PHYSICAL EDUCATION OF STUDENTS

ORIGINAL ARTICLE

Remote versus onsite proctored exams: comparing students' results in physical fitness testing

Aiman A. Sarhan[ABCE], Faisal A. Barwais[ABCDE]

Department of Sport Sciences, Umm Al-Qura University, Makkah, Saudi Arabia

Authors' Contribution: A – Study design; B – Data collection; C – Statistical analysis; D – Manuscript Preparation; E – Funds Collection

Abstract

Background and Study Aim: Since the outbreak of COVID-19, distance learning has become a widespread practice in educational institutions worldwide, leading to the adoption of remote electronic examinations (e-exams) as a primary method of assessment. This study aimed to compare the outcomes of admission tests for the sport sciences department, contrasting traditional face-to-face onsite testing with online-based remote testing.

Material and Methods: A total of 500 students applied (n =177 distance learning students, n =323 onsite students). From the tests, differences in levels of physical fitness (long jump, sit-ups, burpees, and pull-ups/push-ups) were compared between the remote and the onsite participants.

Results: According to univariate analysis of variance (ANOVA), there was a significant difference in the level of physical fitness (long jump, sit-up, burpees, and pull-up/push-up tests) between the remote participants (154.01 ± 83.1 cm; 13.85 ± 8.21 reps/60 sec; 6.76 ± 6.52 reps/30 sec; 11.36 ± 8.0 pull-ups/push-ups, respectively) and the onsite participants (172.34 ± 27.0; 15.28 ± 4.01 reps/60 sec; 27.29 ± 6.61 reps/30 sec; 14.76 ± 9.47 pull-ups/push-ups, respectively).

Conclusions: The results of the present study indicate that the outcomes of physical fitness tests were significantly higher among onsite participants compared to remote participants. Despite the successful implementation of admission test procedures in the distance sport sciences department, the findings suggest a preference for physical fitness tests among onsite participants due to various factors, including 1) increased motivation, 2) model friction, and 3) competitive atmosphere.

Keywords: coronavirus, physical education admission tests, physical fitness tests, remote electronic examinations, traditional onsite face-to-face tests.

Introduction

Since COVID-19 struck the world in 2019, all aspects of life have changed significantly [1]. To prevent the spread of the disease, people were forced to adopt social distancing policies, since human-to-human contact was the fastest way to spread the virus [2]. Most countries had to go into full lockdown to prevent further outbreaks, which led to the idea of virtual workplaces and online schooling. In Saudi Arabia, the level of readiness to implement and use distance learning platforms was exceptional. For some majors, however, the transition to distance learning was a struggle, since they relied heavily on practice, especially at the higher educational level [3]. Physical education is just one example of those subjects that were struggling to adapt to the new schooling environment [2,3].

In physical education, many classes involve participation in indoor and outdoor physical activities and laboratory activities as well as interaction in individual and group sports [4]. Although one study reported that the level of readiness of physical education and sports students for online learning was high, it also showed there to be low levels of motivation among such students [5,6,7]. In addition, e-learning contributed to massively reducing the physical activity and fitness levels of physical education and sport science students [5] (i.e., college students already enrolled in sport sciences). This means that students from other majors were probably at lower levels of fitness, making it harder for them to be accepted into study physical education and sport science courses during the pandemic era.

The challenges of getting accepted to study sport sciences at a Saudi university can be overwhelming due to the low number of seats available in these departments and the intensity of the admission tests. Thus, most students find themselves forced to gain admission to other majors before they subsequently try to make the transition to the sport sciences department; nevertheless; they have to go through the same admission testing system. Following the transition to fully online learning during the pandemic, the entire admission examination process had to be conducted virtually, arguably making it easier for participants to attempt. Therefore, this study aims to compare the results of tests for admission to the sport sciences department at university between traditional onsite testing and remote testing.

doi:10.15561/20755279.2023.0605

Materials and Methods

Participants

The data of 500 applicants (all males) were used in this study to compare traditional onsite admission tests (n = 323) with new remote tests (n = 177). These applicants had applied to transfer in Fall 2019 and Winter 2020 for the onsite tests and Winter 2021 for the online tests. The admission process for Fall 2020 was omitted because there was no onsite testing during that semester. All applicants were students who had already enrolled and been studying for at least one semester at the university in a different major.

