



# Effectiveness of an Online Health and Well-Being Program on Physical Activity, Nutrition, and Sleep in College Students



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## ABSTRACT

**Aims** A healthy lifestyle reduces the mortality from diseases such as cardiovascular diseases and diabetes mellitus. This study aimed to assess the effectiveness of an online health and well-being program in improving physical activity, nutrition, and sleep in college students.

**Materials & Methods** The present study utilized a quantitative methodology, mainly a two-group pretest-posttest design on 178 college students. The experimental group received three months of a health and well-being program while the control resumed their daily activities. The participants answered an adapted online questionnaire divided into socio-demographic and physical activity, nutrition, and sleep data. Data were analyzed using SPSS 27 software.

**Findings** In both experimental and control groups, the participants' physical activity in a day was at an average level. Moreover, the frequency of eating nutritious foods in a week was at an average level for both groups. In terms of hours of sleep per night, the total pretest and posttest mean scores for the experimental and control groups indicated that the participants' hours of sleep per night are at a below-average level. In terms of physical activity, nutrition, and hours of sleep per night, there was no statistically significant difference between the pretest and posttest for both groups ( $p>0.05$ ).

**Conclusion** There is no evidence of a significant difference between college students' physical activity, nutrition, and sleep after the online health well-being program.

**Keywords** Students; Nutrition Status; Sleep; Physical Activity; Health; Cognitive Behavioral Therapy

## CITATION LINKS

[1] Changes in diet, sleep, and ... [2] Sleep, physical activity ... [3] The association ... [4] The independent ... [5] Do universal school-based ... [6] Daily associations ... [7] Temporal relationships ... [8] Lack of exercise ... [9] Evaluation of dietary ... [10] Access disparity ... [11] Change in diet ... [12] Assessment of dietary ... [13] Do medical ... [14] Sleep quality ... [15] The effect of ... [16] Canadian Community ... [17] Evaluating an online ... [18] Cognitive behavioral ... [19] The effects of ... [20] Who are ... [21] Developing a ... [22] FF2022-09: Inflation ... [23] CHED, DBM release ... [24] Mental health ... [25] Supporting mental ... [26] Improving well-being ... [27] US Physical Activity ... [28] Prevalence of ... [29] Nutrition and Mental ... [30] Sleep disturbances ... [31] A Healthy CIT ... [32] Association between ... [33] A 'PERMA' response ... [34] Internet interventions ... [35] Internet-based ... [36] Exploring the feasibility ...

## Introduction

The prevention of lifestyle diseases has become a global issue. Researchers have concentrated their efforts on determining the relationship between physical activity, nutrition, sleep, and favorable health outcomes [1]. It has been shown that a healthy lifestyle, including balanced nutrition, regular physical activity, and adequate sleep, dramatically reduces the mortality from lifestyle diseases such as cardiovascular diseases and diabetes mellitus [2].

The COVID-19 pandemic has impacted many aspects of daily life among college students, including physical activity, nutrition, and sleep [3, 4]. During the pandemic, students who consume a poor diet, engage in little physical activity, and sleep inadequately are predisposed to health problems [5].

Physical activity is critical for overall health maintenance. Numerous benefits immediately become apparent, including decreased anxiety and blood pressure and enhanced sleep [6]. Moreover, regular physical activity has several long-term benefits, including better weight management and stronger bones [7, 8].

College students who consumed more saturated fats and significantly less polyunsaturated fats, monounsaturated fats, folate, vitamin E, and whole grains [9] compared to the recommendations of the American Heart Association [9, 10] are at high risk of developing lifestyle diseases, i.e., hypertension and diabetes mellitus. Additionally, poor nutrition contributes considerably to increased calorie intake and promotes weight gain [11, 12].

Furthermore, sleep-related problems and stress were also considered among college students, which worsened due to the COVID-19 pandemic. A study among Hong Kong, Iran, and Brazil college students had self-reported sleep deprivation [13], poor sleep quality [14], and insomnia [15]. Sleep deprivation and poor sleep quality raise the risk of obesity, heart disease, and infections [3]. Good sleeping habits are crucial for overall health because they affect our body's tissue repair [15]. It also influences our immune system, hunger, respiration, blood pressure, and cardiovascular health [4, 6].

Health and lifestyle behavior programs are essential because it helps the individual to develop his health and well-being practice which will become an integral part of mitigating the risk of developing lifestyle diseases later in life [9]. Developing healthy nutrition habits, incorporating physical activity, and adequate sleep is challenging and will take time; thus, it is essential to create a sustainable health and well-being practice [3].

