Теорія та методика фізичного виховання
Physical Education Theory and Methodology
Teorìâ ta Metodika Fizičnogo Vihovannâ

ISSN 1993-7989 (print)
ISSN 1993-7997 (online)
ISSN-L 1993-7989

ORIGINAL SCIENTIFIC ARTICLE

EXPLORING THE EFFECTIVENESS OF A BATTERY OF PHYSICAL FITNESS TESTS VIA VIRTUAL LEARNING ENVIRONMENT

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Accepted for Publication: June 18, 2023
Published: August 30, 2023

DOI: 10.17309/tmfv.2023.4.01

Abstract

Background. Online PFTs can assess students' physical fitness, according to several studies. However, few papers examined this issue in the setting of a Philippine higher education institution.

Study purpose. This experimental research examined how a subset of Physical Fitness Tests (PFTs) affects BMI improvement.

Materials and methods. After five weeks of fitness tests, this study used an experimental design to compare pre- and post-test scores while controlling for gender, age, and BMI. A two-part survey questionnaire collected the participants' data. First, gender, age, and pre-test BMI were provided. The Physical Activity Readiness Questionnaire was the second part (PAR-Q). Analysis of the 5-week experiment data used IBM SPSS version 27. Descriptive statistical approaches displayed the participants' demographics and fitness testing results (frequency, percentage, mean, and standard deviation). Before and after the selected PFTs, the students' performance was examined using the one-way ANOVA and the independent samples t-test to determine if factors like gender, age, and body mass index affected performance. After the fitness tests, the paired samples t-test was used to see if the pre- and post-test scores were statistically different.

Results. Performance before and after the selected PFTs was not statistically different between age groups. Except for the vertical jump test, gender groups did not differ significantly. Males outperformed females. Finally, after five weeks of performing the recommended PFTs, post-test scores were statistically significantly higher than pre-test levels.

Conclusions. The selected PFTs were useful in online learning, especially in a Philippine local institution. This study supports the idea that college physical education instructors can regularly test their students' fitness levels using the above assessments.

Keywords: distance learning, effectiveness, local college, physical education, physical fitness tests.

Introduction

Apathy toward physical activity has been considered a global pandemic in recent years (Tanucan et al., 2022). College students, especially, are becoming less active (Chaput et al., 2020; Katzmarzyk et al., 2018). The COVID-19 pandemic also has a major influence on individuals worldwide (Haleem et al., 2020; Prevandos & Martin, 2022). Many educational institutions, especially higher education institutions, have had to close their campuses and offer courses online (Aristovnik et al., 2020). College students' physical health suffered from this fast academic environment adjustment (Ding et al., 2021; Nguyen et al., 2021). Physical education teachers urge pupils to have a healthy lifestyle outside of class. Several academic studies have shown that reducing physical activity can lower an individual's fitness level, resulting in decreased muscular strength, agility, and flexibility, cardiorespiratory endurance, and body composition (Armstrong et al., 2011; Bermejo-Cantarero et al., 2017; Pinho et al., 2020). Higher education institutions continue to face several challenges. It has been

emphasized that online PE classes may not provide educational benefits to students because both the teacher and student are physically and spatially separated (Yu & Jee, 2020). In this regard, despite technological developments, virtual physical education cannot adequately mimic social and experiential components (Moustakas & Robrade, 2022). Due to repetition of courses in limited environments and poor learning tools, physical education has disastrous outcomes when its genuine objective and value are not successfully communicated (Jeong & So, 2020). Virtual physical education courses do not affect students' motor skills or tendency to participate in physically demanding activities (Chan et al., 2021). These factors may reduce students' motivation, interest, and peer interactions. Even after the pandemic, higher education institutions worldwide struggle to supply online courses. Online physical education lessons may not seem suitable (Konukman et al., 2022; Selvaraj et al., 2021).

On a more positive note, internet-based instruction will undoubtedly continue to play an essential part in a variety of higher education institutions. In particular, with regard to those educational institutions of higher learning that are still operating under this system of operation. Attending Physical Education lessons in an online environment, like the one studied by Idris et al. (2021), leads to increased levels of self-sufficiency and the ability to adjust to changes in the status quo, as the authors of the study discovered. Additionally, due to the rapid feedbacks and responsiveness of the teachers, the students in the health and physical education classes have a pleasant experience, and they were able to learn the subject more, as well as experience health gain (D'Agostino et al., 2021; Webster et al., 2021). To put it succinctly, resolving the difficulties encountered by students is of the utmost importance in order to give students with meaningful learning experiences, most notably in Physical Education classes, and this is true even in the context of an online learning environment.

