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Orthodox versus virtual approach in the administration of battery of physical fitness tests in the higher education context

Porównanie podejścia ortodoksyjnego i wirtualnego w administracji baterii testów sprawności fizycznej w kontekście szkolnictwa wyższego

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Abstract

PFTs for both traditional and virtual approaches have been shown to be effective in several scientific studies. Over five weeks, this study compared the two PFT administration methods. Participants' post-test scores were used to evaluate both procedures. The participants were divided into two groups. The battery of PFTs includes the hexagonal test, Plank test, Hand-wall test, Stork-balance test, and Vertical jump. One of these exams will be given weekly for five weeks to each student. Obtained data were processed via IBM SPSS 27. The profile and results of the selected PFTs were interpreted using descriptive statistics like frequency, percentage, mean, and standard deviation. Additionally, Independent samples and Paired t-test were performed to determine the variance between the approaches in the administration of PFTs. All selected PFTs performed similarly for both approaches. Interestingly, both treatments showed considerable BMI change. Virtual administration of selected PFTs is modestly significant compared to traditional administration. Finally, the effectiveness of both approaches was not significantly different. Even though traditional is slightly higher than virtual one. Both procedures work well for college students, and the physical fitness assessments can be utilized repeatedly. This study discusses limitations and further research.

Keywords

administration, orthodox approach, physical activities, physical fitness test, virtual approach

Streszczenie

Testy sprawności fizycznej (PFTs) zarówno w tradycyjnym, jak i wirtualnym podejściu okazały się skuteczne w kilku badaniach naukowych. Przez pięć tygodni to badanie porównywało obie metody przeprowadzania PFT. Wyniki uczestników po teście zostały użyte do oceny obu procedur. Uczestnicy zostali podzieleni na dwie grupy. Bateria testów sprawności fizycznej obejmuje test heksagonalny, test deski (Plank test), test ręki do ściany (Hand-wall test), test równowagi na jednej nodze (Stork-balance test) oraz skok w pionie (Vertical jump). Jeden z tych testów był przeprowadzany przez pięć tygodnia u każdego ucznia. Uzyskane dane zostały przetworzone przy użyciu IBM SPSS 27. Profil i wyniki wybranych PFTs były interpretowane przy użyciu statystyk opisowych, takich jak częstotliwość, procent, średnia i odchylenie standardowe. Dodatkowo przeprowadzono testy t niezależnych prób oraz sparowanych, aby określić różnice między podejściami w zarządzaniem PFTs. Wszystkie wybrane PFTs przeprowadzono podobnie dla obu podejść. Co ciekawe, obie metody wykazały znaczące zmiany BMI. Wirtualne zarządzanie wybranych PFTs jest umiarkowanie istotna w porównaniu z tradycyjną administracją. Ostatecznie skuteczność obu podejść nie różniła się znacząco. Chociaż metoda tradycyjna jest nieco skuteczniejsza niż wirtualna. Obie procedury dobrze sprawdzają się u studentów, a oceny sprawności fizycznej można wykorzystywać wielokrotnie. W badaniu omówiono ograniczenia i sugestie dalszych badań.

Słowa kluczowe

zarządzanie, ortodoksyjne podejście, aktywności fizyczne, test sprawności fizycznej, wirtualne podejście

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Introduction

In recent years, disinterest about exercising has been identified as a global epidemic [1]. Students in higher education are particularly at risk for inactivity [2, 3]. It has been shown that the COVID-19 pandemic has a significant impact on people all around the world [4, 5]. As a result, many schools, notably universities, were forced to shut down their campuses and shift to offering classes exclusively online [6]. Students' physical well-being took a hit as they adapted rapidly to their new college environments [7, 8]. Students are encouraged to maintain a healthy lifestyle outside of the classroom by their physical education teachers. Reduced physical activity is associated with a decline in fitness measures like strength, agility, flexibility, cardiorespiratory endurance, and body composition, as shown in a number of scholarly studies [9–11].

At this very moment where this investigation was conducted, blended-learning modality is being employed to students currently enrolled in the college. Hence, there are classes that are being held both in a traditional face-to-face and virtual classes. Traditionally, in order to monitor at-risk students, physical education teachers usually administer various physical fitness tests. Regular assessments of one's physical fitness are given out in the Philippines, and their completion is frequently mandated on a national, provincial, or even a school-level basis [12–14]. These batteries of tests are a set of measures designed to determine a student's level of physical fitness, subdivided into health-related and skills-related components. It also aims to provide students a detailed information about their health in order to encourage them in participating to various physical activities for healthy living. Regular physical exercise is important because it is connected with good health and considerably reduces the risk of acquiring or dying from particular illnesses, such as coronary artery disease (CAD), high blood pressure, high cholesterol, type 2 diabetes, and some malignancies [15–17]. A physically active lifestyle not only lowers one's chance of developing chronic diseases, but it also helps to alleviate stress, enhances muscular tone and strength, lessens the likelihood of suffering an injury, boosts one's sense of self-worth, and makes it easier to carry out a variety of motor activities [18, 19]. Furthermore, there appears to be a good correlation between academic success and physical fitness [20, 21]. Students that are more physically fit appear to have greater academic performance, are more attentive, and have fewer behavioral issues.