Although it has been proved that physical activity, eating, and sleeping habits were altered during the pandemic [3, 4], most research has been undertaken on the general population. Moreover, given the scarcity of research on online health and well-being programs for college students [12], this study covers a critical gap. Thus, this study aimed to assess if an improvement in physical activity, nutrition, and sleep can be observed among college students after an online health and well-being program.

## Materials and Methods

### Study design

This investigation employed a pretest-posttest control group design. The experimental and control groups' socio-demographic profiles in terms of age, sex, socio-economic levels, physical activity, nutrition attributes, and sleep were collected before the online health and well-being program. The online health and well-being program was given only to the experimental group while the control resumed their daily activities. After the conduct of the program, the participants' post-test data were gathered again from the experimental and control groups. Due to the nature of the study, wherein the researchers need to be visible in the Virtual Learning Environment, the allocation was not blinded to those delivering the intervention.

### Setting, participants, inclusion and exclusion criteria

The setting of the study was a private college in Bohol and a state university in Cebu, Philippines.

The participants were college students enrolled for the second semester of the academic year 2020 – 2021.

We chose first-year to third-year students because they were easier to reach than fourth-year students who were completing their OJT (On-the-Job Training) at the time of the study. In addition, exclusion criteria included self-reported conditions such as high blood pressure, diabetes mellitus, or a history of recognized mental health or behavioral issues, as well as students who did not attend at least two sessions and refused to continue participating in the research.

### Study period, recruitment, and sampling method

The study was conducted for a period of three months, from May 2021 to July 2021. To recruit participants, we sent a letter of invitation to the Student Affairs Office and the Student Council of the state university and the private college. For three weeks, while waiting for the students' responses to participate, we also advertised on Facebook through our Facebook Page: Amoma Project. As can be

gleaned in Figure 1, 600 participants responded to the invitation and were assessed for eligibility. However, 470 were excluded due to not meeting inclusion criteria (i.e., On-the-Job Training, physical and mental health concerns, taking prescribed medications), and 290 declined to continue participating in the study, with a total of 130 participants. But after one week, 48 students voluntarily participated and met the inclusion criteria, thus reaching the total sample size of 178.

The randomization function of Microsoft Excel assigned the participants to the experimental (N=93) or control group (N=93). However, eight control group participants were lost to follow-up because they did not respond to researchers' attempts to reach them due to internet connectivity issues. The frequency of the analyzed control group was 85. The experimental group participated in an online health and wellness program for three months, while the control group resumed their daily activities.

