

Association between Physical Health and Well-being: A Quasi-experimental Study

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ABSTRACT

OBJECTIVE: To determine the relationship between physical health and well-being among college students in a state university and private college.

METHODOLOGY: The study used a quantitative method, utilizing a pretest-posttest study design on 178 college students. The test group received three months of the health and well-being program while the control continued their activities of daily living (ADL). Nutrition, physical activity, and sleep were measured using the adapted Canadian Community Health Survey - Annual Component-2021. Well-being was evaluated using the modified positive emotion, engagement, relationships, meaning, and accomplishments (PERMA) questionnaire. Phase 1 includes gathering the participants' socio-demographic profiles, and the research concludes with the evaluation of the program. SPSS v.27 was used to analyze the data.

RESULTS: Multiple regression analysis results for engagement ($r(176) = .26, p = .92$), relationships ($r(176) = .21, p = .06$), accomplishments ($r(176) = .22, p = .31$), and the overall PERMA ($r(176) = .13, p = .42$) were greater than the significance level of 0.05. However, positive emotion ($r(176) = .26, p = .006$) and meaning ($r(176) = .23, p = .02$) results were less than the significance level of $\alpha=0.05$ indicating evidence of significant relationship.

CONCLUSION: The study has established that positive emotion and meaning are significantly related to physical activity, nutrition, and sleep.

KEYWORDS: Physical health, wellness, online health, college students

This article may be cited as: Villarino RT, ML, Temblor MC, Bernard P, Plaisent M. Association between Physical Health and Well-being: A Quasi-experimental Study. J Liaquat Uni Med Health Sci. 2022;21(03):215-21. doi: 10.22442/jlumhs.2022.00948.

INTRODUCTION

Mental health is characterized as our ability to think, feel, and act in ways that contribute to the individual's capability to enjoy life and overcome problems. Additionally, a healthy emotional and spiritual state of mind. Numerous contextual and psychological aspects affecting an individual's mental health are constantly evolving². When regarded as a single continuum, a person's current condition of cognitive functioning can be pinpointed - with 'bad mental health' on one end and 'excellent mental health' on the other.

Meanwhile, physical health refers to a state of health and well-being and, more particularly, the capacity to engage in certain activities related to daily living. Furthermore, it is often attained with healthy eating, moderate-intense exercise, enough rest, and a formal recovery plan³.

One component of physical health is physical activity. Studies showed that it is essential for maintaining good health and overall well-being, and numerous health benefits are immediately noticeable, including decreased anxiety, blood pressure, and improved sleep^{4,5}. In addition, regular exercise provides

additional long-term benefits, such as improved weight management, stronger bones, and a decreased risk of over 35 diseases^{5,6}.

Another vital component in maintaining physical health is a proper diet. For example, consuming a balanced and nutritious diet has lowered the risk of various health problems, including cardiovascular disease and diabetes mellitus⁷. According to recent research, it can also influence our mental health, and many studies indicate that specific eating attributes may help prevent depression and anxiety^{3,8}.

Furthermore, sleep affects nearly every tissue in our body⁹, and it influences our immune system, hunger, respiration, blood pressure, and cardiovascular health. According to research, sleep deprivation raises the risk for obesity, heart disease, and infections¹⁰. Sleep-related problems and stress were also considered among the general population, worsened due to the COVID-19 pandemic^{4,10}.

Even though there is evidence that physical activity, nutrition, and sleep promote mental wellness^{9,10} and prevent mental health symptoms^{11,12} in the adult population, there is less evidence of any link to college students. These studies have failed measurement reliability, define and evaluate physical and mental health, and the indicators of mental health

Received: 21-02-2022
Revised: 23-08-2022
Accepted: 12-09-2022

disorders in various ways. Moreover, limited research has used a cross criterion of mental well-being or symptomatology of mental health issues (highlight only one element of mental well-being such as esteem¹⁰ or subjective efficacy¹³ or a particular mental health issue such as depression^{14,15}). In addition, research findings that used objective physical health assessment to assess correlations are limited^{4,5,16}. Given the limitations mentioned above, this study examined the association between physical health and well-being among college students.

METHODOLOGY

This study used a pretest-posttest control group design. Data on the participants' socio-demographic profile, average time spent on physical activity in a day, frequency of eating nutritious foods in a week, hours of sleep per night, and well-being scores based on the PERMA construct, were gathered from the test and control groups before the online health and well-being program. The control group resumed their activities of daily living (ADL) while the test group underwent the three-month program.

The participants were college students enrolled in a state university and private college for the second semester of 2020–2021. These participants were first-year to third-year students taking up nursing, criminology, accountancy, elementary education, secondary education (major in TLE and English), hospitality management, industrial engineering, fisheries, and industrial technology (major in computer technology, automotive, welding, and drafting).