Review of related literature

Administration of physical fitness test in an orthodoxically approach

The administration of fitness tests in schools as well as in the more conventional environment of face-to-face interaction may result in additional benefits for both individuals and groups in addition to boosting participants' fitness levels. Orthodox or traditional approach is linked to a more teacher-centered approach, is also frequently adopted by physical education instructors [22]. It involves teaching style where decisions concerning planning, instruction, and assessment, such as Physical Fitness Testing, are being administered by teachers with little or none student input. Overall, orthodox approach has a preference for high-structured learning tasks, as it allows close observation by the teacher who critically examines the learners' movement patterns and skills performed, reinforces correct responses, and gives corrective feedback when incorrect responses are identified [23]. Additionally, the importance of the interaction between the instructor and the students has been considered as essential [24]. It was emphasized by [25], that traditional approach in Physical Education system includes control actions that imply physical fitness tests as an important element. On the one hand, orthodox or traditional approach, based on the standard normative approach, no longer provides adequate compliance of pedagogical influences with the regularities related to physical development of students. It can also result to disintegration of interest from the students to fully engage themselves to various physical activities.

It has been well-known that the administration of the physical fitness test in a more orthodox approach is widely accepted and effective provided that the selection of these assessments can cater diverse type of students. There are some published scholarly works that were conducted in relation to the effectiveness of physical fitness tests and exercises administered in a traditional method compared to its counterpart, online-mode assessments. For example, the findings of [1] found out that conventional administration of various physical education exercises outperforms housework-based exercises in producing more significant and favorable fitness effects to college students. On the other hand, the study of Krochmal et al. [26] focused on the US School-Based Physical Fitness Test (SB-PFT) of children. Based on its finding, it was unraveled that the variability and inconsistency in reporting and in the values, however, raises questions about the current status of SB-PFT data and its utility in assessing PF in children. Other than that, it was stressed by [27] that conventional method of measuring physical fitness (i.e., VO2max), are expensive, time consuming and require specialized methods. Aside from the reliability, validity, and other factors concerning traditional way of physical fitness testing, it was also observed that fitness testing can be a source of anxiety, fear and overwhelm for some students [28]. Overall, there may be both advantages and disadvantages in administering physical fitness tests in a more traditional approach. This paper also points out that the studies that were mentioned above were conducted differently to which no prior studies has been conducted in the context of a college in the Philippines. In this regard, this warrants for a study that is needed to be conducted if conducting physical fitness in an orthodox approach is still effective even at this current time.

Administration of the Physical Fitness Test in a Virtual Approach

Numerous difficulties persist in the global context of higher education. It has been argued that the physical and spatial separation between the teacher and the student in an online PE class may negate any educational gains to the student [29]. This is because, despite advancements in technology, virtual physical education still fails to successfully replicate the field's social and experience elements [30]. When the true purpose and value of physical education are not effectively communicated, devastating results arise from the necessity of repeating courses in constrained settings with inadequate learning tools

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[31]. Students' motor skills and propensity to engage in strenuous physical activity are not impacted by taking a physical education class online, according to a study by [32]. Potentially diminished student motivation, engagement, and peer interactions may result from these circumstances. Globally, universities still have trouble meeting demand for online courses even after the pandemic has subsided. Some people might not think that taking PE classes online is a good idea [33, 34].

Extensive research has been done on the concept of administering fitness exams to students online, where they can do it in the secure and convenient environment of their own homes. It is well recognized that when teachers provide students the opportunity to perform these exams on their own, the students gain a crucial grasp of their own personal objectives, thoughts, values, and feelings in regard to their own health [35]. Most notably, it can be an alternate type of assessment that places an emphasis on a method that is learner-centered [36]. Students are better able to engage in a critical thinking process regarding the caliber of their own educational experience with the help of this student-centered approach, which does not only rely on the expertise of the instructors. In addition to this, it has been discovered that students enjoy taking these kinds of tests when technology is used, and thus accomplishing so is seen as a highly effective technique for enhancing testing outcomes. [36] highlighted the potential for student-provided video clips to aid in the process of fitness self-testing by displaying the correct form for exercises such as the sit-and-reach test, sit-ups, and push-ups. Another intriguing element that is particularly relevant to adolescents of today is the elimination of uncomfortable testing environments, in addition to the possibility of sharing the outcomes of fitness testing with school administrators, teachers, and parents.

In addition, numerous studies have been carried out concerning the administration of physical fitness tests in an online environment. The recently completed and recently published research by [37] focused on the effects that taking a physical education class, and more especially, taking a physical fitness exam, had on college students during the assault of COVID-19 from 2019-2021. According to the findings of Sun et al. it was discovered that the replacement of face-to-face physical education with its internet-based counterpart in 2020 had negative effects on pull-ups and 800/1000-meter runs but had significant beneficial impacts on other items [50-m run, sit-ups, standing long jump, pull-ups (males), and sit-and-reach (females]; these findings are consistent with the study of [38]. In addition, the empirical research conducted by [39] discovered that the incorporation of an Internet of Things (IoT) smart sensor into a system for handling the results of physical fitness tests administered to college students improved the process efficiency by sixty percent, hence enabling the system to more swiftly respond to a variety of prospects. Likewise, the mobile application developed and designed by [40] that focuses on multimedia feature, behavior of controls and system information, overall interface and customizability/support for user preferences has been tested to be viable tool as an alternative mode of tracking and computing the physical fitness level of the students. Similar to what was found in the research conducted by [41], the majority of the online fitness test results provided by Singaporean students were positive. According to the findings of the study, a student's attitude toward fitness testing had a significant impact on their level of satisfaction with the activity. The following research, which was detailed above, was the only one that assessed the efficacy of evaluating physical fitness online and using a variety of technologies. An in-depth examination is required in order to determine whether or not measuring one's fitness level online is extremely effective.