Research Design

The traditional attendance admission test. The sport sciences admission test at UQU consists of several stages. Before the test, applicants receive general information via email about the test procedure and what they should do before arriving to conduct it. They have to undergo a standard medical examination at their local medical center, which is necessary to gain medical clearance and to rule out any students with cardiorespiratory abnormalities as well as those with vision or hearing difficulties.

For this study, on the day of the test, applicants had to arrive early so they could be divided into groups of ten, with each one given a test scoring sheet with a serial number on it. In groups, they had to move from one test station to another (Figure 1). Each group was assigned an instructor, and a senior student on the sport sciences course, and all stations were supervised by a sport sciences faculty member.

For each applicant, wearing minimal clothing, the process began at the physical testing station. There, the applicant's height and weight measurements were taken, after which their body was evaluated by a committee for any musculoskeletal abnormalities. The applicant then moved on to the interview station, where they answered committee members' questions to evaluate their hearing and speaking as well as to gain information about their athletic background. After that, the applicant moved to each of the four fitness testing stations.

These fitness stations were designed to test the applicants' lower extremity power, core muscle strength, agility and coordination, and upper-body strength and endurance. First, the standing long jump station had been prepared with a starting line and a scale on the ground. Applicants were told to stand behind the starting line and swing their arms back and forth to generate momentum to get the best results. Two attempts were conducted, with the best result recorded. Second, the sit-up exercise was done in groups. Lying down on the ground with their knees half bent and their hands behind their heads, applicants were asked to perform as many sit-ups as possible in one minute, with a complete sit-up recorded when the body was vertical with the ground. The sport sciences students helped by holding the applicants' feet and counting for them. The completed number of sit-ups was recorded on the scoresheet.

Third, the burpee exercise was conducted in groups, with the sport sciences students counting for the applicants. A successful burpee would start with the applicant standing in an upright position. They would lower their hands to a supported squat position, kick the legs backward to a push-up position, and perform a push-up, then pull the legs back to a supported squat position, stand, and jump quickly, landing at the starting position [8]. The applicants had to complete as many burpees as they could in one minute, and the number of successful burpees was recorded. Finally, the pull-up exercise was carried out under the supervision of an expert faculty member to ensure each applicant's safety. The applicants had to perform as many pull-ups as they could with no time limit. Before starting, each applicant was helped by the instructor onto the horizontal bar, if needed. A successful pull-up was when the chin was raised above the bar, and the number of successful pull-ups was recorded. All scoring and medical sheets were collected.

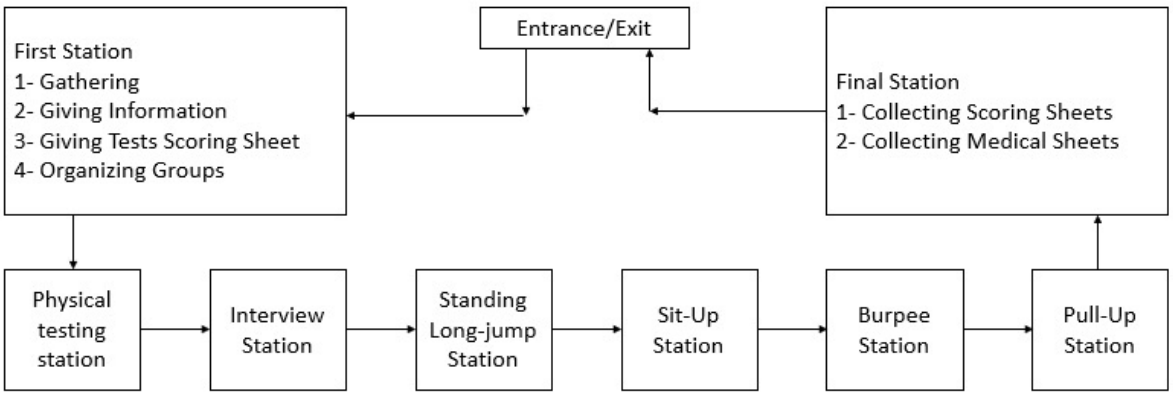

Figure 1. The explanation of attendance admission test stations.