The sample size for the two groups was computed using G*Power 3.1.9.7 using Cohen's medium effect size of 0.5, 0.05 as the significance level, and 0.80 as the statistical power. Six hundred students were screened to determine their eligibility, and four hundred seventy individuals were excluded. One hundred eighty students did not meet the inclusion criteria, and 290 declined to participate. The determined minimum sample size is 130. As a result of increased student participation, the overall sample size increased to 178, with 93 students assigned to the test and control groups. However, eight participants in the control group were lost to follow-up because they did not reply to the researchers' contact attempts. The study used a convenience sampling technique.

Based on the participant's response to the online questionnaire, they must not have any health disorders such as high blood pressure, diabetes mellitus, or a history of diagnosed mental health or behavioural disorders. Moreover, graduate students who could not attend at least two sessions and were unwilling to continue participating in the research were omitted.

The ethical clearance was obtained from Cebu

Technological University-University Research Ethics Committee, and the UREC Protocol Number is 001-2021. After approval, the participants' informed consent was included in the study, and they were oriented on the flow and the duration of the study. Activity, diet, and rest were measured using the adapted Canadian Community Health Survey - Annual Component–2021. Subjective well-being was measured using the modified PERMA questionnaire. A pilot study was undertaken utilizing coherence and consistency tests on 30 students excluded from the research to evaluate the clarity of the questionnaires. The instruments have undergone forward and backward translation. The English version of the measurements was translated into Cebuano (a local dialect in the Philippines) by a specialist in the language and then translated back into English by another expert. The questionnaires were revised based on comments obtained from the students. The translated instruments were finalized by a Psychiatric Nurse, an expert in both languages, and two university professors. After the conduct of the program, the participant's health and well-being as post-test data were gathered again from the test and control groups using the same instruments.

The topics of the program included: Session 1. Introduction to Well-being Development Program; Session 2. Health, Fitness, and Wellness; Session 3. The Mental Health Continuum; Session 4. Understanding Mental Health and Mental Illness; Session 5. Mental Health Promotion; Session 6. PERMA model of subjective well-being; and Session 7. Cognitive Behavioral Therapy for Health and Wellness.

The lead researcher, aided by co-researchers, delivered the seven health and well-being education sessions through Zoom®. The program was developed using Cognitive Behavioral Therapy approaches and the PERMA (positive emotions, engagement, relationships, meaning, and accomplishments) construct. The sessions lasted between 45 and 60 minutes and were held weekly. The schedule was based on the participants' agreed-upon date and time.

Due to the online nature of the instrument, the researchers guaranteed participants' confidentiality and secured data obtained with the assistance of the MIS and Computer Technology Department. The results were tabulated, computed, and interpreted to produce findings, conclusions, and recommendations. The profile of the participants was expressed as frequencies and percentages. Multiple regression analysis was used to determine if significant relationships exist between physical health and well-being variables. The significance level of the test of relationships was set at $\alpha=0.05$. All analyses were performed using SPSS v.27.

RESULTS

The distribution of research participants is presented in the **Table I**. The majority of the research participants in this study were 21 (38.76 %) years old. 76.40 percent of these participants were females. 43.82 percent of the participants belong to the 5-6 socio-economic level, which means they belong to the middle-income group¹⁷. These are families earning between two and twelve times the poverty level. Moreover, this income bracket is not enough to sustain their family needs, especially with the increase in prices of prime commodities¹⁸. However, free tertiary education in the Philippines increases the number of students who can attend college or university¹⁹.

In **Table II**, the average time spent on physical activity shows that the participants in the experimental group indicate an almost equal distribution of the length of time of exercise in the pre-test. However, those who allotted more than 30 minutes in physical activity tend to go down to 10 to 30 minutes in the post-test. On the contrary, the control group tends to change to a more extended exercise time from pre-test to post-test, as can be gleaned from the decrease in the time spent in physical activity with less than 10 minutes and an increase to 10 - 30 minutes in the post-test.

As presented in **Table III**, the research participants in the experimental group increased the frequency of taking nutritious foods per week from pre-test to post-test, as can be gleaned from the increase in the number of those in the higher categories, like 6 and 7 times per week. One example is the case for the 14 participants who took nutritious foods seven times per

TABLE I: SOCIO-DEMOGRAPHIC PROFILE OF THE PARTICIPANTS (n=178)

	Experimental (N=93)	Control (N=85)
Age		
23 and above	7 (7.53%)	9 (10.59%)
22	9 (9.68%)	9 (10.59%)
21	39 (41.93%)	30 (35.29%)
20	20 (21.51%)	27 (31.76%)
19 and below	18 (19.35%)	10 (11.76%)
Gender		
Female	71 (76.34 %)	67 (78.82%)
Male	22 (23.66%)	18 (21.18%)
Socio-economic Level		
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%)

week in the pre-test increased to 31 in the post-test. On the other hand, the control group almost maintained its frequency of eating nutritious foods in the three lowest categories in both the pre-test and post-test.