Materials and method

Research design

This study has utilized an experimental approach throughout the process of the investigation. Additionally, this study aimed to compare the effectiveness of orthodox and virtual approach in the administration of selected physical fitness tests in the context of higher education. After the administration of the selected physical fitness tests, both post-test scores of the participants' BMI will then be compared for both approaches to determine what particular approach is highly effective. When testing a hypothesis, an experiment should get as close to the truth as possible and provide the most tangible findings feasible [42]. Furthermore, this study also focuses on whether the selected physical fitness tests being offered to students can serve as an intervention to determine students who are at-risk, and to help students make lifestyle changes that will improve their health and well-being.

Participants and sampling technique

The selected participants for the study are undergraduate students enrolled from two sections in the program of Bachelor of Physical Education in a higher education institution in the Philippines. Additionally, the participants are currently enrolled in the course Movement Competency Training for the 1st Semester, the Academic Year 2022-2023. In this regard, the participants were selected using Purposive Sampling technique. This method of selecting participants is not based on statistical likelihood, but rather on the researcher's subjective estimation of which participants will yield the most informative data [43]. Ergo, a selection criterion has been formulated to ensure that the participants' data is as accurate as feasible. The following criteria are as follows:

1. Must be at least 19 years old at the time the experimental study was conducted.
2. Either male or female students.
3. Participants' classes are held in both orthodox and virtual modalities.
4. No prior medical conditions.

Table 1 displays the demographic characteristics of the participants for both orthodox and virtual approach according to gender, age, and body mass index (pre-test score). Based on the table, there are 20 participants for both approaches which are equal based on gender [Orthodox approach (N_{male} = 10 (50.00%), N_{female} = 10 (50.00%); Virtual approach (N_{male} = 10 (50.00%), N_{female} = 10 (50.00%)]. In terms of age, the mean age for the participants in the orthodox approach is mean = 19.50 years old, from various age groups ($N_{19\ years\ old}$ = 10 (50.00%), $N_{20\ years\ old}$ = 10 (50.00%); while, for the virtual approach, the age is mean = 20.25 years old, from various age groups ($N_{19\ years\ old}$ = 5 (25.00%), $N_{20\ years\ old}$ = 5 (25.00%), N21 years old = 10 (50.00%). Lastly,

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in terms of body mass index (pre-test scores) of the participants, most of the orthodox approach participants are normal, followed by underweight, and obese (N^{normal} = 11 (55.00%), $N^{underweight}$ = 6 (30.00%) and N^{obese} = 3 (15.00%); while virtual approach participants are mostly normal, followed by underweight and obese (N^{normal} = 13 (65.00%), $N^{underweight}$ = 4 (20.00%) and N^{obese} = 3 (15.00%).

Table 1. Demographic characteristics

Variuables	Items	N (%)
	Orthodox approach	
Gender	Male	10 (50.00%)
	Female	10 (50.00%)
Age (mean = 19.50 years old)	19 years old	10 (50.00%)
	20 years old	10 (50.00%)
	21 years old	0 (00.00%)
BMI (Pre-test)	Underweight (UW)	6 (30.00%)
	Normal (N)	11 (55.00%)
	Overweight (OW)	3 (15.00%)
	Virtual approach	
Gender	Male	10 (50.00%)
	Female	10 (50.00%)
Age (mean = 19.50 years old)	19 years old	5 (25.00%)
	20 years old	5 (25.00%)
	21 years old	10 (50.00%)
BMI (Pre-test)	Underweight (UW)	4 (20.00%)
	Normal (N)	13 (65.00%)
	Overweight (OW)	3 (15.00%)

Instruments and data gathering

The collection of data from the participants were performed by requiring them to answer a survey questionnaire subdivided into two parts. The first part requires participants to provide their gender, age, and BMI (pre-test score), while the second part requests participants to fill-out the Physical Activity Readiness Questionnaire (PAR-Q) to determine participants with medical history. This particular questionnaire screens for evidence of risk factors during moderate physical activity and reviews family history and disease severity [44]. Furthermore, the instructor-in-charge personally measured everyone's height using a GEA manual stature meter. In addition, an SECA 762 brand scale was used for the weighing measures. Standing erect on the device, the participants, being barefoot, placed both feet on the scales to finish the data collection procedure. Also, students between the ages of 2 and 21 had their body mass index (BMI) calculated by dividing their weight in kilograms by the square of their height in meters, or BMI = kg/m^2.

The participants are divided into two groups: (1) Orthodox Approach – to which the selected Physical Fitness Tests (PFTs) will be conducted in a traditional face-to-face setting, and (2) Virtual Approach – to which the tests will be administered online. Additionally, participants were given a battery of PFTs to complete, many of which are being taught during class (Orthodox and Virtual). These include the hexagonal test, Plank test, Hand-wall test, Stork-balance test, and the Vertical jump. One of these exams will be given weekly for five weeks to each student. The instructor will meet with students during a designated week before to the tests to go through important procedures and materials. For the orthodox approach, the teacher demonstrates the specific tests before students may perform it on their own; while for virtual approach, the participants were given a video clip and a module that explained how to complete the subsequent examinations. The structure of the experiment and the specific assessment that they must undergo each week are shown in Table 2.

