



Short communication

Changes in college students' health behaviors and substance use after a brief wellness intervention during COVID-19

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ABSTRACT

College students exhibit low levels of physical activity, high levels of sedentary behavior, poor dietary behaviors, sleep problems, high stress, and increased substance use. On-campus resources offering programs to improve college students' health have been limited during the pandemic. The purpose of this study was to test a brief intervention to improve multiple health behaviors among United States college students. The intervention was a single arm repeated measures study conducted over 12 weeks, utilizing the Behavior Image Model. The intervention involved three components: a survey, a 25-minute wellness specialist consult with a peer health coach, and a 15-minute goal planning session. Follow-up measures were completed at 2-, 6-, and 12-weeks post session to assess changes in wellness behaviors. Linear mixed effects models for repeated measures were used to analyze the association between intervention implementation on within-subject changes in physical activity, sedentary behavior, diet, general health, emotional wellness, and substance use. A total of 121 participants enrolled in the study and 90 (74.4%) completed the health coach session (71% female). At first follow-up, statistically significant increases were observed in vigorous physical activity days/week (coef. = 0.5, 95%CI: 0.2, 0.9), moderate physical activity days/week (coef. = 0.7, 95%CI: 0.2, 1.1), general health (coef. = 4.8, 95%CI: 2.1, 7.5), and emotional wellness (coef. = 8.6, 95%CI: 5.8, 11.3). Statistically significant decreases in cannabis use (coef. = -2.3, 95%CI: -4.1, -0.5) and alcohol consumption (coef. = -2.5, 95%CI: -3.7, -1.3) were observed. Many of these changes were sustained at second and third follow-up. This brief wellness intervention shows promise to positively influence multiple health behaviors in college students.

1. Introduction

College students exhibit low levels of physical activity (PA), high levels of sedentary behavior, poor dietary behaviors, sleep problems, and high stress (Peterson et al., 2018; Becker et al., 2018; Samuolis et al., 2015). Compared to other age groups, 18–24-year-olds also have the highest rates for using e-cigarettes and cannabis, indicating the importance of substance use education among this population (Hu et al., 2016; Mauro et al., 2019). Additionally, studies have highlighted the links between substance use during college and morbidity and mortality (Welsh et al., 2019). As such, college students represent a priority population for wellness interventions.

Reports indicate COVID-19 has exacerbated poor health, with students overall participating in fewer health promoting behaviors (Cope-land et al., 2020). Additionally, many on-campus resources offering

long-term programs to improve student health have been limited during the COVID-19 pandemic. Online interventions targeting health behaviors have shown promise among college students, but typically only target behaviors in isolation (Oosterveen et al., 2017). A multiple behavior approach, in which an intervention simultaneously targets several health behaviors, has been shown to illicit positive health behavior changes in college studies (Werch et al., 2010). The combination of health coaching and remotely delivered interventions has also been used as a way to improve college students' health behaviors, but results are limited (Sandrick et al., 2017). To address the lack of resources available to college students to help improve health behaviors, we developed a modified approach, capitalizing on trained peer health coaches in an online environment. Therefore, the purpose of this study was to examine changes in health behaviors after the implementation of a brief prevention and wellness intervention within a sample of college

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students.

2. Methods

2.1. Participants

A convenience sample of participants were recruited through written advertising (flyers, emails sent out from university professors), peer referrals, and word-of-mouth. Interested participants completed informed consent online prior to starting a screening survey used to determine eligibility and obtain contact information to allow for scheduling. Eligible participants (current undergraduate students enrolled at the host institution, no exclusion criteria) were scheduled for a one-on-one Zoom-based session with one of the trained health coaches (Wellness et al., 2022). Participants received \$15 for completing the wellness session, and \$10 for completing each follow-up survey. All study procedures were approved by the university Institutional Review Board (IRB_00140279).

2.2. Design

The intervention was a single arm repeated measures study over a 12-week period. A baseline survey was completed in the week prior to having the session, while the post-program surveys were completed at 2-, 6-, and 12-weeks post-session to assess the change in wellness behaviors and substance use after the one-hour program was delivered.

