Journal of Population Therapeutics & Clinical Pharmacology

The Influence of a Health Education Intervention on Health Behaviors and Mental Well-being Among College Students

Saleh Mohammad Saleh Alyami[1], Abdullah Jarallah Faris Alyami[2], Mahdi Mohammad Salem Alrasheed[3], Saleh Abdullah Mohammed Al Salem[4], Rashed Mohammed Saleh Zabaid[5], Ayed Obaid Rabie Al-Ajami[6], Mohammed Nagea Alzabaid[7], Muhammad Shaddad Hadi Al Futaih[8], Zayed Adlan Hashem Almuntashiri[9]

1-Nurse Technician, Phc Yadma
2-Xray Technician, Phc Yadma
3-Epidemiology Technician, Yadmah PHC
4-Paramedic Health Assistant, Phc Yadma
5-Public Health, Yadma General Hospital.
6-Technician Operation Rooms, Yadma Hospital
7-Nurse, Public Health
8-Psychologist, Yadamah General Hospital
9-Public Health, Primary Health Care Center Al Debat, Najran

Abstract:
Objective: This study investigates the effects of a health education intervention on health behaviors, self-efficacy, and well-being among college students
Participants: The study involved 532 undergraduate participants
Methods: A theory-based intervention was implemented where participants were divided into control and intervention groups. The intervention group attended a 7-week health education program focusing on knowledge, attitude, and practice related to health behaviors.
Results: Comparing the intervention group (IG) with the control group (CG), significant improvements were observed in the IG regarding high physical activity, regular breakfast consumption, reduced screen time, lower sugar beverage intake, and decreased Internet addiction tendencies. The IG also showed an increase in health behavior scores ($p = 0.040$) compared to the CG, while subjective well-being and self-efficacy changes were similar between the two groups.
Conclusions: The findings suggest that health education interventions can effectively promote positive health behaviors

Introduction:
Unhealthy behaviors significantly contribute to the burden of cardiovascular diseases, cancers, chronic respiratory diseases, mental disorders, and substance use disorders. Previous studies have highlighted that individual with multiple behavioral risk factors, such as physical inactivity and poor dietary habits, face increased risks of chronic diseases, premature death, as well as emotional and social consequences like depression, anxiety, and stigmatization. Conversely, adopting health behaviors has proven effective in reducing morbidity and mortality from chronic diseases. (Bagherniya et al., 2018)
College students, undergoing a critical transition period, are particularly susceptible to developing health-related behaviors. Studies have indicated a high prevalence of risky health behaviors among college students, including binge drinking, excessive screen time, skipping breakfast, and insufficient physical

activity or fruit/vegetable intake, which can adversely affect their physical and mental well-being. Therefore, there is a need for behavioral education interventions tailored to college students. (Peterson et al., 2018)

However, previous studies have shown limited effectiveness of health education programs targeting college students' health behaviors, possibly due to variations in intervention modalities and methods. Additionally, most intervention studies have been conducted in Western countries, who have distinct cultural, social, and behavioral contexts. (Nanney et al., 2015). As there is a lack of research on health education interventions addressing both health behaviors and mental health among youths, this study aims to bridge this knowledge gap. We conducted a health education intervention study based on the social cognitive theory, a successful approach for behavior changes interventions. Our study examines the impact of this intervention on health behaviors and mental health (well-being and self-efficacy) among college students.

Methods:

Participants and Procedure:

This study, assigned two classes into a health intervention group (IG) and a control group (CG). All participants, aged 16–24 years and full-time students, provided oral informed consent. The study was approved by the Medical Research Ethics Committee

Intervention:

The health IG underwent a 7-week instructor-led health education course covering topics like healthy eating, physical activity, stress reduction, healthy sleep, and Internet addiction prevention. The course involved traditional lectures, videos, and interactive activities to enhance knowledge, attitudes, and practices related to health behaviors. To minimize contamination bias, IG students were instructed not to share educational information with others during the study.