Table 2. Design of the selected physical fitness tests to be used on the administration for both orthodox and virtual approach

Week	Selected physical fitness test (PFT)	Instructions
1	Hexagonal Test (s)	• Start with both feet together in the middle of the hexagon facing the front line. On the command 'go', jump ahead across the line, then back over the same line into the middle of the hexagon. • Then, continuing to face forward with feet together, jump over the next side and back into the hexagon. Continue this pattern for three full revolutions.

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Week	Selected physical fitness test (PFT)	Instructions
2	Plank Test (s)	• The aim of this test is to hold an elevated position for as long as possible. Start with the upper body supported off the ground by the elbows and forearms, and the legs straight with the weight taken by the toes. The hip is lifted off the floor creating a straight line from head to toe. • As soon as the subject is in the correct position, the stopwatch is started. The head should be facing towards the ground and not looking forwards. The test is over when the subject is unable to hold the back straight and the hip is lowered.
3	Hand-wall Test (catches/30 s)	• A mark is placed a certain distance from the wall (e.g., 2 meters, 3 feet). The person stands behind the line and facing the wall. The ball is thrown from one hand against the wall, and attempted to be caught with the opposite hand. • The ball is then thrown back against the wall and caught with the initial hand. The test can continue for a nominated number of attempts or for a set time period of 30 seconds.
4	Stork-balance test (s)	• Remove the shoes and place the hands on the hips, then position the non-supporting foot against the inside knee of the supporting leg. • The subject is given one minute to practice the balance. • The subject raises the heel to balance on the ball of the foot. • The stopwatch is started as the heel is raised from the floor. The stopwatch is stopped if any of the follow occur: - The hand(s) come off the hips. - The supporting foot swivels or moves (hops) in any direction. - The non-supporting foot loses contact with the knee. - The heel of the supporting foot touches the floor.
5	Vertical jump (cm)	• Stands side on to a wall and reaches up with the hand closest to the wall. Keeping the feet flat on the ground, the point of the fingertips is marked or recorded. • Then stands away from the wall, and leaps vertically as high as possible using both arms and legs to assist in projecting the body upwards.

Monitoring procedures for physical fitness test program adherence

For the orthodox approach: the instructor will require the participants to perform a specific test on the designated week and is in-charge with the monitoring and encoding of results based on the college-mandated format.

For the virtual approach: The researchers used a double-check system to make sure all of their virtual volunteers finished the fitness test. First, having them turn in an index card with test information in the college-required format, and by requiring participants to upload unedited footage of themselves performing the test. Participants submitted both of the necessary monitoring instruments via Google Drive. Each week, students must demonstrate that they are actively participating in the assessment by submitting the following. Fortunately, 100% of the virtual approach participants turned in their work on time.

Statistical Analysis

Obtained data were processed via IBM SPSS 27 (IBM Statistical Package for the Social Sciences). The demographic profile and the results of the selected fitness assessments were interpreted using descriptive statistics like frequency (f), percentage (%), mean (M), and standard deviation (SD). In order to interpret the scores of the participants across all the selected PFTs, the study has used the corresponding interpretation for each test as shown in Table 3. Additionally, Independent samples t-test and Paired t-test were performed to determine the significant variance in the performance between orthodox and virtual approach participants in the administration of the selected PFTs.

Table 3. Descriptive Interpretation per test

Hexagonal (s)		Plank test (s)		Hand-wall (catches/30 s)		Stork-balance (s)		Vertical-jump (cm)			
								Male		Female	
t	Rate	t	Rate	Catches	Rate	t	Rate	cm	Rate	cm	Rate
< 12	E	> 60	E	> 35	E	> 50	E	> 70	E	> 60	E
13-17	G	40-50	VG	30-35	G	40-50	G	61-70	VG	51-60	VG
18-22	F	30-39	G	20-29	A	25-39	A	51-60	AA	41-50	AA
> 22	P	20-29	A	15-19	F	10-24	F	41-50	A	31-40	A
		10-19	P	< 15	P	< 10	P	31-40	BA	21-30	BA
		1-9	VP					21-30	P	11-20	P
								< 21	VP	< 11	VP

Hexagonal: E – Excellent, G – Good, F – Fair, P – Poor; Plank Test: E – Excellent, VG – Very Good, G – Good, A – Average, P – Poor, VP – Very Poor; Hand –Wall: E – Excellent, G – Good, A – Average, F – Fair, P – Poor; Stork –Balance: E – Excellent, G – Good, A – Average, F – Fair, P – Poor; Vertical –Jump: E – Excellent, VG – Very Good, AA – Above Average, A – Average, BA – Below Average, P – Poor, VP – Very Poor.

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Ethical considerations

All participants were briefed on the experiment's goals, as well as any instruments or tests that would be used to evaluate their progress and output. The positive effects that this investigation will have on higher education institutions and the scientific community as a whole have also been outlined.

