Article

The Impact of Physical Education Classes on Health and Quality of Life during the COVID-19

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Abstract: The purpose of this study was to examine the effects of the COVID-19 pandemic on the well-being and the quality of life of college students participating in physical education classes. We consider this study to be relevant because during the COVID-19 pandemic we tested whether the boost in effective activity among physical education class participants affected well-being and quality of life. A sectional questionnaire survey was conducted across Taiwan in 2019–2020. Data were collected in two stages within 6 months from a sample of 1011 university students in Taiwan (328 male, 683 female). A series of one-way ANOVAs was adopted to examine each outcome across groups and time phases. The results provide support for a positive relationship between well-being ($\beta = 0.25$, $p < 0.001$), and quality of life ($\beta = 0.92$, $p < 0.001$), supporting our expectations. Findings from our study suggest that physical activity was positively associated with mental health; and participation in physical activity had an effect on the well-being and quality of life in college students.

Keywords: COVID-19; physical activity; mental health; health behaviors; college student

1. Introduction

The current outbreak of coronavirus disease 2019 (COVID-19) around the world not only affects the daily physical activity (PA) of various ethnic groups, but more likely causes a major impact on health as well [1] (Górnicka et al., 2020). Especially during the COVID-19 epidemic, student participation in physical activity (PA) has significantly decreased, leading to an increase in the risk of students developing physical illnesses [2,3]. It is noteworthy that, due to the impact of COVID-19, the change of college physical education (PE) courses to online teaching methods may affect the amount of time students can participate in sports, the space required for sports, and the performance of sports behaviors (i.e., completing the general sport skills). The focus of this study is to assess student participation in physical activities (i.e., participation in PE classes) during the COVID-19 pandemic and the possibility of how to promote well-being [4,5], so as to facilitate students to continue participating in PA and enhance the quality of their daily life through PA, thereby improving their quality of life and mental health.

PE provides numerous benefits, including those directly related to the prevention of cardiovascular diseases, enhanced mental health, and life health outcomes [1,2]. In Taiwanese universities, every student must participate in one PE course for 120 min per week. Students are free to complete the course during any of the four years at university. Thus, participation in sports is particularly important for students and is a key aspect of their health outcome (i.e., participation in PA) [2], encouraging students to develop a lifelong holistic learning process, which is acquired and applied in PE contexts [3].

PE courses are important in achieving PA, and participation in sports through PE is one of the important achievements of PE [1,4,5]. The content of the PE course should

be designed in a way that introduces students to different sports activities, improves their athletic skills, encourages engaging in PA regularly throughout life, and teaches the importance of movement to a healthy life [3]. Thanks to positive health outcomes, which is the goal of PE lessons, students become aware of the benefits of PA. The motivation this awareness fosters contributes to them putting sports at the center of their lives. Thus, students who participate in sports have the knowledge and understanding of how to continue PA, how to communicate with others, and how to express themselves. They gain motivation to participate in PA, and develop physical self-perception and self-efficacy [4–6]. No matter how environmental conditions change, those who participate in PA exhibit confidence and maintain their well-being while practicing their movement skills [4,5].

Meanwhile, there is overwhelming evidence of the role of the participation in sports in individuals' well-being and quality of life [4,5]. In the context of PE, participation in sports has been found to contribute to various positive individual outcomes, such as lower illness and higher well-being [6], higher adaptive cognitive response [7], higher behavioral intention [8], as well as better behavioral persistence [9]. Because of the beneficial role of PE in promoting quality of life and health, researchers have focused on elevated outcomes from students' participation in PA.

Reduced PA is one of the largest risk factors for global mortality [1]. Although there are studies that cannot confirm the relationship between PA and health factors, the majority of studies have indeed shown a positive relationship (e.g., [1,2,4,6]). Thus, participation in sports is considered a national and global goal for a healthy population, and it is useful to further investigate the relationship between sport and other aspects of life. For example, people who are more frequently physically active not only feel healthier, but are also happier [3,4]. COVID-19 was first identified in December 2019 in China and caused clusters of respiratory illnesses. However, it is not clear which factors of participating in sports stabilize individual well-being and quality of life during life-changing events like the COVID-19 pandemic.