Measures:

Health behaviors and mental health were assessed using a self-administered questionnaire before and after the intervention. The questionnaire included demographic information, health-related behaviors (physical activity, screen time, eating habits, Internet use), and mental health indicators (subjective well-being, self-efficacy).

Physical activity was measured by the frequency of exercising for at least 30 minutes per day. Screen time was assessed by daily hours spent on the computer. Regular breakfast intake, sugar beverage consumption, and Internet addiction tendency were also evaluated. Health-related behavior performance and general self-efficacy were assessed using validated scales.

Statistical Analysis:

Descriptive statistics, chi-square tests, t-tests, and Mann-Whitney U tests were used for analysis. Generalized estimating equation (GEE) models were employed to assess intervention effects, considering group, time, group × time interaction, and relevant covariates. Significance was set at $p < .05$ using SPSS version 23.0.

Results:

A total of 532 college students, with a mean age of 19.49 years, completed the study, with 263 in the intervention group (IG) and 269 in the control group (CG). Demographic characteristics showed that the mean BMI was significantly lower in the IG (20.37 ± 2.51) compared to the CG (20.83 ± 2.49), and the proportion of males was lower in the IG (47.9%) than in the CG (60.2%). Other demographic variables such as residence, , and parental education did not differ significantly between the groups.

Table 2 presents the self-reported behaviors pre- and post-intervention. After the intervention, the IG showed significant improvements compared to the CG, including a reduction in low physical activity, high screen time, frequent sugar-sweetened beverage consumption, irregular breakfast intake, and Internet addiction tendency (all $p < .05$). After adjusting for confounders, the IG maintained significant improvements in physical activity ($b = 0.408$, $p = .048$), regular breakfast consumption ($b = 0.413$, $p = .018$), and reduced sugar-sweetened beverage consumption ($b = –0.575$, $p = .040$) compared to the CG.

However, there were no significant differences in high screen time or Internet addiction tendency between the two groups.

Table 3 shows the pre- and post-intervention scores for well-being, self-efficacy, and health behaviors. After adjusting for potential confounders, the IG demonstrated a significant improvement in health behavior scores (b = 1.422, p = .040). However, there were no significant differences in pre- and post-intervention scores for well-being or self-efficacy between the IG and CG.

Table 1. Characteristics of Study Participants

Demographic Characteristics	**Intervention (n=263) Mean (SD) (%)**	**Control (n=269) Mean (SD) (%)**	**p Value**
Age (years)	19.4 (0.9)	19.6 (0.9)	0.042
BMI (kg/m²)	20.4 (2.5)	20.8 (2.5)	0.031
Gender			
Male	47.9	60.2	0.005
Female	52.1	39.8	
Residence			
Urban	37.6	33.5	0.367
Rural	62.4	66.5	
Paternal Education			
Primary/Low	5.7	5.2	0.909
Middle	22.8	20.8	
High	28.9	31.2	
College/Above	42.2	42.4	
Maternal Education			
Primary/Low	12.9	11.9	0.871
Middle	24.7	24.9	
High	31.6	29.4	
College/Above	30.4	33.5	

Table 2. Health Behaviors of University Students at Pre- and Post-Intervention Phase

Outcome Variables	**Pre-Intervention**	**Post-Intervention**	**Group × Time Interaction Effects**
	Intervention (n=263)	Control (n=269)	
Physical Activity			
Low	171 (65.0%)	190 (70.6%)	0.408 (-0.007, 0.800)
High	92 (35.0%)	79 (29.4%)	
Screen Time			
Low	97 (36.9%)	78 (29.0%)	-0.304 (-0.693, 0.085)
High	166 (63.1%)	191 (71.0%)	
Sugar Beverages			
Infrequent	57 (21.7%)	56 (20.8%)	-0.575 (-1.124, -0.026)
Frequent	206 (78.3%)	213 (79.2%)	
Breakfast			
Irregular	112 (42.6%)	101 (37.5%)	0.413 (0.070, 0.757)
Regular	151 (57.4%)	168 (62.5%)	
Internet Addiction Tendency			
No	217 (82.5%)	210 (78.1%)	-0.401 (-0.894, 0.093)