Results

Table 4 displays the results of the selected physical fitness tests for both participants underwent the orthodox and virtual approach. For the hexagonal test, 60.00% (N = 12) of the participants (both male and female) scored an "excellent" rating (< 12 s), followed by "poor" rating [N = 3; 15.00% (> 22 s)], "good" [N = 2; 10.00% (13-17 s)], and "fair" [N = 1; 5.00% (18-22 s)] and for the orthodox approach. Meanwhile, 45.00% (N = 9) of the participants (both male and female) scored an "excellent" rating (< 12s), followed by "fair" [N = 5; 25.00% (18-22 s)], "good" [N = 3; 15.00% (13-17s), and "poor" rating [N = 1; 5.00% (> 22s)] for the virtual approach. In regards to the plank test, 50.00% (N = 10) of the participants (both male and female) scored an "excellent" rating (> 60 s), followed by both "very good" [N = 4; 20.00% (40-50 s)] and "good" [N = 4; 20.00% (30-39 s)] rating, and "average" [N = 2; 10.00% (20-29 s)] rating for the orthodox approach. While, 45.00% (N = 9) of the participants (both male and female) scored a "very good" rating (40-50 s), followed by "excellent" [N = 6; 30.00% (> 60 s)], "average" [N = 3; 15.00% (20-29 s)] and "good" [N = 2; 10.00% (30-39 s)] rating for the virtual approach. Concerning hand-wall test, 65.00% (N = 13) of the participants (both male and female) scored an "average" rating (20-29 catches/30 s), followed by "good" [N = 4; 20.00% (30-35 catches/30 s)], "poor" [N = 2; 10.00% (< 15 catches/30 s)], and "fair" [N = 1; 5.00% (15-19 catches/30 s)] rating for the orthodox approach. On the other side, 45.00% (N = 9) of the participants (both male and female) scored an "average" rating (20-29 catches/30 s), followed by "good" [N = 7; 35.00% (30-35 catches/30 s)], "fair" [N = 2; 10.00% (15-19 catches/30 s)], and both "excellent" [N = 1; 5.00% (> 35 catches/30 s)] "poor" [N = 1; 5.00% (< 15 catches/30 s)] rating for the virtual approach. For the stork-balance test, 50.00% (N = 10) of the participants (both male and female) scored an "excellent" rating (> 50 s), followed by "good" [N = 6; 30.00% (40-50 s)], "fair" [N = 3; 15.00% (10-24 s)], and "average" [N = 1; 5.00% (25-39 s)] rating for the orthodox approach. Meanwhile, 50.00% (N = 10) of the participants (both male and female) scored an "excellent" rating (> 50 s), followed by "good" [N = 6; 30.00% (40-50 s)], "average" [N = 3; 15.00% (25-39 s)], and "fair" [N = 1; 5.00% (10-24 s)] rating for the virtual approach. Regarding the vertical jump test, 30.00% (N = 3) of the male participants both scored a "below average" [30.00% (31-40 cm)] and "poor" [N = 3; 30.00% (21-30 cm)] rating, followed by "excellent" [N = 2; 20.00% (> 70 cm)] and "average" [N = 2; 20.00% (41-50 cm)] ratings; 40.00% (N = 4) of the female participants scored a "below average" (31-40 cm) rating, followed by "average" [N = 3; 30.00% (41-50 cm)], "excellent" [N = 2; 20.00% (> 70 cm)], and "above average" [N = 1; 10.00% (51-60 cm)] for the orthodox approach. On the other hand, 40.00% (N = 4) of the male participants scored an "average" rating (41-50 cm), followed by and "poor" [N = 3; 30.00% (21-30 cm)], "below average" [N = 2; 20.00% (31-40 cm)], and "above average" [N = 1; 10.00% 51-60 cm)] rating; 50.00% (N = 5) of the female participants scored an "average" rating (31-40 cm), followed by "above average" [N = 3; 30.00% (41-50 cm)], and both "very good" [N = 1; 10.00% (51-60 cm)] "below average" [N = 1; 10.00% (21-30 cm)] ratings for the virtual approach.

Table 4. Results of selected physical fitness tests (orthodox versus virtual approach)

Approach	Participants	HX (s)		PT (s)		H-W (catches/30 s)		S-B (s)		VJ (cm)	
		t	Rate	t	Rate	Catches	Rate	t	Rate	cm	Rate
Orthodox	O1_M	7.80	E	22.00	A	16	F	50.00	G	40.64	BA
Orthodox	O2_M	8.55	E	30.42	G	28	A	64.00	E	30.00	P
Orthodox	O3_F	26.00	P	60.00	E	21	A	55.00	E	30.48	BA
Orthodox	O4_F	7.00	E	42.00	VG	27	A	32.00	A	45.72	AA
Orthodox	O5_F	32.00	P	65.00	E	12	P	50.00	G	81.00	E
Orthodox	O6_F	8.90	E	40.00	VG	20	A	20.00	F	24.00	BA
Orthodox	O7_M	10.00	E	60.00	E	20	A	20.00	F	120.00	E
Orthodox	O8_M	5.18	E	60.00	E	20	A	55.00	E	50.00	A
Orthodox	O9_M	12.00	E	60.00	E	32	G	60.00	E	85.00	E
Orthodox	O10_F	36.00	P	60.00	E	30	G	10.00	F	24.25	BA
Orthodox	O11_F	7.30	E	34.00	G	28	A	50.00	G	40.64	A
Orthodox	O12_M	20.00	F	60.00	E	30	G	50.00	G	45.72	A
Orthodox	O13_F	12.40	G	30.00	G	20	A	40.00	G	31.00	A
Orthodox	O14_F	7.19	E	21.57	A	30	G	50.98	E	34.00	A
Orthodox	O15_F	6.68	E	65.00	E	21	A	71.00	E	27.00	BA
Orthodox	O16_M	7.00	E	60.00	E	20	A	50.00	G	27.00	P
Orthodox	O17_M	6.69	E	60.00	E	7	P	60.00	E	26.70	P
Orthodox	O18_M	65.00	P	49.98	VG	23	A	65.00	E	32.00	BA
Orthodox	O19_F	12.40	G	35.36	G	21	A	75.00	E	115.40	E
Orthodox	O20_M	61.20	P	50.58	VG	22	A	70.30	E	32.00	BA