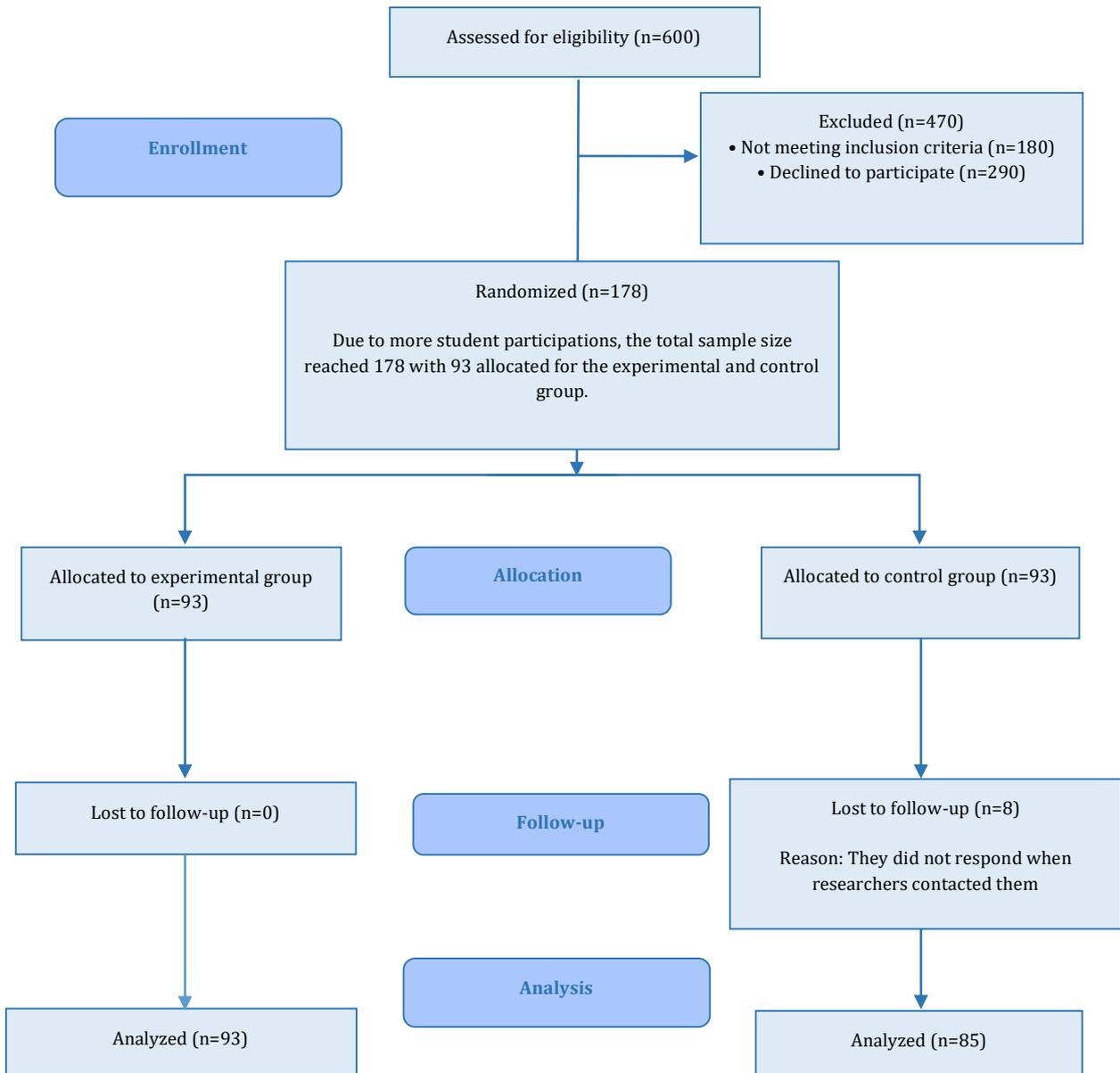


Figure 1) Flowchart of the distribution of participants in the experimental and control groups

**Instrument**

The participant’s physical activity, nutrition attributes, and sleep were adapted and contextualized from the Canadian Community Health Survey - Annual Component (CCHS) – 2021 [16, 17]. The

online instrument was prepared using Google Form®, and the same instrument was distributed to the experimental and control participants during phase I (orientation) and phase IV (evaluation) of the study.

To ensure the clarity of the questionnaires, a pilot study was undertaken utilizing coherence and consistency tests on 30 fourth-year college students who were currently enrolled in a research subject under the lead researcher. To review, the fourth-year college students were excluded since they were in their On-the-Job Training (OJT) during the study. The questionnaire was changed in response to student feedback. After revising, the instrument then underwent forward and backward translation. The English version of the scale was translated into Cebuano (a local dialect in the Philippines) by an expert in the language and then translated back into English by another expert. The translated items were finalized by the lead researcher, an expert in both languages, and two university professors. After receiving the completed instruments, the lead researcher checked the respondents' responses for completeness and accuracy.

### The health and well-being program

The lead researcher first drafted the write-up of the online health and well-being program, which was presented to the university professor for comments and recommendations. After revising the draft program, it was submitted to the psychiatrist and psychiatric nurse for feedback. A series of online meetings took place to discuss their concerns, followed by compliance with the recommendations. After implementing the recommendations, the three experts approved the online health and well-being program for implementation.

The approved program topics included: 1) introduction to the online health and well-being program, 2) health, fitness, and wellness, 3) the mental health continuum, 4) understanding mental health and mental illness, 5) mental health promotion, 6) Seligman's PERMA model of subjective well-being, and 7) Cognitive Behavioral Therapy (CBT) for health and wellness.

The lead researcher delivered the sessions and was assisted by the co-researchers through Zoom®. The duration was between 45-60 minutes, one session per week. The schedule was arranged based on the agreed-upon date and time of the participants. The three health education sessions (phase II) and the well-being program (phase IV) were based on Cognitive Behavioral Therapy techniques [18, 19]. Physical activity, nutrition, and sleep education (phase III) involved implementing requirements for the student to make self-paced physical activities, self-administered nutritional changes, and CBT strategies at home. Basic aerobic or anaerobic physical activities (based on the participants' preference), nutritional, stress, and sleep concepts

were taught to the students using online activities, multimedia presentations, messages, and other displays posted on the study social media group (Amoma Project).

### Scoring procedures

For the time spent (minutes) on physical activity per day, the participants rated themselves based on the ranges in the choices. From "More than 30 minutes" to "Less than 10 minutes," which is interpreted as "High" to "Low" (Table 1).