TABLE II: AVERAGE TIME SPENT ON PHYSICAL ACTIVITY

Experimental Group (N=93)	Pre-test N(%)	Post-test N (%)
More than 30 minutes	32 (34.41)	24 (25.81)
10 to 30 minutes	31 (33.33)	45 (48.39)
Less than 10 minutes	30 (32.26)	24 (25.81)
Control Group (N=85)	Pre-test N(%)	Post-test N(%)
More than 30 minutes	16 (18.82)	31 (36.47)
10 to 30 minutes	41 (48.24)	45 (52.94)
Less than 10 minutes	28 (32.94)	9 (10.59)

TABLE III: FREQUENCY OF EATING NUTRITIOUS FOODS

Experimental Group (N=93)	Pre-test N(%)	Post-test N(%)
7 times per week	14 (15.05)	31 (33.33)
6 times per week	4 (4.30)	19 (20.43)
5 times per week	13 (13.98)	7 (7.53)
4 times per week	15 (16.13)	9 (9.68)
3 times per week	15 (16.13)	15 (16.13)
2 times per week	20 (21.51)	7 (7.53)
1 time per week	12 (12.90)	5 (5.38)
Control Group (N=85)	Pre-test N(%)	Post-test N(%)
7 times per week	25 (29.41)	17 (20.00)
6 times per week	5 (5.88)	11 (12.94)
5 times per week	5 (5.88)	8 (9.41)
4 times per week	8 (9.41)	14 (16.47)
3 times per week	21 (24.71)	20 (23.53)
2 times per week	12 (14.12)	10 (11.76)
1 time per week	9 (10.59)	5 (5.88)

Table IV shows that the experimental group rated 3 to 6 hours of sleep per night while the control rated 3 to 4 hours in the pre-test. However, in the post-test, most participants in the experimental rated their sleep duration from 5 to 6 hours, and the control participants maintained their highest frequency at the ratings of 3 to 4 hours of sleep per night.

The experimental and control groups' overall PERMA pre-test and post-test means are shown in **Table V** with a corresponding sample standard deviation values. The experimental group's overall mean at the pre-test was 7.07 (sd=1.44) with a description of

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normal functioning, while it increased slightly to 7.21 (sd=1.47) in the post-test. The overall mean for the control group in the pre-test was 7.30 (sd=1.47), with a description of normal functioning, decreasing slightly to 7.07 (sd=1.55) in the post-test.

**TABLE IV:
SLEEP DURATION IN HOURS PER NIGHT**

Experimental Group (N=93)	Pre-test N(%)	Post-test N(%)
More than 9 hours	1 (1.08)	0 (0.00)
7 – 8	9 (9.68)	7 (7.53)
5 – 6	34 (36.56)	41 (44.09)
3 – 4	34 (36.56)	23 (24.73)
Less than 2 hours	15 (16.13)	22 (23.66)
Control Group (N=85)	Pre-test N(%)	Post-test N(%)
More than 9 hours	0 (0.00)	2 (2.35)
7 – 8	17 (20.00)	8 (9.41)
5 – 6	21 (24.71)	27 (31.76)
3 – 4	27 (31.76)	30 (35.29)
Less than 2 hours	20 (23.53)	18 (21.18)

**TABLE V:
PERMA SCORES PRE-TEST AND POST-TEST OF
THE EXPERIMENTAL AND CONTROL GROUPS**

	Experimental (N=93)	
	Means	SD
PERMA		
Pre-test	7.07	1.32
Post-test	7.21	1.70
	Control (N=85)	
	Means	SD
PERMA		
Pre-test	7.30	1.47
Post-test	7.07	1.56

N=178; SD is the Sample standard deviation.
The main investigation of this study was on the association between the physical health factors, i.e., physical activity, nutrition, and sleep, to the overall PERMA scores of the control and experimental groups. Since the multiple regression analysis results for engagement ($r(176) = .26, p = .92$), relationships ($r(176) = .21, p = .06$), accomplishments ($r(176) = .22, p = .31$), and the overall PERMA ($r(176) = .13, p = .42$) were greater than the significance level of 0.05, the null hypothesis of no significant relationship between the factors of physical health and the PERMA variables was accepted. However, positive emotion ($r(176) = .26, p = .006$) and meaning ($r(176) = .23, p = .02$) results were less than the

significance level of 0.05, the null hypothesis of no significant relationship between the physical health variables and PERMA factors was rejected. Our findings prove that positive emotion and meaning have a significant relationship with physical health factors regarding physical activity, nutrition, and sleep.