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Approach	Participants	HX (s)		PT (s)		H-W (catches/30 s)		S-B (s)		VJ (cm)	
		t	Rate	t	Rate	Catches	Rate	t	Rate	cm	Rate
Virtual	V1_M	11.00	E	60.00	E	35	G	60.00	E	31.75	BA
Virtual	V2_M	4.64	E	45.00	VG	35	G	50.00	G	50.00	A
Virtual	V3_F	7.52	E	27.00	A	31	G	50.00	G	36.00	A
Virtual	V4_F	16.50	G	43.00	VG	24	A	50.00	G	43.18	AA
Virtual	V5_M	10.50	E	60.00	E	22	A	60.00	E	28.00	P
Virtual	V6_M	21.00	F	30.00	G	13	P	60.00	E	33.02	BA
Virtual	V7_M	11.70	E	60.00	E	21	A	60.00	E	29.00	P
Virtual	V8_F	22.00	F	70.00	E	15	F	64.00	E	42.00	AA
Virtual	V9_F	19.00	F	52.00	VG	19	F	45.00	G	36.00	A
Virtual	V10_M	22.00	F	43.00	VG	27	A	41.00	G	43.18	A
Virtual	V11_F	11.00	E	51.88	VG	33	G	67.20	E	32.00	A
Virtual	V12_M	11.72	E	42.00	VG	30	G	54.00	E	43.18	A
Virtual	V13_M	6.68	E	22.00	A	23	A	26.00	A	30.00	P
Virtual	V14_F	45.00	P	40.00	VG	47	E	90.00	E	32.00	A
Virtual	V15_F	5.65	E	60.00	E	20	A	96.00	E	24.00	BA
Virtual	V16_F	5.00	E	60.00	E	30	G	50.00	G	58.42	VG
Virtual	V17_F	26.00	P	27.00	A	33	G	38.00	A	43.00	AA
Virtual	V18_M	15.00	G	52.00	VG	27	A	17.00	F	50.80	A
Virtual	V19_F	14.29	G	45.00	VG	21	A	60.00	E	32.00	A
Virtual	V20_M	20.00	F	39.00	G	20	A	39.00	A	58.42	AA

Note: HX (Hexagonal): E – Excellent, G – Good, F – Fair, P – Poor; PT (Plank Test): E – Excellent, VG – Very Good, G – Good, A – Average, P – Poor, VP – Very Poor; H – W (Hand – Wall): E – Excellent, G – Good, A – Average, F – Fair, P – Poor; S – B (Stork – Balance): E – Excellent, G – Good, A – Average, F – Fair, P – Poor; VJ (Vertical – Jump): E – Excellent, VG – Very Good, AA – Above Average, A – Average, BA – Below Average, P – Poor, VP – Very Poor.

Table 5 presents the findings based on the analysis of variance in the performance according to each selected physical fitness tests based on approach. First, it was found that no significant variance was observed in the performance of the participants for both approaches in the hexagonal test [t(38) = 0.590, p = 0.559], even though orthodox approach is slightly higher compared to its counterpart [Orthodox (17.96 ± 17.76) versus Virtual (15.31 ± 9.43)]. Second, there has been no significant variance also observed in the participants' performance on plank test to both approaches [t(37.502) = 0.416, p = 0.680], even though orthodox approach is higher compared to its counterpart [Orthodox (48.30 ± 14.87) versus Virtual (46.44 ± 13.25)]. Third, no significant difference was observed in the participants' performance on the hand-wall test for both approaches [t(35.988) = −1.692, p = 0.099], even virtual is slightly higher compared to its counterpart [Virtual (26.30 ± 8.11) versus Orthodox (22.40 ± 6.37)]. Fourth, there is also no significant variance was observed in the performance of the participants on the stork-balance test [t(37.942) = −0.690, p = 0.495], even though virtual approach is slightly higher compared to its counterpart [Virtual (53.86 ± 18.44) versus Orthodox (49.91 ± 17.73)]. Lastly, no significant difference was observed in the participants' performance for both approaches in the vertical jump test [t(38) = 1.201, p = 0.237], even though orthodox approach is slightly higher compared to its counterpart. Overall, no observed variance for both approaches was found based on the findings of the experiment.