Given the advantages that participating in PA classes brings to the well-being and quality of life of students [5,10], the purpose of this study was to examine the effects on the well-being and the quality of life of students who participate in PA classes in a university context. We consider this study to be relevant because during the COVID-19 pandemic, we tested whether students could boost effective activity by participating in PE classes. Moreover, there are still methodological pitfalls and deficiencies in PA research which make it very difficult to detect causal relationships [10]. Thus, we cannot demonstrate causality. Filling in this research gap would contribute to the literature in various ways by exploring the interaction effects of PA classes on outcomes from the COVID-19 pandemic.

Consistent with the literature reviewed above, we have formulated three specific hypotheses:

First, participation in sports was found to be a positive contributor to well-being and quality of life (e.g., [1,4,8,10]). Therefore, hypothesis H1 is as follows: Participation in sports is positively correlated with well-being and quality of life (showed in Figure 1).

Second, college students may face different risks during the COVID-19 pandemic. Questions arise considering the impact of these lifestyle changes on psychosocial factors such as quality of life (e.g., [1,4,8,10]). Hence, incentives such as sports and educational programs, clubs, and other opportunities can exist, but everyone must initiate their own participation. Therefore, hypothesis H2 is as follows: Participation in sports positively affects quality of life (showed in Figure 2).

Third, higher levels of PA moderate the relationship between COVID-19 cases and deaths (e.g., [1,2,4]), supporting the importance of analyzing the impact of COVID-19 related changes on mental health (i.e., well-being). For the above reasons, it was expected that insofar as it pertains to PA, the COVID-19 pandemic might have affected mental health, and an increase in PA behaviors might contribute to individual well-being. Therefore, hypothesis H3 is as follows: Participation in sports positively affects well-being (showed in Figure 3).
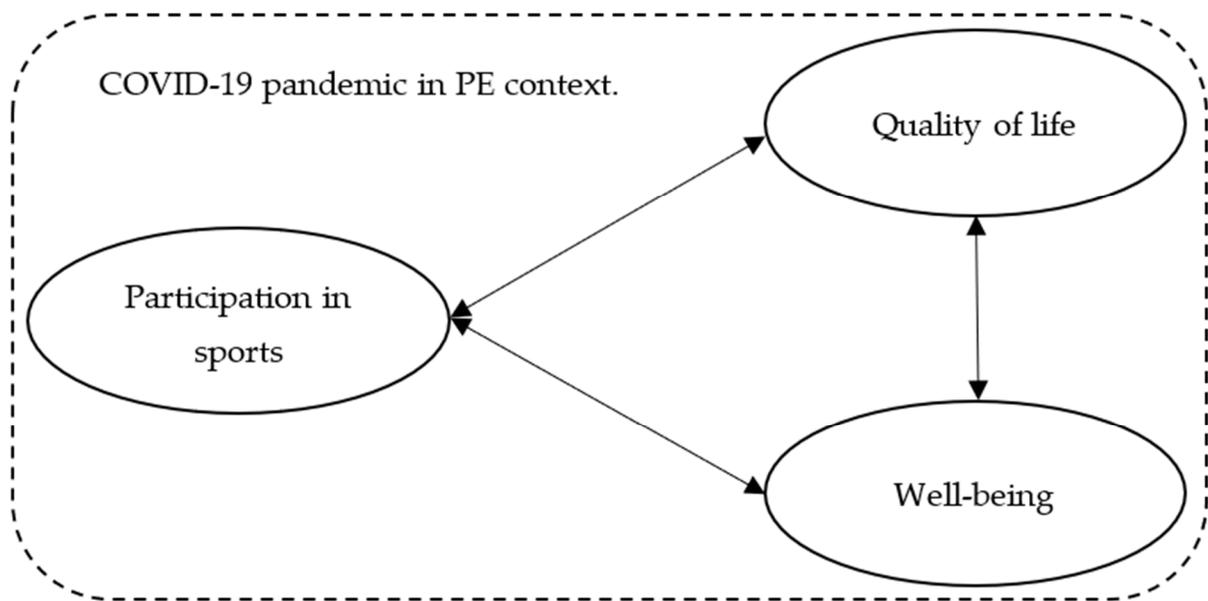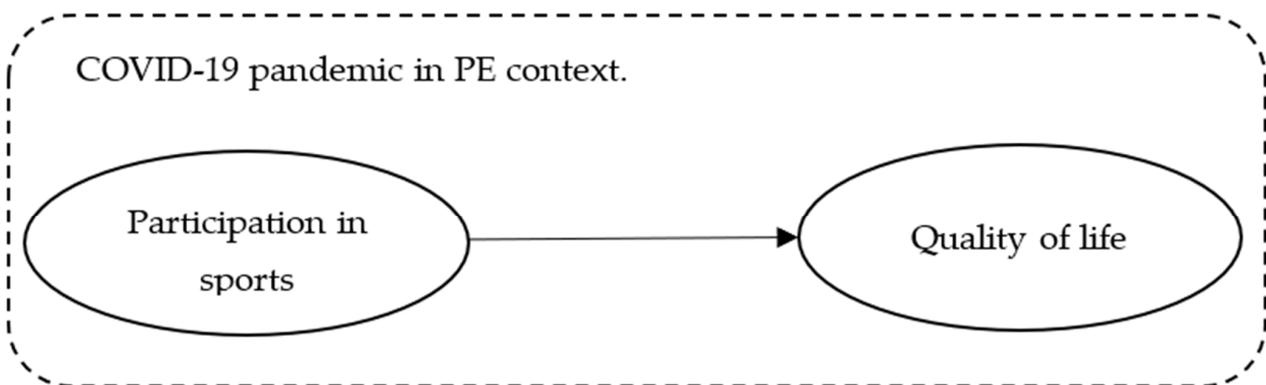
Figure 1. Hypotheses 1 path model.