Administration of Physical Fitness Test in an online environment

Online physical fitness testing has been studied extensively, where students will perform these tests in the comfort of their homes. It has been known that allowing students to administer these tests on their own provides critical understanding of their own goals, ideas, values, and emotions (Yan & Brown, 2017) in relation to their own health. Most importantly, it can be an alternative form of assessment that emphasizes a learner-centered approach (Keating et al., 2020). Instead of relying solely to the instructors, this student-centered approach aids students in engaging in a critical thinking process about the quality of their own learning. Furthermore, integrating technology in these kinds of tests has been seen to be popular among students and seen as a highly effective strategy in improving testing results. Keating et al. (2020) highlight the potential for student-provided video-clips to aid in fitness self-testing by demonstrating the proper form for exercises like the sit-and-reach test, sit-ups, and push-ups. The idea of sharing fitness testing results with school officials, teachers, and parents, as well as doing away with uncomfortable testing environments, is another exciting feature that is highly applicable to the present generation of students.

Furthermore, there have been various conducted concerning the administration of physical fitness testing in an online setting. The newly published study of J. Sun et al. (2023) which focused on the impact of physical education class, specifically physical fitness testing, to college students during the onslaught of COVID-19 from 2019-2021. Based on the findings of J. Sun et. al., it was found that the replacement of in-person physical education with its online counterpart in 2020 had negative effects on pull-ups and 800-/1000-metre runs but had significantly positive effects 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 Xia et al. (2021). Additionally, the experimental study of Xu et al. (2022) found that integrating an IoT smart sensor into a system for managing college students' physical fitness test results improves process efficiency by 60%, allowing the system to more quickly respond to diverse clientele. Likewise, the findings on the study of Ashley and Kawabata (2021), fitness test results from Singaporean students were mainly positive. The study found that students' happiness with fitness testing was strongly connected with their views about it. However, only the following research described above examined the efficacy of measuring physical fitness online and using various technologies. To assess if online fitness testing is highly effective, a rigorous investigation is needed. Researchers in this study assessed participants' pre- and post-exercise scores on a battery of PFTs to determine whether or not the workouts improved their fitness levels. This experimental study's results can lend credence to the idea that PFTs can be successfully administered via distance education.

Materials and methods

Study participants

The participants were selected via Judgmental Sampling Technique, which is a non-probability sampling technique in which the study's participants are exclusively selected due to their characteristics that are highly suitable for the study (Thomas, 2022). This study is an extension of another study which was already performed in a local college in Angeles City, Pampanga. In this particular study, undergraduate students taking the degree of Bachelor of Physical Education at a prominent college in Mabalacat, Pampanga, Region III, in the Philippines, enrolled in the Physical Education 1 course are the participants for the study. In connection to this, the researchers formulated a selection criterion in order to obtain the most reliable data possible: (1) must be at least 19 years old; (2) can be either male or female; (3) no history of any medical illness;

The demographic characteristics of the participants are typified in Table 1 according to age, gender, and pre-test BMI scores. Among the 50 participants, majority of them are females compared to their counterpart [(Nfemale = 33(66.00%), Nmale = 17(34.00%)]. Additionally, most of the participants fall under 21 years old, followed by those who are 19 and 20, respectively [(N21yo = 20(40.00%), N19yo = 15(30.00%), N20yo = 15(30.00%)]. According to participants' pre-test BMI, most of them are normal, followed by those who are underweight and overweight [(Nnormal = 30(60.00%), Nunderweight = 12(24.00%), Noverweight = 8(16.00%)].

Table 1. Demographic characteristics

Variable	Item	N(%)
Gender	Male	17(34.0%)
	Female	33(66.0%)
Age	19 years old	15(30.0%)
	20 years old	15(30.0%)
	21 years old	20(40.0%)
Body Mass Index (pre-test)	Underweight (UW)	12(24.0%)
	Normal	30(60.0%)
	Overweight	8(16.0%)

Study organization

By using an experimental design, this study compared the participants' body mass index (BMI) before and after they participated in the selected PFTs in an online learning environment over the course of five (5) consecutive weeks. An additional analysis (pre- and post-test) will compare students' overall performance on the basis of their gender, age, and body mass index (BMI). A well-designed experiment will yield the most precise results available, allowing researchers to draw the most definitive conclusions feasible about a hypothesis (Miller et al., 2020) appropriate use, and sustainability of effective clinical practices in real world clinical settings. Many implementation science questions can be feasibly answered by fully experimental designs, typically in the form of randomized controlled trials (RCTs). This research attempted to find out if these PFTs are necessary for keeping students' BMIs in a healthy range, even if the tests were done in the comfort of their own homes.

A two-part survey questionnaire was used to elicit responses from the test subjects. The first section consists of demographic information about the participant, such as their gender, age, and pre-test Body Mass Index. In the second section, participants were asked to complete the Physical Activity Readiness Questionnaire (PAR-Q). Participants who have had medical conditions in the past are disqualified from taking part in the study.

A battery of PFTs, including the hexagonal test, Plank test, Hand-wall test, Stork-balance test, and Vertical jump, were given to the participants. Before students administer the following tests, the teacher (researcher) will go over the procedures and materials they will need with them during a designated week. Due to the nature of the online course delivery, students were additionally provided with a video and a module detailing the specifics of how to succeed on the subsequent assessments. Table 2 details the weekly schedule and specific evaluations that participants must complete during the investigation.