Table 5. Independent Samples T-test measuring the difference in the performance of participants according to approach

		N	M ± SD	SE	df	t-test	Sig.	Decision
HX (s)	Orthodox Virtual	20 20	17.96 ± 17.76 15.31 ± 9.43	3.97 2.11	38	0.590	0.559	Not significant
PT (s)	Orthodox Virtual	20 20	48.30 ± 14.87 46.44 ± 13.25	3.33 2.96	37.502	0.416	0.680	Not significant
H-W (catches/30 s)	Orthodox Virtual	20 20	22.40 ± 6.37 26.30 ± 8.11	1.42 1.81	35.988	−1.692	0.099	Not significant
S-B (s)	Orthodox Virtual	20 20	49.91 ± 17.73 53.86 ± 18.44	3.96 4.12	37.942	−0.690	0.495	Not significant
VJ (cm)	Orthodox Virtual	20 20	47.13 ± 29.38 38.80 ± 9.92	6.57 2.21	38	1.201	0.237	Not significant

Note: Values are expressed as Mean ± Standard Deviation; HX (Hexagonal), PT (Plank Test), H-W (Hand-Wall), S-B (Stork-Balance), VJ (Vertical-Jump)

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Table 6 demonstrates the results on the analysis of the variance in the improvement of the participants' body mass indexes according to approach performed. It was found out that both the orthodox [t(19) = 2.906, p = 0.009] and virtual [t(19) = 3.305, p = 0.004] approach significantly improved the participants' BMI. Additionally, both approaches, were found to have a slightly significant reduction/improvement to participant's BMI {[Orthodox approach ($BMI_1^{(pre)}$ 20.92 ± 3.77) vs ($BMI_2^{(post)}$ 20.49 ± 3.69) and Virtual approach ($BMI_1^{(pre)}$ 20.76 ± 3.86) vs ($BMI_2^{(post)}$ 20.57 ± 3.59)]}. Interestingly, it was also observed that in terms of significance value, administration of the selected PFTs on the virtual approach is slightly significant compared to orthodox approach [Virtual approach (p = 0.004) × Orthodox approach (p = 0.009)].

Table 6. Paired samples t-test measuring the difference on the orthodox versus virtual pre- and post-test results after performing the selected physical fitness tests

	Paired Differences							
			95% Confidence Interval of the Difference					
	M ± SD	SE	Lower	Upper	t	df	Sig.	Decision
Orthodox $BMI_1^{(pre)} - BMI_2^{(post)}$	0.43 ± 0.67	0.15	0.12138	0.74661	2.906	19	0.009	Significant
Virtual $BMI_1^{(pre)} - BMI_2^{(post)}$	0.51 ± 0.68	0.15	0.18521	0.82478	3.305	19	0.004	Significant

Note: Values are expressed as Mean ± Standard Deviation; BMI-Body Mass Index (pre- and post-test)

Table 7 illustrates the findings on the analysis of the effectiveness of both orthodox versus virtual approach in the administration of selected PFTs to the participants. Based on the results, it was observed that there is no significant variance observed between the two approaches [t(37.973) = 0.205, p = 0.839], even though that orthodox approach (20.49 ± 3.69) is slightly higher compared to virtual approach (20.26 ± 3.59).

Table 7. Independent Samples t-test results on the analysis of the effectiveness of orthodox versus virtual approach on the administration of selected physical fitness tests

PFT / Approach	N	M ± SD	SE	df	t-test	Sig.	Decision
$Orthodox^{(post)}$	20	20.49 ± 3.69	0.82	37.973	0.205	0.839	Not significant
$Virtual^{(post)}$	20	20.26 ± 3.59	0.80				

Note: Values are expressed as Mean ± Standard Deviation.

Discussion

The results of the study showed that there was no significant variance in terms of the participants' performance on the selected physical fitness tests for both approaches that were employed for this investigation. Based on the findings, it can be postulated that both approaches are highly effective in the monitoring, measurement, and improvement of students' body mass indexes. For the orthodox approach, this can be supported by the study of [45], to which it observed that all physical fitness tests, except flexibility, were negatively related to BMI, regardless of sex. This study also found that between-person and within-person BMI and flexibility were positively associated in both men and women. Both sexes demonstrated positive associations between and within cardiorespiratory endurance, explosive power, and flexibility. Likewise, the findings of [46] observed that grip strength, standing long jump, sit and reach, 50 m dash, and endurance run in two age groups (13-15 yrs., 16-18 yrs) of children and adolescents in Xinjiang, China, are correlated. 0.048 to 0.744 is the Pearson coefficient range. Only several indicators show significant associations in the other two age groups (7-9 yrs., 10-12 yrs.), and the Pearson coefficient ranges from 0.002 to 0.589. In most age groups, BMI and physical fitness form a U-shaped or inverted U-shaped curve (R2 ranges from − 0.001 to 0.182). Boys score higher on physical fitness tests than females, with R2 ranging from − 0.001 to 0.182 for boys and 0.001 to 0.031 for girls. Furthermore, the experimental study of [47] also unraveled that BMI and fitness differed across assessments. Higher BMI boys and girls in each age group had lower fitness in sit-ups, jump, and distance run. Increasing BMI sloped differently by age and gender. Age made relationships for the three fitness items parabolic, and teenage boys had steeper parabola peaks than girls. The sit and reach relationships were different from the others and varied by age and gender. On the one hand, these tests that were conducted to students are not the same with the current assessments that were used in this experimental study. Furthermore, this study does not take age and gender into consideration. In this regard, future researchers may find curiosity in performing a similar study to support or repudiate the claims of this investigation.