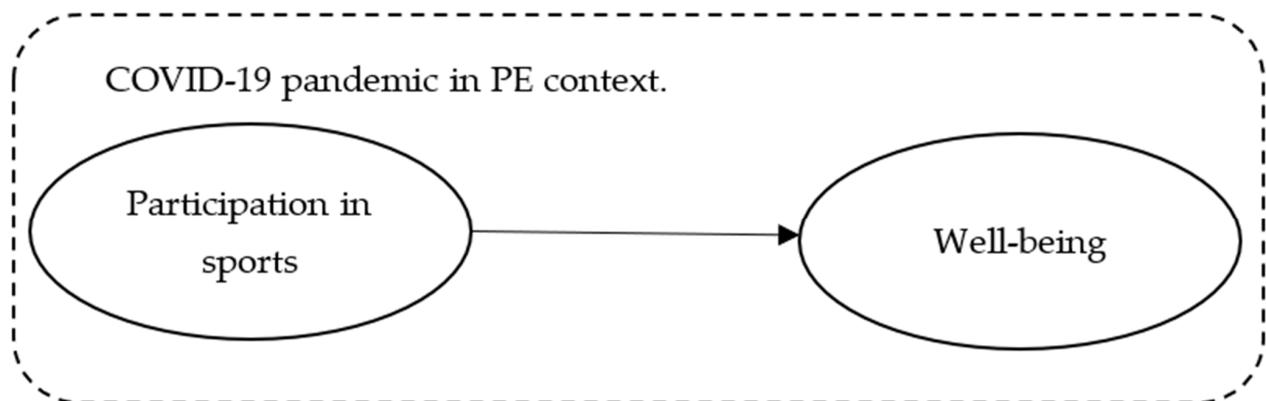**Figure 2.** Hypotheses 2 path model.

Figure 3. Hypotheses 3 path model.