2.3. Intervention

InShape Prevention Plus Wellness was a 60-minute program designed to promote protective factors to prevent substance use among young adults (Werch et al., 2008; Werch et al., 2010; Werch et al., 2011). The focus was on improving PA, eating, sleep, and stress management behaviors to reduce the likelihood of using e-cigarettes. The program's basic premise was that developing a positive social image and future self-image will lead to health-promoting activities. The program was developed using the Behavior Image Model (Werch and Chad, 2007). The Behavior Image Model is a framework for planning brief health interventions that influence multiple behaviors. The model promotes positive goals and health-enhancing behaviors, while raising health-risk awareness. The advantage of focusing on images is that multiple, covarying behaviors can be addressed in a relatively efficient manner, making this approach ideal for a brief intervention. Compared to traditional wellness programs that might address exercise and substance abuse in separate, lengthier interventions, the use of images of physically active and healthy young adults can be used to address multiple behaviors (e.g. exercise, diet, and substance use) within a single session.

The intervention involved three components: (1) A 20-minute self-administered survey (Behavior Image Screen) to provide awareness of wellness and substance use behaviors; (2) A 25-minute wellness specialist consult with a peer health coach to provide feedback on health habits and the use of positive image messages to increase motivation for change; (3) A 15-minute goal planning session in which health coaches provided individualized recommendations and a goal plan to improve fitness and future image.

2.4. Outcome measures

Primary outcomes of the intervention included self-reported frequency and duration of PA and sedentary behavior, sleep duration, dietary habits, and general and emotional health, measured at baseline, 2-, 6-, and 12-weeks post-session. Secondary outcomes of the intervention were self-reported e-cigarette and cannabis use, and alcohol consumption, measured at the same timepoints as the primary outcomes. The specific measures used are available within the Supplemental File.

2.5. Analysis

Descriptive analyses were conducted on baseline survey items including sex, race/ethnicity, socioeconomic status (mother's education used as a proxy), and membership in fraternities/sororities and athletic teams. These analyses were also conducted on the same variables for participants who completed the health coaching session (i.e., those who received the intervention). Linear mixed effects models for repeated measures with time as the independent variable were used to analyze the association between intervention implementation on within-subject changes in the self-reported measures outlined in Section 2.4. Linear mixed effects modeling uses a maximum likelihood approach to accommodate missing data, providing increased statistical power through the inclusion of participants with missing data (Verbeke et al., 2014). Although a maximum likelihood approach was utilized, multiple imputation by chained equations (MICE) was also employed to account for variable missingness, which ranged from 6.9 to 29.1%. MICE also allowed for the inclusion of several covariates, including sex, mother's education level, and membership in club and athletic teams (Supplemental File). All analyses were conducted in Stata v16.0 statistical software package (Statacorp. College Station, TX, USA) and the alpha level was set at $p < 0.05$.

3. Results

3.1. Participant characteristics

Of 121 participants who enrolled in the study and completed the baseline survey, 90 (74.4%) completed the health coach session (71.1% female, 76.7% White), and 2-, 6-, and 12-week follow-up surveys were completed by 83, 75, and 73 participants, respectively. The retention rate was 81.1%. Table 1 contains descriptive statistics for the sample.