Table 2. Physical Fitness Test design for five (5) weeks

Week	Selected physical fitness test (PFT)
Week 1	Hexagonal Test (s)
Week 2	Plank Test (s)
Week 3	Hand-wall Test (catches/30s)
Week 4	Stork-balance test (s)
Week 5	Vertical jump (cm)

Monitoring procedures for physical fitness test program adherence. Participants were required to submit both (1) an index card in the standard format required by the educational institution outlining the tests they took and (2) an unaltered and unprocessed video recording of themselves completing the tests. Participants uploaded both essential monitoring tools to Google Drive. Each week, students must demonstrate that they are actively participating in the assessment by submitting the following. Surprisingly, every participant met the requirements and submitted their work on schedule.

Statistical analysis

Data was handled with IBM SPSS 27 (IBM Statistical Package for the Social Sciences). The demographic profile and selected assessments of fitness were analyzed using descriptive statistics including frequency (f), percentage (%), mean (M), and standard deviation (SD). Each fitness test's tabular description is shown in Table 3. In addition, Independent Samples T-Test and One-way ANOVA were used to determine if gender, age, and BMI affect participants' pre- and post-test performance on various physical fitness tests (PFTs). Parametric tests like the Independent Samples T-Test and One-Way Analysis of Variance (ANOVA) evaluate the means of two or more groups to discover if there is a statistically significant difference (Ahmed & Hamarai, 2022;

Table 3. Descriptive Interpretation per test

Hexagonal (s)		Plank test (s)		Hand-wall (catches/30s)		Stork-balance (s)		Vertical-jump (cm)			
								Male		Female	
s	Rate	s	Rate	Catches	Rate	s	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.

Gerald, 2018). After the physical fitness tests, the Paired samples t-test was performed to see if the participants' IBM scores changed significantly (Ross & Willson, 2017).

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 study's positive effects for higher education institutions and the scientific community at general have also been outlined.

Results

Table 4 displays participants' pre-test Body Mass Index (BMI) by gender and age. Age-wise, most male participants are normal, followed by overweight and underweight [(Nmale(normal) = 10(58.82%), Nmale(overweight) = 5(29.41%), Nmale(underweight) = 2(11.77%)], while most female participants are normal, followed by overweight and underweight [(Nfemale(normal) = 20(60.60%), Nmale(underweight) = 10(30.30%), Nmale(overweight) = 3(9.1%)]. Concerning age, most 19-year-olds are normal, followed by those who are underweight and overweight [(N19yo(normal) = 7(46.67%), N19yo(underweight) = 5(33.33%), N19yo(overweight) = 3(20.0%)]; most 20-year-olds are normal, followed by those who are overweight and underweight [(N20yo(normal) = 10(66.67%), N20yo(underweight) = 4(26.66%), N20yo(overweight) = 1(6.67%)]; and finally, most 21 years old fall under the normal classification, followed by those who are overweight and underweight [(N21yo(normal) = 13(65.0%), N21yo(underweight) = 4(20.0%), N19yo(overweight) = 3(15.0%)]. Based on the table, most participants across genders and ages are normal.

The outcomes of the participants' fitness assessments are displayed in Table 5. More than half (52.0%) of the sample scored an "excellent" (<12s) on the hexagonal test. The majority of participants scored "excellent" (>60s) on the plank test, accounting for 44.00% of the total population. Based on their performance on the hand-wall test, nearly half of the participants (48.00%) were classified as "average" (catches/30s). About three-quarters (72.00%) of the sample population scored "excellent" (>50s) on the stork balance test. Finally, 38.00% of the overall sample group scored within the "average" range (41-50cm-male/31-40cm-female) on the vertical-jump test.