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Meanwhile, for the virtual approach, the findings of the study can be supported by various published scholarly works that were conducted in recent years. For example, the newly published paper of [37] discovered that by the year 2020, the replacement of traditional physical education with its digital analogue would have a negative impact on pull-ups and 800- and 1000-meter runs but would have a positive impact on other items [50-meter dash, sit-ups, standing long jump, pull-ups (males), and sit-and-reach (females)]. Likewise, 24,112 male and 9,690 female physical fitness test data were used in the study of [38]. The Wilcoxon signed-rank test used 11,219 male and 4,651 female students' 2019 and 2020 physical fitness exam scores. The male 50-m dash dropped 0.1 s, the male 1,000-m race dropped 14 s, while the female 800-m race dropped 11 s. Notably, the proportion of male obesity, based on BMI, climbed from 10.6 to 15.2% and 17.1 to 21.8% for male overweight, while the percentage of male normal weight fell from 55.9 to 51.9% and 16.4 to 11.1% for male thinness. Finally, the findings of [39] have revealed that the college students' physical fitness test management system through the Internet of Things smart sensor can swiftly respond to repeated customer visits with reasonably high processing efficiency, increasing efficiency by 60%. However, the studies that were aforementioned above are not the same in terms of the tests that were administered to the participants of this study. Additionally, these studies have only measured the effectiveness of these tests using various technologies, and also comparing the results by taking gender into consideration. Therefore, performing a comparative study is highly recommended to determine the if the claims of this investigation may be supported or rejected.

Additionally, as have mentioned earlier from other supporting studies that were indicated in this paper, there are also other factors that should be taken into consideration in terms of PFT performance. Various scholars have accentuated that eating habits are highly correlated to BMI which may affect their performance in the administration of various PFTs [48–50]. For example, the study of [51] revealed that BMI is directly related to eating habits, like plant-based diets and fish consumption are both correlated with a reduced body mass index [52], and body mass index rises in people who eat a lot of meat and refined carbohydrates [53]. Also, in connection to dietary habits, not eating breakfast in the morning is correlated with a higher body mass index [54]. Likewise, late dinner may also increase body mass index [55]. Also, it was found that people who eat dinner late tend to forego breakfast on a regular basis, which might lead to weight gain [56]. Another factor that was found to be linked with PFT performance are personal habits including not getting enough exercise, smoking and drinking too much [57, 58]. Such as the findings of [59], 2,854 men aged 24.6 years were studied. Groups differed in fitness and training. Never users averaged the most total physical training, followed by ENDS users, smokers, and dual users. Compared to never users on the fitness tests, ENDS users averaged +27 seconds on the 2-mile run, −4.56 push-ups, and −2.01 sit-ups; smokers averaged +8 seconds, −2.15 push-ups, and −1.44 sit-ups; and dual users averaged +32 seconds, −5.17 push-ups, and −3.88 sit-ups. Dual users performed worse on all three fitness tests than current smokers and never users ($p < 0.05$). This study reveals that smokers and e-cigarette users are less fit than abstainers. Also, the findings of [60] observed that a decrease in perceived health status and health-related physical fitness performance, as well as an increased risk of abdominal obesity, were all associated with current smoking. Giving up cigarettes improved self-reported health, cardiorespiratory fitness, and muscular fitness but had no effect on flexibility. Furthermore, the findings of [61] revealed that drinking more heavily at each drinking occasion is connected with a higher body mass index, which may affect physical fitness test performance. Likewise, the study of [62] unraveled that alcohol intake was associated with higher body mass index levels among Eastern Thailand's college students. This study lends credence to the idea that regular alcohol intake is associated with an increased chance of being overweight, with the possibility that gender also plays a role. In order to determine if these factors may contribute in the performance of college students during the administration of physical fitness tests for both orthodox and virtual approach, an experimental study is warranted.

Conclusion

This experimental study has focused on exploring the difference in terms of effectiveness of orthodox or traditional versus virtual approach in the administration of selected physical fitness tests in a span of five weeks. At this current situation, specifically, post-pandemic period, the institution is under blended learning modality. Meaning, there are some physical education classes that are being held in a traditional face-to-face setting, while other classes are being held online. In this regard, it is only imperative to measure the effectiveness of these two approaches in order to determine if these methods can benefit the students, most especially in the improvement of their body mass index. Based on the findings, it was observed that both approaches are highly effective to college students and the selected physical fitness tests administered may continuously be used. By comparing students' performance before and after assessment, instructors can identify those at risk and help them make lifestyle changes that will improve their health and well-being. It is probable that this strategy will only be successful if physical education instructors employ a stringent and detailed system of monitoring. The major goal of such surveillance should be ensuring that students take all mandatory assessments.

This study has several limitations that should be highly taken into consideration. Students who are taking the degree in Bachelor of Physical Education in a higher education institution are the only participants for this study. Therefore, the results of this study may not generalize the entire studentry of the same institution, the country, and even in a global scale. In this regard, future researchers may take into consideration by performing a similar study of the same assessments used to verify or disprove the initial findings. Lastly, the participants' diets, lifestyles, and fitness levels were not taken into account in this study. As a consequence of this, it is strongly recommended that further experiments of a similar nature be carried out while taking into account the other factors stated earlier. In conclusion, this research contributes to the existing body of knowledge by comparing conventional and digital approaches to the administration of the identified physical fitness tests with the goal of identifying students who are at-risk, as well as decreasing and improving students' Body Mass Index.

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