3.2. Physical Activity, sedentary behavior, sleep, general health, and emotional wellness

Table 2 shows the linear mixed effects models and the time specific contrasts on each of the health behavior outcomes compared to baseline. At the first follow-up, statistically significant increases were observed in vigorous physical activity (VPA) days/week (coef. = 0.5, 95%CI: 0.2, 0.9), moderate physical activity (MPA) days/week (coef. = 0.7, 95%CI: 0.2, 1.1), general health (coef. = 4.8, 95%CI: 2.1, 7.5), and emotional wellness (coef. = 8.6, 95%CI: 5.8, 11.3). At second follow-up, significant increases were observed in MPA (coef. = 0.9, 95%CI: 0.4, 1.4) and weeknight sleep hours (coef. = 0.4, 95%CI: 0.1, 0.7), general health (coef. = 7.4, 95%CI: 4.3, 10.4), and emotional wellness (coef. = 13.1, 95%CI: 10.0, 16.2). A significant decrease was observed in sitting hours per day (coef. = -1.9, 95%CI: -2.9, -0.9). At third follow-up, significant increases were observed in metabolic equivalent of task (MET) min/day of total activity (coef. = 879.4, 95%CI: 189.5, 1569.2), VPA days/week (coef. = 0.6, 95%CI: 0.2, 0.9), MPA min/day (coef. = 16.9, 95%CI: 3.3, 30.5), MPA days/week (coef. = 1.4, 95%CI: 0.9, 1.8), MPA MET min/day (coef. = 535.3, 95%CI: 270.9, 799.6), walking MET min/day (coef. = 404.0, 95%CI: 21.7, 786.4), weeknight sleep hours (coef. = 0.3, 95%CI: 0.04, 0.6), general health (coef. = 6.7, 95%CI: 3.8, 9.5), and emotional wellness (coef. = 12.4, 95%CI: 9.5, 15.3). A significant decrease was observed in sitting hours per day (coef. = -2.4, 95%CI: -3.3, -1.0).

3.3. Substance use

Table 2 also shows the linear mixed effects models and the time specific contrasts on each of the substance use outcomes compared to baseline. At first follow-up, statistically significant decreases in cannabis use (coef. = -2.3, 95%CI: -4.1, -0.5) and alcohol consumption (coef. = -2.5, 95%CI: -3.7, -1.3) were observed. At second follow-up,

Table 1
Characteristics of participants who completed baseline measures and the health coach session.

Characteristics	Baseline		Completed health coach session	
	N = 121		N = 90	
	N	%	N	%
Sex				
Male	30	24.8	25	27.8
Female	90	74.4	64	71.1
Choose not to respond	1	0.8	1	1.1
Hispanic, Latino, or Spanish origin				
Yes	17	14.1	12	13.3
No	104	85.9	78	86.7
Race				
White	96	79.3	69	76.7
Black or African American	5	4.1	5	5.6
American Indian or Alaska Native/Pacific Islander	2	1.7	2	2.2
Asian	15	12.4	13	14.4
Other	3	2.5	1	1.1
Highest degree or level of school mother/female guardian has completed				
Less than a high school degree	2	1.7	2	2.2
High school diploma or GED	12	9.9	9	10.0
Some college, no degree	36	29.8	28	31.1
Associate degree	12	9.9	9	10.0
Bachelor's degree or higher	58	47.9	42	46.7
Unsure	1	0.8	0	0.0
Member of social fraternity or sorority				
Yes	14	11.6	11	12.2
No	107	88.4	79	87.8
Member of an athletic team				
Yes, varsity team	2	1.7	0	0.0
Yes, club team	8	6.7	4	4.5
No	110	91.7	85	95.5

significant decreases in cannabis use (coef. = -2.2 , 95%CI: -4.3 , -0.1) and alcohol consumption (coef. = -1.6 , 95%CI: -3.1 , -0.1) were observed as well. Decreases in cannabis use (coef. = -2.6 , 95%CI: -4.6 , -0.5) and alcohol consumption (coef. = -2.7 , 95%CI: -4.1 , -1.3) were sustained at third follow-up.

4. Discussion

This study examined changes in physical activity, sedentary behavior (sitting), sleep, general health, emotional wellness, and substance use in college students after a brief intervention that utilized the Behavior Image Model to remotely deliver a multiple health behavior coaching session using peer health coaches. Findings indicate positive behavior change in the areas of physical activity, general health, emotional wellness, and substance use. Specific outcomes, unique components of the intervention, and the limitations of the study and implications for future research are further discussed.