Table 6 displays the average mean score on the performance of the participants after performing all the selected physical fitness tests with respect to gender, age, and body mass index (pre-test). Based on the findings, most of the female participants (17.47 ± 15.16) performed higher in the hexagonal test compared to males (13.32 ± 7.91), but both yielded a "good" rating (13-17s); male participants (53.31 ± 14.15) performed better in the plank test compared to females (46.54 ± 14.74), but both yielded a "very good rating" (40-50s); female participants (24.01 ± 7.76) performed better in the hand-wall test compared to males (22.52 ± 8.44), but both yielded an "average" rating (20-29 catches/30s); female participants (54.35 ± 17.50) performed better in the stork-balance test compare to males (52.35 ± 33.45), but both yielded a "good" rating (40-50s); lastly, male participants performed better in the vertical-jump test compared to females, which yielded a "very good" (61-70cm) and "average" (31-40cm) rating, respectively. Additionally, 20-years old participants performed better in the hexagonal tests (17.06 ± 19.15), followed by those who are 19- (16.61 ± 9.63) and 21-years old (14.89 ± 10.43) respectively, but yielded a "good" rating across age groups (13-17s); 19-years old participants performed better in the plank test (14.89 ± 10.43), followed by those 21- (49.30 ± 15.75) and 20-years old (46.77 ± 14.27), but yielded a "very good" rating across age groups (40-50s); 20-years old participants performed better in the hand-wall test (24.58 ± 7.15), followed by those 21- (24.28 ± 9.57) and 19-years old (21.42 ± 6.19), but yielded an "average" rating across age groups (20-29 catches/30s); lastly, 21-years old participants performed better in the stork-balance test (57.26 ± 32.99), followed by those 20- (56.82 ± 10.02) and 19-years old (45.73 ± 17.52), and yielded an "excellent" (>50/s) and "good" (40-50/s) ratings respectively. Finally, participants who are underweight performed better in the hexagonal test (14.08 ± 8.62), followed by those who are normal (15.61 ± 14.60) and overweight (20.69 ± 13.71), and yielded a "good" (13-17/s) and "fair" (18-22/s) rating respectively; overweight participants performed better in the plank test (51.41 ± 10.17), followed by those who are normal (48.70 ± 15.41) and underweight (47.48 ± 16.45), but all yielded a "very good" rating (40-50/s); normal participants performed better in the hand-wall test (24.81 ± 6.31), followed by those who are overweight (24.75 ± 12.62) and underweight (19.44 ± 7.11), and yielded an "average" (20-29 catches/30s) and "fair" (15-19 catches/30s) rating respectively; lastly, overweight participants performed better in the stork-balance test (60.37 ± 47.40), followed by those who are underweight (57.75 ± 10.48) and normal (50.24 ± 18.46), and yielded an "excellent" (>50/s) rating across groups.

Table 4. Contingency Table on gender, age, and Body Mass Index (BMI)

	Body Mass Index Classification		
	Underweight/UW (%)	Normal/N (%)	Overweight/OW (%)
Gender			
Male	2(11.77%)	10(58.82%)	5(29.41%)
Female	10(30.30%)	20(60.60%)	3(9.1%)
Age			
19 years old	5(33.33%)	7(46.67%)	3(20.0%)
20 years old	4(26.66%)	10(66.67%)	1(6.67%)
21 years old	3(15.0%)	13(65.0%)	4(20.0%)

Table 7 lists gender-specific physical fitness test results. The Independent Samples T-test showed that both genders performed similarly on the hexagonal [t(47.966) = -1.274, p = 0.209], plank [t(33.636) = 1.581, p = 0.123], hand-wall [t(30.094) = -0.607, p = 0.548], and stork-balance [t(20.622) = -0.230, p = 0.820]. Males performed better in the vertical jump test (69.99 ± 27.50 vs. 38.21 ± 17.78) [t(48) = 4.946, p < 0.05].

The results of a one-way ANOVA comparing the participants' ages to their scores on a variety of fitness tests are shown in Table 8. Based on the findings, no significant difference was observed in between groups after performing hexagonal (F(46.761, 8498.678) = 0.129, p = 0.879),

Table 5. Results of selected physical fitness tests

Participant	Selected Physical Fitness Test (PFT)									
	Hexagonal (s)		Plank test (s)		Hand-wall (catches/30s)		Stork-balance (s)		Vertical-jump (cm)	
	s	Rate	s	Rate	Catches	Rate	s	Rate	cm	Rate
F	7.80	E	22.00	A	16	F	50.00	E	40.64	AA
F	8.55	E	30.42	G	28	A	64.00	E	30.00	BA
F	26.00	P	60.00	E	21	A	55.00	E	30.48	BA
F	7.00	E	42.00	VG	27	A	32.00	A	45.72	AA
F	32.00	P	65.00	E	12	P	50.00	E	81.00	E
F	8.90	E	40.00	VG	20	A	20.00	F	24.00	BA
M	10.00	E	60.00	E	20	A	20.00	F	120.00	E
M	5.18	E	60.00	E	20	A	55.00	E	50.00	A
M	12.00	E	60.00	E	32	G	60.00	E	85.00	E
F	36.00	P	60.00	E	30	G	10.00	P	24.25	BA
F	7.30	E	34.00	G	28	A	50.00	E	40.64	A
F	20.00	F	60.00	E	30	G	50.00	E	45.72	AA
F	12.40	G	30.00	G	20	A	40.00	G	31.00	A
F	7.19	E	21.57	A	30	G	50.98	E	34.00	A
F	6.68	E	65.00	E	21	A	71.00	E	27.00	BA
F	7.00	E	60.00	E	20	A	50.00	E	27.00	BA
F	6.69	E	60.00	E	7	P	60.00	E	26.70	BA
F	65.00	P	49.98	VG	23	A	65.00	E	32.00	A
F	12.40	G	35.36	G	21	A	75.00	E	115.40	E
F	61.20	P	50.58	VG	22	A	70.30	E	32.00	A
F	11.00	E	60.00	E	35	E	60.00	E	31.75	A
M	4.64	E	45.00	VG	35	E	50.00	E	50.00	A
F	7.52	E	27.00	A	31	G	50.00	E	36.00	A
F	16.50	G	43.00	VG	24	A	50.00	E	43.18	AA
F	10.50	G	60.00	E	22	A	60.00	E	28.00	BA
F	21.00	F	30.00	G	13	P	60.00	E	33.02	A
F	11.70	E	60.00	E	21	A	60.00	E	29.00	BA
F	22.00	F	70.00	E	15	F	64.00	E	42.00	AA
F	19.00	F	52.00	VG	19	F	45.00	G	36.00	A
M	22.00	F	43.00	VG	27	A	41.00	G	43.18	A
F	11.00	E	51.88	VG	33	G	67.20	E	32.00	A
F	11.72	E	42.00	VG	30	G	54.00	G	43.18	AA
F	6.68	E	22.00	A	23	A	26.00	A	30.00	BA
F	45.00	P	40.00	VG	47	E	90.00	E	32.00	A
F	5.65	E	60.00	E	20	A	96.00	E	24.00	BA
F	5.00	E	60.00	E	30	G	50.00	E	58.42	VG
F	26.00	P	27.00	A	33	G	38.00	A	43.00	AA
M	15.00	G	52.00	VG	27	A	17.00	F	50.80	A
F	14.29	G	45.00	VG	21	A	60.00	E	32.00	A
M	20.00	F	39.00	G	20	A	39.00	A	58.42	AA
M	5.77	E	33.00	G	21	A	60.00	E	55.88	AA
M	7.00	E	60.00	E	30	G	2.00	P	71.12	E
M	7.00	E	60.00	E	10	P	60.00	E	71.12	E
M	32.00	P	55.00	VG	18	F	60.00	E	55.88	AA
M	22.00	F	60.00	E	18	F	60.00	E	101.60	E
M	21.90	F	60.00	E	12	P	60.00	E	129.54	E
M	15.40	G	36.31	G	7	P	160.00	E	44.00	A
M	12.75	G	90.00	E	32	G	26.00	A	50.80	A
M	8.00	E	60.00	E	20	A	60.00	E	50.80	A
M	5.80	E	33.00	G	34	G	60.00	E	101.60	E