Yes	46 (17.5%)	59 (21.9%)	

a Adjusted for age, body mass index, gender, residence, living expense monthly, paternal education, and maternal education.
b Chi-square test between intervention and control groups.
c Binary logistic generalized estimating equation model with the working matrix of first-order auto-regressive [AR (1)].

Table 3. Well-being, Self-Efficacy, and Health Behavior Scores of University Students at Pre- and Post-Intervention Phase

Outcome Variables	**Pre-Intervention**	**Post-Intervention**	**Group × Time Interaction Effects**
	Intervention (n=263)	Control (n=269)	
Well-being, Mean (SD)	16.03 (4.51)	15.25 (5.15)	-0.004 (-0.685, 0.677)
Self-efficacy, Mean (SD)	25.79 (4.74)	25.72 (5.48)	0.318 (-0.517, 1.152)
Health Behavior, Mean (SD)	72.24 (8.43)	69.23 (9.95)	1.422 (0.065, 2.780)

a Adjusted for age, body mass index, gender, residence, living expense monthly, paternal and maternal education.
b Mann-Whitney U test between intervention and control groups.
c Gamma with identity link generalized estimating equation model with the working matrix of first-order auto-regressive [AR (1)].

Discussion

The study investigated the impact of a health education intervention on health behaviors and mental health among university students. The findings revealed positive changes in health behaviors such as increased physical activity, regular breakfast consumption, and reduced intake of sugar beverages among the intervention group (IG) compared to the control group (CG). Although there were no significant improvements in well-being and self-efficacy, the overall health behavior improvements in the IG were noteworthy. This suggests that a class-based health behavior intervention can effectively influence college students' health-promoting behaviors. (Chen et al., 2014)

Initially, a considerable proportion of participants (67.9%) reported physical inactivity, but after the intervention, the IG showed a significant increase in sufficient physical activity (from 35% to 45.2%). This aligns with previous research, such as Greene et al.'s study, which demonstrated a positive effect of interventions on physical activity frequency and duration. However, other studies, like Duan et al.'s, did not show significant changes, possibly due to different intervention durations and methods. Our study's feedback provision on baseline behavior may have motivated participants to improve their behaviors. (Duan et al., 2017)

The promotion of physical activity is crucial, given its protective role in mental health and chronic diseases. Our findings highlight the effectiveness of health education interventions in this regard, emphasizing the need for supportive campus facilities and professional guidelines to sustain physical activity among college students. (Xu et al., 2016)

Additionally, addressing modifiable unhealthy behaviors like skipping breakfast and excessive sugar beverage intake is essential due to their association with various health risks. Our study's intervention showed promise in improving healthy dietary and lifestyle behaviors among college students, suggesting the importance of widespread dissemination of healthy diet information and practical interventions. (LaChausse, 2012)

While no significant changes were observed in screen time and internet addiction tendency, this could be attributed to the widespread use and ingrained habits related to electronic devices among college students.

However, leveraging these devices for health education interventions remains a viable strategy, as they are accessible and can sustain engagement. (Plotnikoff et al., 2015)

Although the intervention significantly improved overall health behavior scores, its impact on well-being and self-efficacy was not significant. This inconsistency aligns with previous studies, emphasizing the need for integrated techniques and mechanisms in future intervention strategies to achieve effective behavioral changes. (Wartberg et al., 2016)

The findings of this study are relevant for health practitioners planning interventions for students , considering the significant population of students and the impact of environmental, behavioral, and cultural factors on their health behaviors. Integrating tailored health education programs could offer substantial health benefits to this population. (Després, 2016)

Conclusion

In conclusion, the study highlights the positive impact of a health education intervention on college students' health behaviors. Increased physical activity, regular breakfast consumption, and reduced sugar beverages intake were observed among participants, indicating the potential of integrating targeted health education into college curricula to promote healthier lifestyles. Future research addressing the identified limitations can provide further insights into the effectiveness and sustainability of such interventions.