2. Materials and Methods

2.1. Participants

We randomly selected students from universities in Taiwan and asked them to complete questionnaires. A total of 1011 university students in Taiwan (328 male (32.4%), 683 female (67.6%); mean age 20.17 years; standard deviation of age 0.47; age range:

18–23 years) were recruited as participants in this study. To test our hypotheses, first, a letter of invitation was sent to PE teachers in each school. PE teacher consent was obtained before the two waves of questionnaires were distributed. Second, all participants were asked to provide informed consent with emphasis on the voluntary nature of the survey before participating in the study. We conducted tests in two phases and measured variables at intervals of 18 weeks to confirm their sequential relationships. The most effective means to reduce common method variance and systematic measurement errors (which might lead to an inflation or a deflation of the correlation of the examined variables) is to separate the measure of the variables constructs. To do so, we placed a time lag between the assessment of the examined variables [11]. We used the time segregation method to collect different variable data in different phases. The first phase of the questionnaire measured the independent variable (i.e., Participation in sports) and collected demographic data. The second phase measured the dependent variable (Quality of life) and the dependent variable (Well-being). At the same time, we performed a paired comparison of demographic variables to eliminate confounding factors. Questionnaire results were anonymized, and items were allocated randomly in the measurement tool design to avoid psychological interference in the responses. After excluding invalid questionnaires, the final number of effective paired comparison questionnaires (i.e., paired comparison questionnaires where questionnaires from both phases were completely filled out) was 1011. The questionnaires were distributed to the participants before PE classes. The average range of questionnaire completion time was 10–15 min. Participants' confidentiality and anonymity were assured. This study was conducted as per the protocol within the scope of the exemption categories for Research Ethics (REC) review, and all study participants consented to participate. In addition, all authors participated in a workshop on research ethics held by a center for research ethics, obtaining an REC certificate.

2.2. Measures

2.2.1. Participation in Sports

We assessed participation in sports using the five-item scale developed by Boothby, Tungatt, and Townsend [12]. These items evaluate the extent to which students participate in sports [12]. An illustrative item was "What are the sports you do most often?"; "The average number of times you engage in sports per week is?" Cronbach's α was 87 in this study.

2.2.2. Well-Being

We assessed well-being using the eight-item scale developed by Campbell [13]. These items evaluate the extent to which students always act in pursuit of what they think will give them the greatest balance of pleasure over pain [13]. An illustrative item was "you look happy today"; "I'm very happy for you". The response scale ranged from 1 (strongly disagree) to 6 (strongly agree). Cronbach's α was 84 in the study of Edmondson [14] and was 89 in this study.

2.2.3. Quality of Life

We assessed quality of life using the 28-item scale developed by Burckhardt and Anderson [14]. Quality of life measures have become a vital and often required part of health outcomes appraisal. This measures five conceptual domains of quality of life: material and physical well-being, relationships with other people, social, community, and civic activities, personal development and fulfillment, and recreation. The response scale ranged from 1 (strongly disagree) to 5 (strongly agree). Cronbach's α was 92 in the study of Burckhardt and Anderson [15] and was 89 in this study.

2.3. Data Analysis

Data processing and analysis were completed in two stages. During stage one, data were initially screened for outliers and distribution assumptions were examined. Internal

consistency estimates were calculated for all student survey variables. During stage two, descriptive statistics were computed for all student survey variables across demographics of age and gender for both groups. Analyses of variance (ANOVAs) and correlation were conducted to determine any differences across groups on student participation in sports, quality of life, and well-being during COVID-19 in PE. A series of one-way ANOVAs was adopted to examine each outcome across groups and time phases. Post-hoc Scheffe and LSD analyses were used according to ANOVAs respectively to discover contributing factors to significant F values. Moreover, a series of linear regressions was adopted to examine each outcome variable prediction path. All data were analyzed using the Statistical Package for the Social Sciences (version 20.0; SPSS Inc., Chicago, IL, USA). The significance level was set at 95% for all analyses.