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.

Table 6. Contingency Table for gender, age and Body Mass Index (BMI) on selected physical fitness tests

Variables	HT (s)		PT (s)		HWT (s)		SBT (s)		VJT (cm)	
	M ± SD	R	M ± SD	R	M ± SD	R	M ± SD	R	M ± SD	R
Gender										
Male	13.32 ± 7.91	G	53.31 ± 14.15	VG	22.52 ± 8.44	A	52.35 ± 33.45	G	69.99 ± 27.50	VG
Female	17.47 ± 15.16	G	46.54 ± 14.74	VG	24.01 ± 7.76	A	54.35 ± 17.50	G	38.21 ± 17.78	A
Age										
19 years old	16.61 ± 9.63	G	50.29 ± 14.66	VG	21.42 ± 6.19	A	45.73 ± 17.52	G	-	-
20 years old	17.06 ± 19.15	G	46.77 ± 14.27	VG	24.58 ± 7.15	A	56.82 ± 10.02	E	-	-
21 years old	14.89 ± 10.43	G	49.30 ± 15.75	VG	24.28 ± 9.57	A	57.26 ± 32.99	E	-	-
Body Mass Index (Pre-test)										
Underweight	14.08 ± 8.62	G	47.48 ± 16.45	VG	19.44 ± 7.11	F	57.75 ± 10.48	E	-	-
Normal	15.61 ± 14.60	G	48.70 ± 15.41	VG	24.81 ± 6.31	A	50.24 ± 18.46	E	-	-
Overweight	20.69 ± 13.71	F	51.41 ± 10.17	VG	24.75 ± 12.62	A	60.37 ± 47.40	E	-	-

Table 7. Independent Samples T-test measuring the difference in performance of various physical fitness test with respect to gender

Variables	N	M ± SD	SE	df	t-test	Sig.	Decision
Hexagonal (s)							
Male	17	13.32 ± 7.91	1.91	47.966	-1.274	0.209	Not significant
Female	33	14.47 ± 15.15	2.63				
Plank (s)							
Male	17	53.31 ± 14.15	3.43	33.636	1.581	0.123	Not significant
Female	33	46.54 ± 14.74	2.57				
Hand-wall (catches/30s)							
Male	17	22.53 ± 8.44	2.05	30.094	-0.607	0.548	Not significant
Female	33	24.01 ± 7.76	1.35				
Stork-balance (s)							
Male	17	52.35 ± 33.45	8.11	20.622	-0.230	0.820	Not significant
Female	33	54.34 ± 17.49	3.05				
Vertical jump (cm)							
Male	17	69.99 ± 27.50	6.67	48	4.946	0.000	Significant
Female	33	38.21 ± 17.78	3.10				

Table 8. One-way ANOVA test measuring the difference in performance of various physical fitness test with respect to age