References

1. Gakidou, E., Afshin, A., Abajobir, A. A., et al. (2017). Global, regional, and national comparative risk assessment of 84 behavioural, environmental and occupational, and metabolic risks or clusters of risks, 1990–2016: A systematic analysis for the Global Burden of Disease Study 2016. Lancet, 390(10100), 1345–1422. doi:10.1016/S0140-6736(17)32366-8.
2. Lippke, S., Nigg, C. R., & Maddock, J. E. (2012). Health-promoting and health-risk behaviors: Theory-driven analyses of multiple health behavior change in three international samples. International Journal of Behavioral Medicine, 19(1), 1–13. doi:10.1007/s12529-010-9135-4.
3. Xu, Y., Qi, J., Yang, Y., & Wen, X. (2016). The contribution of lifestyle factors to depressive symptoms: A cross-sectional study in Chinese college students. Psychiatry Research, 245, 243–249. doi:10.1016/j.psychres.2016.03.009.
4. Bauer, U. E., Briss, P. A., Goodman, R. A., & Bowman, B. A. (2014). Prevention of chronic disease in the 21st century: Elimination of the leading preventable causes of premature death and disability in the USA. Lancet, 384(9937), 45–52. doi:10.1016/S0140-6736(14)60648-6.
5. Duan, Y. P., Wienert, J., Hu, C., Si, G. Y., & Lippke, S. (2017). Web-based intervention for physical activity and fruit and vegetable intake among Chinese university students: A randomized controlled trial. Journal of Medical Internet Research, 19(4), e106. doi:10.2196/jmir.7152.
6. Feng, Q., Zhang, Q. L., Du, Y., Ye, Y. L., & He, Q. Q. (2014). Associations of physical activity, screen time with depression, anxiety and sleep quality among Chinese college freshmen. PLoS One, 9(6), e100914. doi:10.1371/journal.pone.0100914.
7. Kwan, M. Y., Cairney, J., Faulkner, G. E., & Pullenayegum, E. E. (2012). Physical activity and other health-risk behaviors during the transition into early adulthood: A longitudinal cohort study. American Journal of Preventive Medicine, 42(1), 14–20. doi:10.1016/j.amepre.2011.08.026.
8. Small, M., Bailey-Davis, L., Morgan, N., & Maggs, J. (2013). Changes in eating and physical activity behaviors across seven semesters of college: Living on or off campus matters. Health Education & Behavior, 40(4), 435–441. doi:10.1177/1090198112467801.
9. Ye, Y. L., Wang, P. G., Qu, G. C., Yuan, S., Phongsavan, P., & He, Q. Q. (2016). Associations between multiple health risk behaviors and mental health among Chinese college students. Psychology, Health & Medicine, 21(3), 377–385. doi:10.1080/13548506.2015.1070955.
10. Ulla Diez, S. M., Fortis, A. P., & Franco, S. F. (2012). Efficacy of a health-promotion intervention for college students: A randomized controlled trial. Nursing Research, 61(2), 121–132. doi:10.1097/NNR.0b013e3182475aaa.