3. Results

3.1. Participants' Demographic Characteristics

A total of 1011 student participants completed the questionnaire. Regarding the sports expertise represented by the participants, 210 (20.8%) were currently engaged in interscholastic sports teams, while 801 (79.2%) were not engaged in interscholastic sports teams. Among the participants, 55 of them (5.4%) perceived the atmosphere of sports as "Not good," 810 (80.1%) considering it "Ok," and 146 (14.4%) considering it "Very good." As for exercise frequency, 224 of the participants (22.2%) voted for "Regularly exercise," and 787 (77.8%) for "Not regularly exercise." In all, 80.1% of the participants perceived sports atmosphere in PE class as "Ok". In this study, all of the main hypotheses path testing was estimated by one-way ANOVAs and linear regression. Descriptive scores of the overall participants' demographic characteristics, well-being, and quality of life for each group at each time phase are shown in Table 1. All items had a mean score greater than 3.0 (i.e., midpoint on the five-point Likert-type scale), and none of them had a mean score lower than the midpoint, which reflects that these PE university demand variables were indeed important when considering attendance at sports. Moreover, skewness and kurtosis of each participation in sports, well-being, and quality of life item were well within the acceptable threshold (± 3.0) [16,17], meaning that the distribution of the data did not deviate from normality for any given variable. Moreover, the sample normal distribution skewness of items was between -37 to -1.96, which was not greater than the threshold ± 2; and the kurtosis between -0.003 to 6.07, which did not exceed the recommended value of 7, which meets the requirements of normal distribution [17]. Furthermore, non-significant differences between participation in sports were found from the one-way ANOVAs at the students' mean scores of each variable, as shown in Table 2. In the current findings, the Scheffe test scores of different participations (F1, 1009 = 1.61), and different times (F1, 1009 = 0.46) are shown in Table 2.

3.2. COVID-19's Effect on the Physical Education Course between Physical Fitness, Quality of Life, Attitude, and Well-Being in College Students

Additionally, the correlation analyzed effects of all variables as presented in Table 3. As shown in Table 3, participation in sports was positively related to well-being (r = 0.02, *p* < 0.01), and was positively related to quality of life (r = 0.16, *p* < 0.01). In addition, well-being was positively related to quality of life (r = 0.15, *p* < 0.01). The results showed variables of participation in sports were significant effect correlations. In addition, well-being was positively related to quality of life and there were significant correlations. Given these results, the impact of the COVID-19 pandemic on the participation in sports and on well-being and quality of life were significant, supporting our hypothesis H1 expectations (showed in Figure 4).

Table 1. Participants' demographic characteristics of variables (*N* = 1011).

Variables	*M*	*SD*	Category	Frequency	Cumulative %
Gender	1.68	0.47	Male	328	32.4%
			Female	683	67.6%
Grade	2.00	0.09	Year 1	3	0.3%
			Year 2	1002	99.1%
			Year 3	6	0.6%
Participated on interscholastic sports teams			Yes	210	20.8%
			No	801	79.2%
Perceived atmosphere of sport			Not good	55	5.4%
			Ok	810	80.1%
			Very good	146	14.4%
Exercise frequency			Regularly exercise	224	22.2%
			Not regularly exercise	787	77.8%
Well-being	3.52	0.46			
Quality of life	3.27	0.27			

Note. M = Mean; *SD* = Standard Deviation.

Table 2. Analysis of variance (ANOVA) of variables for different groups in perceptions of sports. (*N* = 1011).

Source	*SS*	*df*	*MS*	*F*	*Scheffe's*
Difference participations	0.03	1	0.00	1.61	
Error	72.59	1009	0.72		
Amounts	72.59	1010			
Difference times	0.03	1	0.03	0.46	
Error	72.56	1009	0.07		
Amounts	72.59	1010			

Note. SS = Sum of Squares; *df* = degree of freedom; *MS* = Mean Square; *F* = F-test.

Table 3. Correlation of variables (*N* = 1011).

Variables	Participation in Sports	Well-Being	Quality of Life
1. Participation in sports	-		
2. Well-being	0.02 **	-	
3. Quality of life	0.16 **	0.15 **	-

Note. ** *p* < 0.01.