Variable		Sum of Squares	df	Mean Square	F	Sig.
Hexagonal (s)	Between Groups	46.761	2	23.381	0.129	0.879
	Within Groups	8498.678	47	180.823		
	Total	8545.439	49			
Plank test (s)	Between Groups	100.671	2	50.336	0.224	0.800
	Within Groups	10569.539	47	224.884		
	Total	10670.210	49			
Hand-wall (catches/30s)	Between Groups	94.554	2	47.277	0.742	0.482
	Within Groups	2995.360	47	63.731		
	Total	3089.914	49			
Stork-balance (s)	Between Groups	1351.334	2	675.667	1.203	0.309
	Within Groups	26389.259	47	561.474		
	Total	27740.592	49			
Vertical-jump (cm)	Between Groups	2455.867	2	1227.933	1.856	0.168
	Within Groups	31088.420	47	661.456		
	Total	33544.287	49			

Table 9. One-way ANOVA test measuring the difference in performance of various physical fitness test with respect to Body Mass Index (pre-test)

Variable		Sum of Squares	df	Mean Square	F	Sig.
Hexagonal (s)	Between Groups	224.838	2	112.419	0.635	0.534
	Within Groups	8320.601	47	177.034		
	Total	8545.439	49			
Plank test (s)	Between Groups	75.719	2	37.860	0.168	0.846
	Within Groups	10594.491	47	225.415		
	Total	10670.210	49			
Hand-wall (catches/30s)	Between Groups	261.669	2	130.834	2.174	0.125
	Within Groups	2828.245	47	60.175		
	Total	3089.914	49			
Stork-balance (s)	Between Groups	910.442	2	455.221	0.797	0.456
	Within Groups	26830.150	47	570.854		
	Total	27740.592	49			
Vertical (cm)	Between Groups	380.722	2	190.361	0.270	0.765
	Within Groups	33163.565	47	705.608		
	Total	33544.287	49			

Table 10. One-way ANOVA test measuring the difference in performance of various physical fitness test with respect to Body Mass Index (post-test)

Variable		Sum of Squares	df	Mean Square	F	Sig.
Hexagonal (s)	Between Groups	6727.395	41	164.083	0.722	0.768
	Within Groups	1818.044	8	227.256		
	Total	8545.439	49			
Plank test (s)	Between Groups	8579.136	41	209.247	0.801	0.704
	Within Groups	2091.074	8	261.384		
	Total	10670.210	49			
Hand-wall (catches/30s)	Between Groups	2887.580	41	70.429	2.785	0.064
	Within Groups	202.333	8	25.292		
	Total	3089.914	49			
Stork-balance (s)	Between Groups	25685.439	41	626.474	2.439	0.092
	Within Groups	2055.153	8	256.894		
	Total	27740.592	49			
Vertical (cm)	Between Groups	31112.432	41	758.840	2.496	0.086
	Within Groups	2431.855	8	303.982		
	Total	33544.287	49			

plank ($F(100.671, 10569.539) = 0.224$, $p = 0.800$), hand-wall ($F(94.554, 2995.360) = 0.742$, $p = 0.482$), stork-balance ($F(1351.334, 26389.259) = 1.203$, $p = 0.309$), and vertical-jump ($F(2455.867, 31088.420) = 1.856$, $p = 0.168$) tests.

The results of a one-way ANOVA comparing the participants' Body Max Index (pre-test) to their scores on a variety of fitness tests are shown in Table 9. Based on the findings, no significant difference was observed in between groups after performing hexagonal ($F(224.838, 8320.601) = 0.635$, $p = 0.534$), plank ($F(75.719, 10594.491) = 0.168$, $p = 0.846$), hand-wall ($F(261.669, 2828.245) = 2.174$, $p = 0.125$), stork-balance ($F(910.442, 26830.150) = 0.797$, $p = 0.456$), and vertical-jump ($F(380.722, 33163.565) = 0.270$, $p = 0.765$) tests.

The results of a one-way ANOVA comparing the participants' Body Max Index (post-test) to their scores on a variety of fitness tests are shown in Table 10. Based on the findings, no significant difference was observed in between groups after performing hexagonal ($F(6727.395, 1818.044) = 0.722$, $p = 0.768$), plank ($F(8579.136, 2091.074) = 0.801$, $p = 0.704$), hand-wall ($F(2887.580, 202.333) = 2.785$, $p = 0.064$), stork-balance ($F(25685.439, 2055.153) = 2.439$, $p = 0.092$), and vertical-jump ($F(31112.432, 2431.855) = 2.496$, $p = 0.086$) tests.

The comparison of the participants' post-test scores to their pre-test scores is presented in Table 11. It is possible to deduce, on the basis of the findings, why there was a shift in the pre-test scores of the participants after they had been putting themselves through the selected physical fitness tests for a period of five (5) weeks.

