life, compared to students receiving standard health care information. In addition, effect sizes were typically two to four times larger for brief intervention young adults than control participants on measures found to improve over time for both treatment groups.

These findings are supported by an earlier, initial study examining brief image-based interventions for college students,<sup>39</sup> which found that brief strategies may have improved a

number of health habits, including exercise, nutrition, sleep, stress management, and health-related quality of life one-month after follow-up. However, while no effects were found on substance use in the earlier study, the current trial found significant reductions on alcohol and marijuana consumption, including decreases in hazardous heavy drinking and heavy marijuana use, as well as frequency of drinking and driving, and alcohol and drug problems. Since the content did not differ dramatically between the two intervention trials, the most likely reason for these differences is the extended follow-up period for the current study, which may have permitted more time for substance use changes to occur. This conclusion seems to be supported by two earlier studies examining brief image-based interventions for younger adolescents, which also found reductions in substance use during three-month post-intervention periods.<sup>37,38</sup>

Improvements on all four measures of health-related quality of life, including reductions in the number of days usual activities were limited due to poor health, are noteworthy. As mentioned earlier, these findings are supported by similar findings from the initial brief intervention study with college students.<sup>39</sup> While it is unclear at this time as to what health behaviors or factors might be mediating the various dimensions of quality of life, changes on these health measures indicate that a brief multiple behavior intervention may have outcomes that extend beyond health behaviors to enhance quality of life and daily functioning. Further research is needed to help better understand the mechanisms by which MBIs influence various health behaviors and quality of life indices.

The effects found in favor of the standard care control have two probable explanations. One is that the students who volunteered to participate in the study were already motivated to improve their health habits. Providing these students with an opportunity to participate in a health promotion research program emphasizing fitness may have therefore supplied the additional impetus needed to change selected health behaviors. A second more likely reason, however, is that the standard care materials used in this study addressed content similar to that in the brief intervention. This appears to be the case in that control materials discussed salient social images of physically fit individuals like having more energy, handling stress better, sleeping better, being more alert and productive, and losing weight and keeping it off, and also addressed future self-image by including an action plan, setting realistic goals, keeping a log, and providing an opportunity to make a written commitment to behavior change. This finding raises the intriguing possibility that print materials targeting social and future self images may be sufficient to impact multiple health habits of young adults, even without brief interpersonal contacts such as one-on-one consultations.

While this trial found that a brief intervention reduced alcohol and marijuana consumption, cigarette smoking appears to have been largely unaffected. Previous research indicates that brief image-based multiple behavior interventions for adolescents can reduce cigarette use for up to a year post-baseline.<sup>38</sup> Therefore, it may be that the smoking-related image messages were less appropriate for, or acceptable to, college students than younger adolescents. Such a possibility suggests the need for more content tailoring, and ensuring that messages targeting each of the behaviors in multiple behavior interventions are viewed as believable and applicable to target populations.

This study had a number of limitations. First, this investigation was limited to a three-month post-intervention follow-up. While this follow-up period is longer than the original study of brief image-based MBIs for college students, longer trials will be needed to determine the stability and trajectory of outcomes across multiple behaviors, as well as to test strategies to strengthen and maintain effects over time. Second, this study examined a sample of college students from a single university in the southeastern United States. Additional research is needed to eventually determine the effectiveness of these intervention effects on students



from other college campuses and under real world conditions, as well as for young adults not attending college. Lastly, because this trial used print materials which included much of the content of the brief intervention, future trials are needed to compare this and other brief, multiple behavior interventions against more typical standard health information found on college campuses emphasizing health risks and educational content for individual health behaviors.

In conclusion, the results of this trial evaluating a multiple behavior intervention suggest that social and self-image-based content in a brief screen, tailored consult, and goal plan holds potential to cost-effectively impact the epidemiologic reality of multiple risk factors facing college students, as well as perhaps their health-related quality of life. More research is needed examining image-based interventions to determine the minimal content and format variations that would significantly impact and sustain multiple behavior and quality of life changes among both youth and adult populations.

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Table 1

Characteristics of participants at baseline by group

Characteristic	Total sample (n = 299)		Intervention (n = 146)		Control (n = 153)		$\chi^2$	df	p-value
	n	%	n	%	n	%			
Gender									
Male	121	40.5	64	43.8	57	37.3			
Female	178	59.5	82	56.2	96	62.7	1.34	1	.25
Ethnicity									
Hispanic/Latino	26	8.7	12	8.2	14	9.2	.08	1	.78
Race									
Black/African American	38	12.7	21	14.4	17	11.1			
White	214	71.6	102	69.9	112	73.2			
Other	47	15.7	23	15.8	24	15.7	.75	2	.69
Age (M/SD)	19.19/1.12		19.18/1.18		19.20/1.07		t = -.14	291	.89
Family alcohol/drug problem									
Yes	132	44.1	65	44.5	67	43.8	0.02	1	.90
Health education last year									
Yes	178	59.5	80	54.8	98	64.1	2.66	1	.10
Living situation									
Co-ed residence hall or dormitory	134	44.8	66	45.2	68	44.4			
Off-campus house or apartment	115	38.5	54	37.0	61	39.9			
Single sex residence hall or dorm and others	50	16.7	26	17.8	24	15.7	.37	2	.83