11. LaChausse, R. G. (2012). My student body: Effects of an internet-based prevention program to decrease obesity among college students. Journal of American College Health, 60(4), 324–330. doi:10.1080/07448481.2011.623333.
12. Bagherniya, M., Taghipour, A., Sharma, M., et al. (2018). Obesity intervention programs among adolescents using social cognitive theory: A systematic literature review. Health Education Research, 33(1), 26–39. doi:10.1093/her/cyx079.
13. Plotnikoff, R. C., Costigan, S. A., Williams, R. L., et al. (2015). Effectiveness of interventions targeting physical activity, nutrition and healthy weight for university and college students: A systematic review and meta-analysis. International Journal of Behavioral Nutrition and Physical Activity, 12(1), 45.
14. Bandura, A. (2004). Health promotion by social cognitive means. Health Education & Behavior, 31(2), 143–164. doi:10.1177/1090198104263660.
15. Wartberg, L., Kriston, L., Kegel, K., & Thomasius, R. (2016). Adaptation and psychometric evaluation of the Young Diagnostic Questionnaire (YDQ) for parental assessment of adolescent problematic Internet use. Journal of Behavioral Addictions, 5(2), 311–317. doi:10.1556/2006.5.2016.049.
16. Li, Y., Zhang, X., Lu, F., Zhang, Q., & Wang, Y. (2014). Internet addiction among elementary and middle school students in China: A nationally representative sample study. Cyberpsychology, Behavior, and Social Networking, 17(2), 111–116. doi:10.1089/cyber.2012.0482.
17. Ni, S. G., Xu, J. H., & Ye, L. (2012). Revision of irrational procrastination scale in Chinese college students and its relations with self-efficacy and health behavior. Chinese Journal of Clinical Psychology, 20(05), 603–605 + 655.
18. Zhang, J. X., & Schwarzer, R. (1995). Measuring optimistic self-beliefs: A Chinese adaptation of the General Self-Efficacy Scale. Psychological International Journal of Psychology Orient, 38(3), 174–181.
19. Topp, C. W., Østergaard, S. D., Søndergaard, S., & Bech, P. (2015). The WHO-5 Well-being Index: A systematic review of the literature. Psychotherapy and Psychosomatics, 84(3), 167–176. doi:10.1159/000376585.
20. Greene, G. W., White, A. A., Hoerr, S. L., et al. (2012). Impact of an online healthful eating and physical activity program for college students. American Journal of Health Promotion, 27(2), e47–e58. doi:10.4278/ajhp.110606-QUAN-239.
21. Després, J. P. (2016). Physical activity, sedentary behaviours, and cardiovascular health: When will cardiorespiratory fitness become a vital sign? Canadian Journal of Cardiology, 32(4), 505–513.
22. Pedersen, B. K., & Saltin, B. (2015). Exercise as medicine – evidence for prescribing exercise as therapy in 26 different chronic diseases. Scandinavian Journal of Medicine & Science in Sports, 25, 1–72. doi:10.1111/sms.12581.
23. Peterson, N. E., Sirard, J. R., Kulbok, P. A., DeBoer, M. D., & Erickson, J. M. (2018). Sedentary behavior and physical activity of young adult university students. Research in Nursing & Health, 41(1), 30–38. doi:10.1002/nur.21845.
24. Lai, S. K., Costigan, S. A., Morgan, P. J., et al. (2014). Do school-based interventions focusing on physical activity, fitness, or fundamental movement skill competency produce a sustained impact in these outcomes in children and adolescents? A systematic review of follow-up studies. Sports Medicine, 44(1), 67–79. doi:10.1007/s40279-013-0099-9.
25. Nanney, M. S., Lytle, L. A., Farbakhsh, K., et al. (2015). Weight and weight-related behaviors among 2-year college students. Journal of American College Health, 63(4), 221–229. doi:10.1080/07448481.2015.1015022.
26. Chen, J., Cheng, J., Liu, Y., et al. (2014). Associations between breakfast eating habits and health-promoting lifestyle, suboptimal health status in southern China: A population-based, cross-sectional study. Journal of Translational Medicine, 12(1), 348.