As can be shown in Table 11, there was a statistically significant difference between the scores obtained on the pre-test (20.85 ± 3.77) and the scores obtained on the post-test (20.45 ± 3.53); $t(49) = 4.233$, $p < 0.05$. In light of the findings,

Table 11. Body Mass Index (BMI)-based pre- and post-test scores of participants after completing a series of physical fitness tests

Post-test						Pre-test					
Participants	BMI	Class	Participants	BMI	Class	Participants	BMI	Class	Participants	BMI	Class
1	17.52	UW	26	16.99	UW	1	18.02	UW	26	17.02	UW
2	18.35	UW	27	18.90	N	2	18.37	UW	27	18.50	N
3	22.92	N	28	17.24	UW	3	23.05	N	28	18.01	UW
4	18.65	N	29	18.59	N	4	19.05	N	29	18.00	N
5	17.76	UW	30	15.17	UW	5	18.02	UW	30	16.22	UW
6	20.50	N	31	28.01	O	6	21.20	N	31	27.59	O
7	23.15	N	32	20.20	N	7	23.45	N	32	19.50	N
8	26.44	O	33	18.15	N	8	25.02	O	33	18.30	N
9	23.79	N	34	20.80	N	9	22.25	N	34	19.50	N
10	29.03	O	35	29.10	O	10	28.06	O	35	28.35	O
11	19.23	N	36	18.75	N	11	18.06	N	36	18.00	N
12	29.45	O	37	21.62	N	12	29.25	O	37	21.33	N
13	19.20	N	38	17.36	UW	13	18.50	N	38	17.30	UW
14	18.75	N	39	26.96	O	14	18.25	N	39	26.00	O
15	17.24	UW	40	24.80	N	15	16.45	UW	40	23.25	N
16	22.00	N	41	23.41	N	16	21.75	N	41	23.30	N
17	17.92	UW	42	14.76	UW	17	17.05	UW	42	15.15	UW
18	19.80	N	43	22.08	N	18	19.00	N	43	21.20	N
19	17.33	UW	44	25.36	O	19	16.55	UW	44	25.20	O
20	19.50	N	45	18.52	N	20	18.50	N	45	18.60	N
21	21.19	N	46	24.80	N	21	20.20	N	46	23.50	N
22	20.90	N	47	16.14	UW	22	19.50	N	47	16.85	UW
23	18.50	N	48	26.80	O	23	17.25	UW	48	25.58	O
24	18.59	N	49	20.80	N	24	18.01	UW	49	21.25	N
25	17.52	UW	50	18.50	N	25	18.02	UW	50	18.70	N

Class: UW-Underweight, N-Normal, O-Obese

Table 12. Pre-test versus post-test scores after performing the selected physical fitness tests

		Paired Differences				t	df	Sig.
		M ± SD	SE	95% Confidence Interval of the Difference				
				Lower	Upper			
1	Pre-test - post-test	0.41 ± 0.68	0.09642	0.21443	0.60197	4.233	49	0.000

one reasonable conclusion that can be drawn is that participation in the various physical fitness tests that were chosen may have contributed to an improvement or reduction in the Body Mass Index of the students.

Discussion

Except for the vertical jump, the results of the PFTs indicated no significant variations by gender, age, or body mass index (both before and after the test). Previous research publications have identified disparities in students' physical fitness assessments based on their gender, age, and body mass index (Busing & West, 2016; Devries & Jakobi, 2021). However, there was no significant difference in PFT performance between both genders or between the participants of different ages or body compositions. There was a statistically significant change between the participants' pre- and post-test scores on the specified physical fitness tests after they had taken the tests weekly for five (5) weeks. Students' body mass indexes likely improved because of the PFTs they were required to do, even though the course was delivered entirely online. These results corroborated those of previous studies that had shown that online fitness assessments were effective (Apriyanto & Adi, 2021; Xu et al., 2022) XI and XII sample using total sampling. There are 346 respondes. The data collection instrument used online learning questionnaire used google form. Data analysis used descriptive statistics. The study showed that, students

assessed physical education learning with online learning is very effective (8.3%). However, no previously published papers were found to have been conducted in conjunction with this current inquiry that prompted the selected PFTs in a technologically driven environment. In light of this issue, it is recommended that another research investigation with similar goals be conducted to determine whether or not the findings of this study can be accepted or repudiated.

PFT performance can also be impacted by a number of other factors, all of which must be taken into account. Studies have found that the eating habits of an individual are significantly linked to their BMI, which in turn may affect their performance (Grace et al., 2021; Gutiérrez-Pliego et al., 2016; M. Sun et al., 2020; Xie et al., 2020). The inverse is also true; a higher score of harmful patterns correlates with a higher BMI. There was also a strong connection between BMI and factors associated to individuals' dietary and physical activity habits. Numerous studies have linked a person's BMI to their personal habits including not getting enough exercise, smoking, and drinking too much (Günalan, 2020; Hossein Abbasi & Aghaamiri, 2020; Nejadsadeghi et al., 2018; Štefan et al., 2017). To determine whether or not there is a significant difference in the findings of the participants when taking into account such variables, an experimental study may be conducted with the inclusion of other aspects specified previously.