**Table 2**

Repeated measures MANOVAs of health behavior measures for time by group

	Intervention (n =140)				Control (n =143)				<i>d</i>	<i>p<sup>a, b</sup></i>	
	Pretest		Posttest		Pretest		Posttest				
	M	SE	M	SE	M	SE	M	SE			
<b>Alcohol <sup>c</sup></b>											
<i>F</i> = 1.34, <i>df</i> = 4, 278, <i>p</i> <sup>a</sup> = .25; <i>F</i> = 3.42, <i>df</i> = 4, 278, <i>p</i> <sup>b</sup> = .01											
Length of drinking	3.51	.15	3.61	.14	-.06	3.84	.15	3.92	.14	-.05	.14; .94
Frequency of drinking	2.56	.12	2.36	.12	.15	2.57	.12	2.72	.12	-.10	.68; .01
Quantity of drinking	3.76	.24	3.57	.22	.07	3.93	.24	3.85	.22	.03	.26; .63
Heavy drinking	1.91	.11	1.72	.10	.16	1.86	.11	2.01	.10	-.12	.73; .00
<b>Alcohol/drug problems <sup>c</sup></b>	3.76	.33	2.74	.32	.35	3.82	.32	3.41	.33	.13	.00; .09
<b>Driving after drinking <sup>c</sup></b>	.64	.11	.50	.11	.12	.56	.11	.71	.10	-.12	.99; .02
<b>Cigarettes <sup>c</sup></b>											
<i>F</i> = .97, <i>df</i> = 5, 277, <i>p</i> <sup>a</sup> = .44; <i>F</i> = 1.09, <i>df</i> = 5, 277, <i>p</i> <sup>b</sup> = .52											
Length of smoking	1.43	.10	1.43	.09	.00	1.47	.10	1.35	.09	.11	.18; .18
Frequency of smoking	1.59	.12	1.55	.11	.03	1.58	.12	1.42	.11	.12	.04; .18
Quantity of smoking	1.38	.08	1.35	.07	.03	1.36	.07	1.29	.07	.09	.13; .53
Heavy use of cigarettes	1.13	.06	1.12	.06	.02	1.12	.06	1.09	.05	.04	.56; .73
<b>Marijuana <sup>c</sup></b>											
<i>F</i> = .66, <i>df</i> = 5, 277, <i>p</i> <sup>a</sup> = .66; <i>F</i> = 2.75, <i>df</i> = 5, 277, <i>p</i> <sup>b</sup> = .02											
Length of using marijuana	1.90	.14	1.70	.13	.13	1.95	.13	2.06	.13	-.07	.46; .02
Frequency of using marijuana	1.59	.12	1.50	.12	.07	1.61	.12	1.67	.11	-.04	.78; .15
Quantity of using marijuana	1.54	.12	1.41	.12	.10	1.55	.12	1.73	.12	-.12	.67; .03
Heavy use of marijuana	1.46	.10	1.33	.10	.12	1.48	.10	1.58	.10	-.08	.80; .02
<b>Exercise <sup>e</sup></b>											
<i>F</i> = 2.94, <i>df</i> = 6, 276, <i>p</i> <sup>a</sup> = .01; <i>F</i> = 1.00, <i>df</i> = 6, 276, <i>p</i> <sup>b</sup> = .43											
Length of exercise	3.46	.15	3.66	.13	.12	3.67	.15	3.75	.13	.05	.06; .40
30-day Vigorous exercise	3.71	.15	3.97	.14	.16	3.96	.15	4.19	.14	.13	.02; .90
30-day Moderate exercise	4.32	.15	4.52	.15	.11	4.72	.15	4.46	.14	-.15	.78; .03
7-day Strenuous exercise	3.44	.19	3.56	.18	.06	3.80	.19	3.83	.17	.01	.57; .70
7-day Moderate exercise	5.18	.22	5.25	.19	.03	5.15	.22	5.22	.19	.03	.61; .99
<b>Nutrition <sup>e</sup></b>											
<i>F</i> = 3.97, <i>df</i> = 3, 279, <i>p</i> <sup>a</sup> = .01; <i>F</i> = 1.33, <i>df</i> = 3, 279, <i>p</i> <sup>b</sup> = .27											



	Intervention (n = 140)						Control (n = 143)					
	Pretest			Posttest			Pretest			Posttest		
	M	SE	d	M	SE	d	M	SE	d	M	SE	d
Nutrition: fruits/vegetables	4.06	.21	4.31	.17	.11	3.97	.20	3.73	.16	-.12	.93	.12
Nutrition: good carbohydrate	4.55	.22	5.46	.23	.33	4.46	.22	4.76	.23	.12	.00	.11
Nutrition: good fats	3.71	.22	4.34	.21	.24	3.54	.22	3.59	.21	.02	.04	.09
<b>Sleep<sup>c</sup></b>	3.29	.09	2.83	.08	.46	3.20	.09	3.08	.08	.12	.00	.00
<b>Stress management<sup>e</sup></b>	2.31	.05	2.57	.05	.48	2.25	.05	2.47	.05	.41	.00	.52
<b>Health-related quality of life<sup>c</sup></b>	<i>F</i> = 4.43, <i>df</i> = 5, 277, <i>p</i> = .00; <i>F</i> = 2.87, <i>df</i> = 5, 277, <i>p</i> = .02											
Physical health	2.90	.12	2.56	.11	.22	2.40	.12	2.21	.11	.16	.00	.41
Mental health	3.11	.13	2.71	.11	.28	2.90	.13	2.63	.10	.20	.00	.42
Spiritual health	2.40	.14	1.91	.13	.31	2.09	.14	2.15	.13	-.04	.04	.01
Social health	2.34	.11	1.96	.10	.30	1.90	.11	2.01	.09	-.10	.09	.00
Activity limitation	2.26	.10	2.04	.09	.19	2.01	.10	1.91	.09	.10	.03	.44

Note:

<sup>a</sup> *p* value's = Time,

<sup>b</sup> *p* value's = Time \* Group Interaction,

<sup>c</sup> Higher mean score = Higher risk,

<sup>e</sup> Higher mean score = Lower risk, *d*: effect size, with negative effects shown with a -.