27. Fernandes, J., Arts, J., Dimond, E., Hirshberg, S., & Lofgren, I. E. (2013). Dietary factors are associated with coronary heart disease risk factors in college students. Nutrition Research, 33(8), 647–652. doi:10.1016/j.nutres.2013.05.013.
28. Abdel Rahman, A., Jomaa, L., Kahale, L. A., Adair, P., & Pine, C. (2018). Effectiveness of behavioral interventions to reduce the intake of sugar-sweetened beverages in children and adolescents: A systematic review and meta-analysis. Nutrition Reviews, 76(2), 88–107. doi:10.1093/nutrit/nux061.
29. Sun, J., Yi, H., Liu, Z., et al. (2013). Factors associated with skipping breakfast among Inner Mongolia medical students in China. BMC Public Health, 13(1), 42.
30. Dlodlo, N., & Mahlangu, H. B. (2013). Usage of mobile-devices for recreation among the millennial generation. African Journal of Physical Health Education, Recreation & Dance, 19(4), 874–890.
31. Head, K. J., Noar, S. M., Iannarino, N. T., & Grant Harrington, N. (2013). Efficacy of text messaging-based interventions for health promotion: A meta-analysis. Social Science & Medicine, 97, 41–48. doi:10.1016/j.socscimed.2013.08.003.
32. Lee, L. L., Kuo, Y. C., Fanaw, D., Perng, S. J., & Juang, I. F. (2012). The effect of an intervention combining self-efficacy theory and pedometers on promoting physical activity among adolescents. Journal of Clinical Nursing, 21(7-8), 914–922. doi:10.1111/j.1365-2702.2011.03881.x.
33. Lustria, M. L. A., Noar, S. M., Cortese, J., Van Stee, S. K., & Glueckauf, R. L., & Lee, J. (2013). A meta-analysis of web-delivered tailored health behavior change interventions. Journal of Health Communication, 18(9), 1039–1069. doi:10.1080/10810730.2013.768727.
34. Maher, C. A., Lewis, L. K., Ferrar, K., Marshall, S., De Bourdeaudhuij, I., & Vandelanotte, C. (2014). Are health behavior change interventions that use online social networks effective? A systematic review. Journal of Medical Internet Research, 16(2), e40. doi:10.2196/jmir.2952.
35. Mohr, D. C., Burns, M. N., Schueller, S. M., Clarke, G., & Klinkman, M. (2013). Behavioral intervention technologies: Evidence review and recommendations for future research in mental health. General Hospital Psychiatry, 35(4), 332–338. doi:10.1016/j.genhosppsych.2013.03.008.
36. Prestwich, A., Kellar, I., Parker, R., et al. (2014). How can self-efficacy be increased? Meta-analysis of dietary interventions. Health Psychology Review, 8(3), 270–285. doi:10.1080/17437199.2013.813729.
37. Olander, E. K., Fletcher, H., Williams, S., Atkinson, L., Turner, A., & French, D. P. (2013). What are the most effective techniques in changing obese individuals' physical activity self-efficacy and behaviour: A systematic review and meta-analysis. International Journal of Behavioral Nutrition and Physical Activity, 10(1), 29. doi:10.1186/1479-5868-10-29.
38. Institute of International Education. (2016). Top 25 places of origin of international students, 2014/15-2015/16. Retrieved from https://www.iie.org/en/Research-and-Insights/Open-Doors/Data/International-Students/Places-of-Origin/Leading-Places-of-Origin/2015-16.
39. Chen, W. (1998). Chinese and American college students' motives for participation in physical activities. Perceptual and Motor Skills, 87(suppl 3), 1463–1470. doi:10.2466/pms.1998.87.3f.1463.
40. Pan, Y. L., Dixon, Z., Himburg, S., & Huffman, F. (1999). Asian students change their eating patterns after living in the United States. Journal of the American Dietetic Association, 99(1), 54–57. doi:10.1016/S0002-8223(99)00016-4.
41. Han, X., Han, X., Luo, Q., Jacobs, S., & Jean-Baptiste, M. (2013). Report of a mental health survey among Chinese international students at Yale University. Journal of American College Health, 61(1), 1–8. doi:10.1080/07448481.2012.738267.