**Table 1)** Rating of physical activity per day based on time spent

Time spent	Score range	Verbal description	Interpretation
More than 30 minutes	1.50-2.00	High	Participants' physical activity in a day is at above-average level.
10 to 30 minutes	0.51-1.49	Medium	Participants' physical activity in a day is at average level.
Less than 10 minutes	0.00-0.50	Low	Participants' physical activity in a day is at below-average level.

Regarding the frequency of eating nutritious foods, the participants rated themselves based on the ranges in the choices. From "7 times per week" to "1-2 times per week", which is interpreted as "Excellent" to "Poor" (Table 2).

**Table 2)** Rating the frequency of eating nutritious foods

Frequency of eating	Score range	Verbal description	Interpretation
7 times per week	6.20-7.00	Excellent	Participants' frequency of eating nutritious foods in a week are at superb level.
5-6 times per week	5.40-6.19	Very Good	Participants' frequency of eating nutritious foods in a week are at above-average level.
3-4 times per week	3.80-5.39	Good	Participants' frequency of eating nutritious foods in a week are at average level.
1-2 time per week	1.00-3.79	Poor	Participants' frequency of eating nutritious foods in a week are at below-average level.

The participants' hours of sleep per night were rated based on the ranges in the choices. From "9-10 hours" to "1-2 hours," which is interpreted as "Excellent" to "Poor" (Table 3).

Also, the socio-economic levels of participants were determined as follows: 13-14: rich, 11-12: high income (but not rich), 9-10: upper middle income, 7-8: middle class, 5-6: lower middle class, and 3-4: low income (but not poor) [20].

**Table 3)** Rating the hours of sleep per night

Hours of sleep per night	Score range	Verbal description	Interpretation
9-10 hours	8.20-10.00	Excellent	Participants' hours of sleep per night are at superb level.
7-8 hours	6.40-8.19	Very Good	Participants' hours of sleep per night are at above-average level.
5-6 hours	4.80-6.39	Good	Participants' hours of sleep per night are at average level.
3-4 hours	3.00-4.79	Poor	Participants' hours of sleep per night are at below-average level.

### Statistical analysis

The socio-demographic profile of the participants, in terms of age, sex, socio-economic level, and data on physical activity, nutrition, and sleep, were expressed as frequencies, percentages, and means and Standard Deviation (SD). One-way analysis of covariance was used to test if significant differences exist in the pretest-posttest physical activity, nutrition, and sleep between the experimental and control groups. All analyses were performed using SPSS 27 software.

### Findings

The majority of the participants were 20-22 years old and mostly female. Most participants were in the 5-6 socio-economic level, meaning they had lower middle-income (Table 4).

**Table 4)** Frequency distribution of socio-demographic characteristics of the respondents (number and percentage)

Variables	Experimental group (n=93)	Control group (n=85)
<b>Age (years)</b>		
≥23	7 (7.53)	9 (10.59)
20-22	68 (73.12)	56 (65.88)
≤19	18 (19.35)	20 (23.53)
<b>Sex</b>		
Female	71 (76.34)	65 (76.47)
Male	22 (25.88)	20 (21.51)
<b>Socio-economic Level</b>		
13-14	0 (0.00)	0 (0.00)
11-12	0 (0.00)	0 (0.00)
9-10	4 (4.30)	6 (7.06)
7-8	27 (29.03)	23 (27.06)
5-6	41 (44.09)	37 (43.53)
3-4	11 (11.83)	10 (11.76)
0-2	10 (10.75)	9 (10.59)

The total mean scores of the experimental and control groups in both the pretests and posttest indicated that the participants' physical activity in a day and frequency of eating nutritious foods in a week were at a average level. Also, the total mean scores of the participants' hours of sleep per night were at a below-average level. In terms of physical activity, nutrition, and hours of sleep per night, there was no statistically significant difference between the

pretest and posttest for both groups ( $p > 0.05$ ; Table 5).

**Table 5)** Comparing the mean scores of physical activity, nutrition, and sleep between pre-test and post-test in the experimental and control groups using one-way ANCOVA

Variable	Pretest	Post-test	Meansquare	F	P-value
<b>Physical Activity</b>					
Experimental group	1.02±0.82	1.05±0.74	0.42	0.76	0.39
Control group	0.86±0.71	1.09±0.73	0.08	0.15	0.70
<b>Nutrition</b>					
Experimental group	5.02±1.57	4.81±1.77	6.45	0.67	0.42
Control group	4.38±1.74	4.53±1.71	5.65	0.55	0.46
<b>Sleep</b>					
Experimental group	4.54±2.92	4.38±3.10	9.04	2.94	0.09
Control group	4.22±3.12	3.89±3.20	0.15	0.01	0.94

### Discussion

This study assessed if improvements in physical activity, nutrition attributes, and sleep can be observed among college students after an online health and well-being program.