To test our path, a script version of the SPSS was adopted for simple linear regression analysis. We also conducted a linear regression by predicting the correlations to confirm the variables' direct effect as presented in Table 4. The linear regression analysis of how participation in sports influences quality of life revealed a significant amount of explained variance, $R^2 = 0.03$, $\beta = 0.92$, $F (1, 1009) = 5.06$, $p < 0.001$. Furthermore, the linear regression analysis of how participation in sports influences well-being revealed a significant amount of explained variance, $R^2 = 0.02$, $\beta = 0.25$, $F (1, 1009) = 4.69$, $p < 0.001$. Thus, we cannot reject the possibility of illustrated significantly predicted effects of variables, which supports hypothesis H2 and H3 (showed in Figures 5 and 6).

Table 4. Regression path of variables (*N* = 1011).

Variables	*B*	*SE*	*t*	*R²*
				0.03 ***
Participation in sports - > Quality of life	0.92	0.02	5.06	
				0.02 ***
Participation in sports - > Well-being	0.25	0.05	4.69	

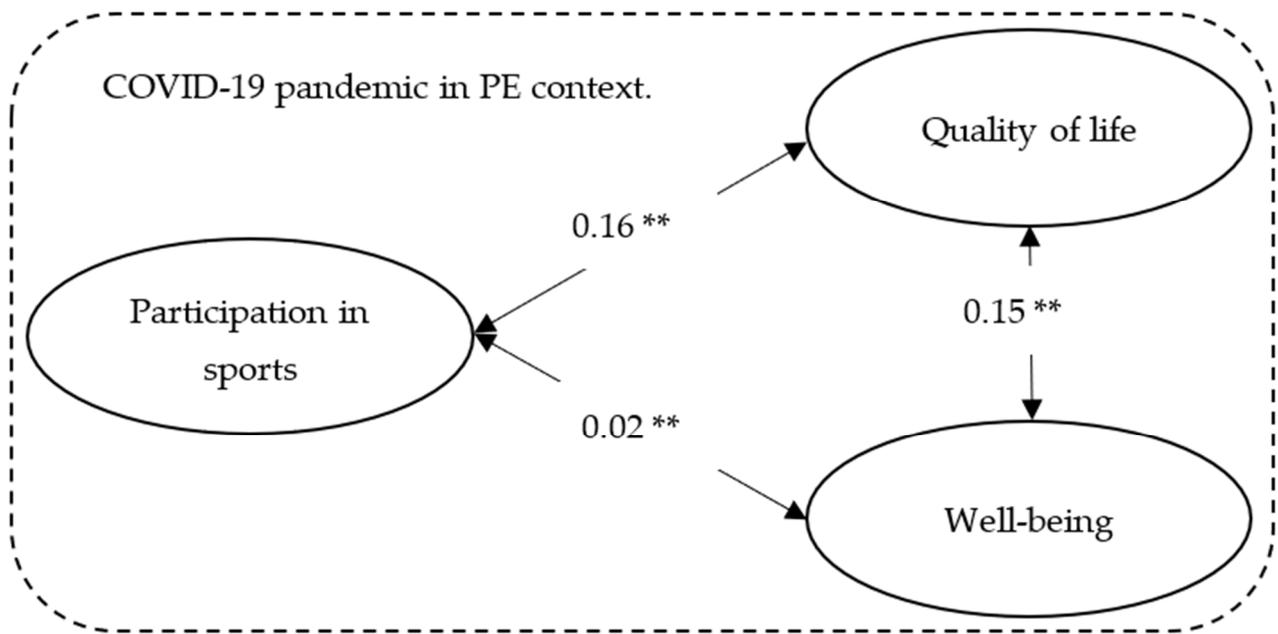*Note.* *** *p* < 0.001.