Positive outcomes were observed during this study, including increases in days/week of MPA, days/week of VPA, emotional health and general health, and decreases in sitting hours/day, cannabis use, and alcohol consumption. These findings are consistent with other health behavior interventions that have targeted college-aged participants. For example, Morton et al (Morton et al., 2020) delivered a multi-modal intervention to college students that resulted in significant improvements in participants' emotional wellbeing. Werch et al (Werch et al., 2010) delivered a multiple behavior intervention to college students and found that certain health outcome effects observed at three months, such

as health-related quality of life and moderate exercise, were sustained at 12 months, in absence of the intervention treatment. While our study was not longitudinal in nature, results at second and third follow-up support findings from Werch et al. (2010) Short, Kinman, and Baker (Short et al., 2020) utilized peer coaching to positively influence undergraduates' wellbeing. Findings from their study and from our study highlight the utility of peer coaching as a viable way to deliver health behavior interventions to college students. King et al (King et al., 2020) compared the effects of an alcohol intervention delivered via telehealth versus face-to-face delivery and found that both led to significantly reduced alcohol consumption. These findings, along with our remotely delivered intervention, highlight the potential for interventions that can be delivered via alternative modalities. However, many of these interventions have had relatively small sample sizes, our study included. Future health behavior intervention studies targeting college-aged participants should put effort into designing programs that can be effectively scaled-up to a larger audience, as there is evidence of success Yang et al. (2020).

There were several unique components of this intervention, including targeting multiple health behaviors, utilizing peer coaches, delivering the intervention online, and delivering the intervention in a one hour session. This study highlights the ways in which all of these components can be put together for an intervention delivered during the COVID-19 pandemic. Previous research conducted by Copeland et al (Copeland et al., 2020) showed that college students enrolled in a campus wellness program were less affected by COVID in terms of internalizing symptoms and attention problems than those who were not in the wellness program. Another unique strategy employed by this intervention was the goal setting and behavior image focus utilizing the Behavior Image Model. Our study provides an example of how to deliver this type of intervention to participants in an online setting.

4.1. Limitations

There were limitations to this study that warrant further discussion. First, this intervention design lacked a comparison group, which did not allow us to test intervention effectiveness. There were also no screening processes undertaken to determine if participants had any existing mental health issues or concurrent treatment. Second, baseline substance use was observed to be low in our sample of participants. Future studies may seek to identify students at greater risk for substance use to maximize the impact and potential of the intervention. Third, the 12-week follow-up measures were taken during the summer months, when many college students have reduced academic workloads, compared to the Spring semester when baseline measurements were taken. Because of the lack of comparison group, we cannot conclude that the positive changes in health behaviors were a result of the intervention or a function of when measurements were taken. It must also be acknowledged that response bias may have been present in this sample and possible confounding variables were not considered in this analysis. Finally, because this was a multi-component intervention, without component analyses, there is no way to clarify to what degree coaching, education, or goal setting specifically influences outcomes or if it is a synthesis of all three.

5. Conclusions

This brief wellness intervention positively influenced multiple health behaviors in college students while also providing an example of how peer health coaching can be successfully delivered in an online setting. On-campus resources offering programs to improve college students' health have been limited during COVID-19. Researchers who design health behavior interventions for college students may consider remote delivery a viable alternative to improve health behaviors.

Table 2
Results from linear mixed models on primary and secondary outcomes.