**TABLE VI: TEST OF A SIGNIFICANT
RELATIONSHIP BETWEEN PHYSICAL HEALTH
VARIABLES AND PERMA FACTORS**

Factors	Correlation coefficient	p-value
Physical Health and Positive Emotion	0.26	0.006
Physical Health and Engagement	0.05	0.92
Physical Health and Relationships	0.21	0.06
Physical Health and Meaning	0.23	0.02
Physical Health and Accomplishment	0.22	0.31
Physical Health and Overall PERMA	0.13	0.42

N=178; df=176; Significance Level $\alpha = 0.05$

DISCUSSION

This study assesses the association between physical health and well-being among college students enrolled in a state university and private college. Based on the multiple regression analysis results, engagement ($r(176) = .26, p = .92$), relationships ($r(176) = .21, p = .06$), accomplishments ($r(176) = .22, p = .31$), and the overall PERMA ($r(176) = .13, p = .42$) indicate no evidence of significant relationship with physical health. However, for positive emotion ($r(176) = .26, p = .006$) and meaning ($r(176) = .23, p = .02$) suggest evidence of significant relationship with physical health at a significance level of $\alpha=0.05$.

Our findings agree with evidence-based literature on the correlation between physical health and well-being. Each PERMA component has been shown to have a significant positive relationship with physical health, vitality, life satisfaction, and commitment^{10,20}. Physical activity, nutrition, and sleep are positive psychology in action because it contributes to the production of several PERMA model components, including positive emotions, engagement, flow, and accomplishment, as well as the prevention and reduction of more negative experiences and states (i.e., depression, anxiety, and stress)²¹.

With steadily increasing human life expectancy¹², a growing interest in how individuals live better lives is going mainstream explicitly in low-to-middle income countries¹³. The concept of well-being refers to an intangible measure of success that encompasses the degree to which an individual flourish, has positive

relationships with others, experiences both positive and negative affect, and is resilient in the face of adversity²⁰. A growing emphasis on well-being is evident across the scientific community and policymakers; for example, it is regularly studied in scientific research²², has influenced the evolution of new psychotherapeutic interventions for depression²³, and has served as the benchmark for community-based health promotion interventions²⁴.

Moreover, numerous studies have demonstrated that regular physical activity improves sleep⁸. Aerobic exercise (such as cardio and running) and resistance exercise (such as weightlifting) can enhance the quality of sleep²⁵. Any physical activity can help the individual sleep better, although younger people typically require more activities to achieve the same benefits as older people⁴.

Consuming a balanced diet high in vegetables and nutritious foods (while avoiding processed or sugary foods) has improved mental health. Individuals who consumed more fruits and vegetables reported feeling better²⁶. According to a review of research on children and adolescents, an unhealthy diet (high in saturated fat, refined carbohydrates, and processed foods) was associated with poor mental health²⁷.

According to neuroimaging and neurochemistry research, adequate sleep promotes mental and emotional resilience, whereas sleep deprivation supports negative cognition and affective vulnerability²⁸. Sleep disorders are more prevalent in individuals who suffer from mental health issues and may increase their risk of developing mental health disorders⁴.

The present study used a limited sample size, and replicating the findings using a larger sample is essential. The outcome variables were also measured using self-reporting techniques. In future studies, including objective metrics will help to increase the study's validity. Furthermore, our included participants were only from two institutions. As a result, our findings may not apply to college students enrolled in other universities.

CONCLUSION

The study has established that positive emotion and meaning are significantly related to physical activity, nutrition, and sleep. The result of this study is relevant for individuals without physical or mental debilitating diseases. A longitudinal study may provide robust evidence on the correlation between physical health attributes and well-being.

Ethical permission: CEBU Technological University, Philippines, ERC letter No. 001-2021, dated 05-03-2021.

Conflict of Interest: There is no any potential conflict of interest in this research, its publication and its authorship

Financial Disclosure / Grant Approval: Department of Science and Technology (DOST) National Research Council of the Philippines (NRCP) Through the Frontier Research Agenda and Capability Building of Researchers in the Visayas: NRCP Science and Technology Experts Pool (NSTEP) | NSTEP Visayas funded this research project.

Data Sharing Statement: The data supporting this study's findings are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

AUTHOR CONTRIBUTIONS

Vilarino RT: Conceived of the idea, developed the theory and performed the computations, verified the analytical methods, supervised the findings of this work
Vilarino ML: Conceived of the idea, Developed the theory and performed the computations, Verified the analytical methods

Templor MC: Conceived of the idea, developed the theory and performed the computations

Bernard P: Conceived of the idea, verified the analytical methods, supervised the findings of this work

Plaisent M: Conceived of the idea, developed the theory and performed the computations, verified the analytical methods, supervised the findings of this work
All authors discussed the results and contributed to the final manuscript

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