Conclusions

This analysis was conducted to evaluate the usefulness of the enumerated physical fitness tests in the context of a virtual environment. Participants were selected from a pool of undergraduates majoring in physical education at an esteemed college in Mabalacat City, Pampanga, Region III, Philippines. After five weeks of testing, results showed that the examined physical fitness assessments are useful for students of both genders between the ages of 19 and 21, regardless of body mass index. This study provides support for the idea that college physical education teachers might routinely employ the aforementioned assessments to determine their students' fitness levels. Using a pre- and post-test technique, we can determine which students are at risk and work with them to make positive changes that will have a positive impact on their health and well-being. It's possible that this method will only work if teachers implement a rigorous and meticulous monitoring plan. The compliance of students with the exams they are required to take should be the primary emphasis of this monitoring.

Limitations are incredibly important factors to keep in mind during the process, and the investigators of this experimental study hope to place special attention on these. At the outset, only those who are majoring in physical education at the Bachelor's level will be allowed to take part. This limits the generalizability of the study's results to other degrees or other forms of teacher education at the same institution. The results of this study strongly suggest that a comparable study be conducted with the involvement of students from other academic disciplines. It's also possible that other educational institutions all across the world may conduct the same tests to verify or disprove the initial findings. Finally, this study did not account for the participants' eating habits, lifestyle choices, or other measures of physical fitness. Consequently, it is strongly advised that similar tests be conducted while considering the aforementioned other variables. In conclusion, this study adds new information to the current body of knowledge about the effectiveness of the identified physical fitness tests in reducing and improving participants' Body Mass Index (BMI) within an online setting.

Acknowledgment

All of the students who volunteered their time and energy to this study are deeply appreciated by the researchers.

Conflict of interest

The authors have no competing interests to disclose.

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ВИВЧЕННЯ ЕФЕКТИВНОСТІ КОМПЛЕКСУ ТЕСТІВ ФІЗИЧНОЇ ПІДГОТОВЛЕНОСТІ ЗА ДОПОМОГОЮ ВІРТУАЛЬНОГО НАВЧАЛЬНОГО СЕРЕДОВИЩА

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Реферат. Стаття: 12 с., 12 табл., 42 джерел.

Історія питання. Згідно з результатами кількох досліджень, рівень фізичної підготовленості студентів можна оцінювати за допомогою онлайн-тестів фізичної підготовленості. Проте вивченню цього питання в умовах філіппінського закладу вищої освіти присвячено небагато статей.

Мета дослідження. У цьому експериментальному дослідженні вивчали вплив підгрупи тестів фізичної підготовленості (ТФП) на покращення ІМТ.

Матеріали та методи. Після п'яти тижнів виконання тестів фізичної підготовленості в цьому дослідженні використовували експериментальний план для порівняння результатів попереднього й підсумкового тестування з контролем статі, віку та ІМТ. Дані учасників збирали за допомогою опитувальника з двох частин. У першій частині учасники надавали дані про стать, вік та показник ІМТ до початку тестування. Другою частиною була анкета готовності до фізичної активності (PAR-Q). Для аналізу даних 5-тижневого експерименту використовували програмне забезпечення IBM SPSS версії 27. Описові статистичні підходи відображали демографічні показники та результати тестування фізичної підготовленості учасників (частота, відсоток, середнє значення та стандартне відхилення). До та після проведення відібраних ТФП, щоб визначити, чи впливають на результативність такі фактори, як стать, вік та індекс маси тіла, результативність студентів

досліджували з використанням однофакторного дисперсійного аналізу та t-критерію Стьюдента для незалежних вибірок. Після проведення тестів фізичної підготовленості, щоб побачити, чи відрізняються статистично значуще результати попереднього й підсумкового тестування, використовували t-критерій Стьюдента для парних вибірок.

Результати. Статистично значущої різниці в показниках результативності до та після проведення ТФП між різними віковими групами не спостерігалося. За винятком результатів тесту на стрибок угору, статистично значущої різниці між гендерними групами не спостерігалося. Чоловіки показали кращу результативність, ніж жінки. Зрештою, після п'яти тижнів виконання рекомендованих ТФП, результати підсумкового тестування були статистично значуще вищими за результати попереднього тестування.

Висновки. Вибрані ТФП виявилися корисними в дистанційному навчанні, особливо у філіппінському місцевому закладі освіти. Це дослідження підтверджує припущення про те, що за допомогою вищевикладених методів оцінювання викладачі фізичного виховання в коледжах можуть регулярно перевіряти рівень фізичної підготовленості своїх студентів.

Ключові слова: дистанційна освіта, ефективність, місцевий коледж, фізичне виховання, тести фізичної підготовленості.

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Cite this article as: Lobo, J., Prevandos, F.G., Bautista, C., De Dios, D.A., Dimalanta, G., & Gazali, N. (2023). Exploring the Efficiency of a Battery of Physical Fitness Tests via Virtual Learning Environment. *Physical Education Theory and Methodology, 23*(4), 487-498. https://doi.org/10.17309/tmfv.2023.4.01

Received: 21.02.2023. Accepted: 18.06.2023. Published: 30.08.2023