Most participants were in the 5-6 socio-economic level, meaning they belonged to the lower middle-income group [20, 21]. These families earn between 2 and 12 times the poverty level (9,520-21,194 PHP/month). This income bracket is not enough to sustain their family needs, especially with the increase in prices of prime commodities [22]. However, free tertiary education in the Philippines increases the number of students who can attend college or university [23].

Our results indicated that the participants' physical activity in a day is at an average level. Moreover, the frequency of eating nutritious foods in a week was at an average level for both groups. In terms of hours of sleep per night, the overall pretest and posttest mean results for the experimental and control groups indicated that the participants' hours of sleep per night are at a below-average level. Moreover, the analysis of covariance results indicated that there were no statistically significant difference in the pretest-posttest of physical activity, nutrition, and sleep between the experimental and control groups. Although our results showed no evidence of a significant difference in the pretest-posttest means on physical activity, nutrition, and sleep among college students after an online health and well-being program, still, health and well-being programs are essential in the college students' holistic development [24, 25]. Since health and well-being have many facets, improving students' health and well-being requires a whole-school approach involving teachers and parents. Moreover, institutions should

provide lessons focusing on the need to adopt a healthy lifestyle and how to prevent or cope with health problems in collaboration with those involved, including health and social services, local authorities, and civil society organizations [21, 26].

The pretest and posttest results of the experimental and control groups indicated that the participants' physical activity in a day is at an average level. This is in agreement with some results in the literature. Adults should engage in aerobic or anaerobic physical activity for at least 150 minutes per week at a moderate intensity or 75 minutes per week at a vigorous intensity or an equivalent mix [27]. Furthermore, studies by Kwan *et al.* and Pop *et al.* [12, 28] discovered that male college students were more involved in more intense activities such as sports or weightlifting. At the same time, females were more interested in dance or aerobics.

A nutritious diet enables the individual to maintain a healthy body weight and cardiovascular function [4]. Additionally, it helps lower the risk of some chronic conditions [3]. The participants in the experimental group increased the frequency of taking nutritious foods per week from pretest to posttest, as evidenced by the increase in the number of those increasing their frequency of consuming nutritious foods in a week into the higher categories, like 6 and 7 times per week. For example, 14 participants, who took nutritious foods seven times per week in the pretest, increased to 31 participants in the posttest. On the other hand, the control group almost maintained its frequency of eating nutritious foods in the three lowest categories in both the pretest and posttest. According to the American Association of Family Medicine [29], our food choices may also affect the individual's mood and mental health. It is occasionally referred to as the "food-mood relationship".

Sleep is an essential component of a daily biological cycle and is critical for health promotion [30]. Most of the experimental participants maintained their highest ratings between 5 and 6 hours of sleep per night. This is consistent with Jalali *et al.*'s [15] findings that most individuals rate their sleep duration between 5 and 6 hours per night. A recent survey found that 79.3 percent (n=1215) of college students did not get the required at least seven hours or more per night as recommended by the American Academy of Sleep Medicine's (AASM) and Sleep Research Society's (SRS) [31]. Moreover, sleeping less than seven hours per night is connected with unfavorable health impacts [7, 32].

The utilization of internet-based interventions to support health and well-being among college

students has been encouraged [33]. Furthermore, online programs are helpful for students because of convenience and easy accessibility [25]. A systematic review by Harrer *et al.* [34] demonstrated the efficacy of internet-based programs in addressing common health problems among university students. The health and well-being program was delivered using a Virtual Learning Environment. The Virtual Learning Environment was critical in allowing students to participate in weekly sessions and obtain expanded access to sources of health assistance via our social media: Amoma Project. Having permanent access to resources was critical to the program's success, serving as a crucial tool for reluctant individuals to seek assistance [35]. This approach aims to promote health autonomy and self-efficacy [36].

The current study used a limited sample size, and it is necessary to replicate the findings using a larger sample size. The outcome variables were assessed using self-reporting techniques. Moreover, the results of this study are relevant only to individuals without physical or mental debilitating diseases. In future studies, a larger sample size, including objective metrics, will help to increase the study's validity.

The findings of our study may aid researchers in identifying target-specific individuals that need health interventions and in developing preventive health education programs for future research.

## Conclusion

There is no evidence of a significant difference between college students' physical activity, nutrition, and sleep after introducing the online health well-being program.

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Researcher (15%); Bernard P (Fourth Author), Assistant Researcher (15%); Michel Plaisent M (Fifth Author), Assistant Researcher (10%)

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