Figure 4. Hypotheses 1 path model of correlation analyzed effects. Note. ** $p < 0.01$.
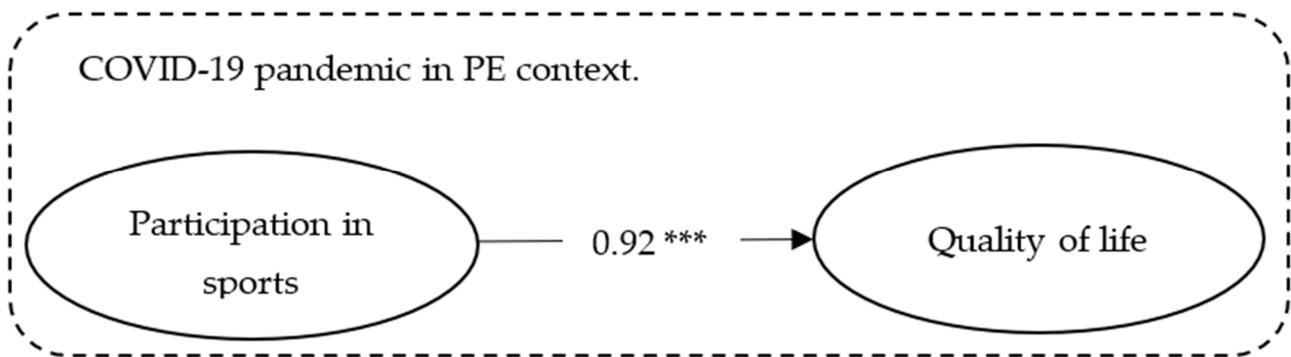
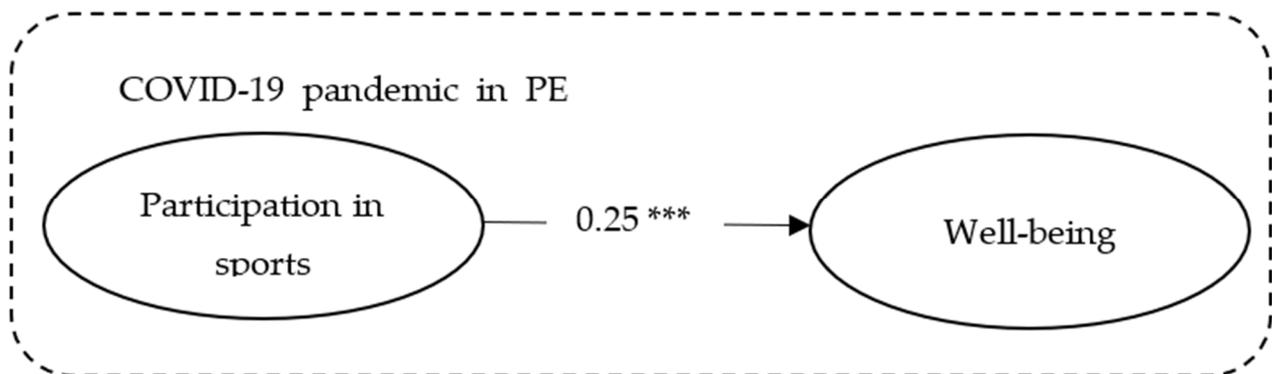**Figure 5.** Hypotheses 2 path model of regression analyzed effects. Note. *** $p < 0.001$.

Figure 6. Hypotheses 3 path model of regression analyzed effects. Note. *** $p < 0.001$.

4. Discussion

The purpose of this study was to examine the effects on the well-being and quality of life of students who participate in PA in a university PE context. The results provide support for a positive relationship between well-being and quality of life, supporting our expectations. Moreover, the study highlights the fact that the influence of adolescent

participation in PA on well-being and quality of life during the COVID-19 pandemic was significant. Here again, health claims provide a topical example. For example, (1) School is an appropriate context in which to introduce young people to PA; (2) If young people are taught at school about the importance of PA for health, they will strive to maintain PA for life; and (3) If college students are exposed to a range of different activities, they will find something they like or are good at and will choose to continue being active after school hours and beyond school life [2,3,16]. We consider that this study is relevant because we tested whether the COVID-19 situation could boost the effective activity of participating in PA in a university PE context [18–20] The study provided several important insights not only for PE and PA literature but also for sport educators and learners. Overall, our hypotheses were supported and provide several contributions to the literature.