Outcome ¹	First Follow-up ²		Second Follow-Up ³		Third Follow-Up ⁴	
	Regression coefficient	95% CI	Regression coefficient	95% CI	Regression coefficient	95% CI
<i>Physical Activity and Sedentary Behavior</i>						
Total Activity (MET min/day)	-307.9	-1007.7, 391.9	-154.6	-897.5, 588.3	879.4*	189.5, 1569.2*
Vigorous PA (min/day)	-6.7	-14.3, 0.8	-6.2	-14.7, 2.3	-5.4	-13.2, 2.4
Vigorous PA (days/week)	0.5*	0.2, 0.9*	0.3	-0.1, 0.7	0.6*	0.2, 0.9*
Vigorous PA (MET min/day)	-153.1	-457.4, 151.2	-274.7	-617.2, 67.8	-54.0	-367.9, 259.9
Moderate PA (min/day)	-4.5	-18.3, 9.1	-6.4	-21.3, 8.4	16.9*	3.3, 30.5*
Moderate PA (days/week)	0.7*	0.2, 1.1*	0.9*	0.4, 1.4*	1.4*	0.9, 1.88*
Moderate PA (MET min/day)	-53.6	-320.0, 212.7	-8.3	-296.54, 279.9	535.3*	270.9, 799.68*
Walking (min/day)	-14.7	-35.9, 6.5	7.8	-15.4, 30.9	9.7	-11.7, 31.2
Walking (number of days)	0.3	-0.2, 0.7	0.3	-0.2, 0.8	0.7	0.2, 1.2
Walking (MET min/day)	-159.1	-537.0, 218.9	204.9	-207.4, 617.1	404.0*	21.7, 786.48*
Sitting (hours/day)	-0.1	-1.0, 0.7	-1.9*	-2.9, -0.9*	-2.4*	-3.3, -1.0*
<i>Diet and Nutrition</i>						
Sugar sweetened beverages (servings/day)	-0.2	-1.7, 1.4	0.2	-1.5, 1.9	0.5	-1.1, 2.1
Fruit (servings/day)	-0.3	-0.9, 0.3	-0.3	-1.1, 0.4	-0.3	-1.0, 0.3
Vegetables (servings/day)	-0.4	-1.1, 0.2	-0.3	-0.9, 0.4	-0.6	-1.2, 0.1
<i>Sleep</i>						
Average Weeknight Sleep (hours)	0.2	-0.1, 0.5	0.4*	0.1, 0.7*	0.3*	0.04, 0.6*
Average Weekend Sleep (hours)	-0.1	-0.3, 0.2	0.01	-0.3, 0.3	0.02	-0.3, 0.3
<i>Health and Wellness</i>						
General Health (out of 100)	4.8*	2.1, 7.5*	7.4*	4.3, 10.4*	6.78*	3.8, 9.5*
Emotional Wellness (out of 100)	8.6*	5.8, 11.3*	13.1*	10.0, 16.2*	12.4*	9.5, 15.3*
<i>Substance Use</i>						
E-Cigarette Use (number of days within last 30 days)	-1.7	-5.3, 1.9	0.1	-3.7, 3.9	-0.8	-5.4, 3.7
Cannabis Use (number of days within last 30 days)	-2.3*	-4.1, -0.5*	-2.2*	-4.3, -0.1*	-2.6*	-4.6, -0.5*
Alcohol consumption (number of days within last 30 days)	-2.5*	-3.7, -1.3*	-1.6*	-3.1, -0.1*	-2.7*	-4.1, -1.3*

Note: 95% CI stands for 95% Confidence Interval; MET stands for Metabolic Equivalence of Task; PA stands for Physical Activity; Bold and asterisk denotes significance at the $p < 0.05$ level.

¹ All regression coefficients indicate change from baseline.

² First Follow-up data was collected 2-weeks after the intervention.

³ Second follow-up data was collected 6 weeks after the intervention.

⁴ Third follow-up data was collected at 12 weeks after the intervention

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CRedit authorship contribution statement

Christopher D. Pfladderer: Formal analysis, Methodology, Investigation, Data curation, Writing – original draft, Writing – review & editing. **Yang Bai:** Conceptualization, Data curation, Investigation, Writing – original draft, Writing – review & editing. **Timothy A. Brusseau:** Supervision, Project administration, Writing – original draft, Writing – review & editing. **Ryan D. Burns:** Methodology, Writing – original draft, Writing – review & editing. **Jessica L. King Jensen:** Conceptualization, Investigation, Methodology, Project administration, Funding acquisition, Writing – original draft, Writing – review & editing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.pmedr.2022.101743>.

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