Although the results of the study allow a broad discussion of this problem, we next focus on the most important findings related to the study aims regarding the results of how students' participation in PA had an influence on quality of life and well-being in a university PE context [2,20–22]. This study found that the positive influence of PA on mental health and health outcomes is important for students [23,24]. Most notably, the results of our study highlight a health benefit in the participation of PA, as other factors may have influenced mental health over this period [8,13,22,23,25]. In addition, engaging in PA is one of the key learning areas that provides PE with the opportunity to nurture students and create an environment that allows the development of their physical fitness [26–28].

It is possible to derive several implications for PE practice from the findings of this study. Our results revealed the positive effect of student's participation in sports on quality of life and well-being. Therefore, students are encouraged to develop positive interactions in their daily life [5,7,24,28,29], establish participation in PA relationship, and consistent PE expectations [25,29,30] and, on this basis, shape student's positive participation in PA behavior, thereby enhancing quality of life and well-being [5,26,31]. Specifically, participation in PA can be described as the motivation, confidence, physical competence, knowledge, and understanding that help to value and take responsibility for engagement in PA for life [30–34]. In an excellent overview of this concept, Wang et al., among others, indicated that participation in PA is crucial to the acquisition by a college student of essential life skills that enable alleviating the negative well-being impacts on a crisis such as the COVID-19 pandemic [35]. Most specifically, students with a higher level of participation in PA were able to apply, and PA was found to support individuals in bouncing back from adversity more quickly than without participating in sport and physical exercise [28,29,36]. From our perspective, the previous citation summarizes different aspects of participation in PA that collectively resulted in the relationship between the fitness status and well-being and quality of life in the current challenging times.

In addition, results of the regression analysis show that students who regularly participate in PA tend to acquire sufficient motivation, self-confidence and physical skills, and consequently improve their well-being and quality of life [22,27,37]. The college student's PE context-based PA are a positive predictor of quality of life and well-being. Hence, performing these PA contributes to individuals' quality of life and well-being, even when circumstances are drastically affected by the COVID-19 pandemic. The importance of participating in PA behavior from a health perspective was represented by the strong relationships found with regard to commitment to various PA [22,37–39]. The role of participation in PA behavior in the COVID-19 pandemic still developing positive health behaviors has been recognized in this study [32,35]. Accordingly, the implications for individual health should be acknowledged. Considering the health consequences of physical inactivity for individuals and societies, these findings have a degree of importance, and reinforce the value of participating in PA for mental health. To conclude, the results provide support for a positive relationship between well-being and quality of life, supporting our expectations. In addition, PA was consistently associated with mental health, and a healthy, active lifestyle and one's overall well-being are crucial to achieving a good quality, happy,

and fulfilled life [40–42]. As one of the elements of healthy living, positive participation in PA can contribute to mental health.

Limitations and Future Directions

Although the study findings contribute to the literature and provided meaningful implications for various stakeholders in college student participation in PA, this study is not free of limitations. First, this study is also limited in its generalizability because the collected data are from a single university. In addition, although this study is expected to prove the hypothesis (such as the low correlation between the variables and the significant predictive regression path), follow-up research should conduct longitudinal data collection for samples from different regions and use more diversified data to conduct cross-regional repeated test comparisons for samples with more diversified measurement methods [43,44] in order to improve the reliability of the results, thereby assessing the psychological state of students participating in the physical education curriculum, and ensuring the psychological health of students. The authors believe that a longitudinal research study may inspire a meaningful discussion of implementing different programs to gain more support from various stakeholders. Second, self-reported changes are subject to participant bias and the ability of participants to recall information. Finally, the self-reported data might inflate our research variables' relationships because of common method variance. Future research should address this issue by using objective measurements or field experiments.

5. Conclusions

Overall, the study highlights the importance of positive participation in PA behavior during the COVID-19 pandemic in fostering the development of good mental health. Findings from our study suggested that PA was positively associated with good mental health; and participation in PA affected the well-being and quality of life in college students. In this regard, highlighting the role of participation in PA as well as its relationship to the well-being and quality of life of students is an important finding emerging from this study [45]. In summary, the study highlights the fact that the influence of positive participation in PA behavior on a college student's well-being and quality of life was significant toward promoting strong mental health during the COVID-19 pandemic.

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