The online remote admission test. The process of online testing also consisted of several phases. It was initiated when the applicants received an email containing very specific instructions about the test process and how to perform and record all the fitness tests. The instructions included pictures and video clips for each test. To be accepted into the sport sciences department, the applicants had to read the conditions for the actual test, which stated that they must have medical clearance, be 165 cm high or taller, and pass the fitness and physical tests. Applicants with cardiorespiratory, hearing, or vision difficulties were ruled out immediately.

The next stage was to record the fitness tests. First, each applicant had to show their ID to the camera while introducing themself. They then had to stand in front of the camera wearing only shorts and turn around slowly to allow the committee to examine their body. Apart from the pull-up test, the overall fitness testing process was the same as that which the physical applicants performed. The standing long jump was carried out next to a measuring tape, and the results were recorded; sit-ups were performed for 1 minute, as was the burpee test. The pull-up test was replaced by a timeless push-up test to measure upper-body strength and endurance. All videos and medical examination sheets were uploaded to the sport sciences department website and reviewed by the admission committee.

Although the pull-up and the push-up tests measured upper body muscles, they were incomparable, since they measured different muscle groups.

Statistical analysis

All statistical analyses were performed using SPSS Statistics for Windows, Version 26.0 statistical software (IBM SPSS Inc., Chicago, IL), and statistical significance was set at $p < 0.05$. Descriptive statistics are expressed as means and standard deviations (95% confidence intervals). T-tests for independent samples were used to investigate any significant difference between the remote and the onsite participants for all demographic characteristics. Differences in physical fitness testing levels between the participant groups were determined using one-way univariate analysis of variance (ANOVA). The effect sizes for mean differences were expressed as Cohen's d (difference in means divided by the standard deviation of the difference) and interpreted as small, moderate, or large, based on values of 0.2, 0.5, and 0.8, respectively [9].

Results

The participant characteristics are shown in Table 1. Of the 500 applicants, 177 were remote and 323 were onsite. Their ages ranged from 20 to 23 years (mean 21.83 years). Their BMI ranged from 14.5 to 41.10 kg/m^2 (mean BMI ± SD, 21.83 ± 4.1 kg/m^2), and based on their BMI categorization, 99 applicants (19.8%) were found to be underweight, 306 (61.2%) to be normal weight, 75 (15.0%) to be overweight, and 20 (4.0%) to be obese.

Table 2 shows the differences in physical fitness testing levels between the remote and the onsite participants. ANOVA was used to determine whether there were significant differences in physical fitness levels between the two groups. The results indicate that there was a significant difference in the standing long jump test between the remote (154.01 ± 83.1 cm) and the onsite (172.34 ± 27.0) participants (F [1498] = 13.26; p <0.001). For the sit-up test, a significant difference was found between the remote (13.85 ± 8.21 reps/60 sec) and the onsite (15.28 ± 4.01 reps/60 sec) participants (F [1498] = 6.82; p <0.001). For the burpee test, there was found to be a significant difference between the remote (6.76 ± 6.52 reps/30 sec) and the onsite (27.29 ± 6.61 reps/30 sec) participants (F [1498] = 112.3; p <0.001). Likewise, there were found to be significant differences in the pull-up and push-up

Table 1. Participants' demographic characteristics (n = 500)

Variables	Remote (n = 177)	Face to face (n = 323)	Overall (n = 500)	*F*	*p*-value
Age (years)	21.47 ± 1.1	22.02 ± 1.3	21.83 ± 1.3	13.76	$p < 0.05$
Height (cm)	172.38 ± 6.0	171.27 ± 6.1	171.66 ± 6.2	.103	$p < .743$
Weight (kg)	65.40 ± 13.3	63.88 ± 12.8	64.43 ± 13.0	.827	$p < .364$
BMI (kg·m^{-2})	22.01 ± 4.3	21.75 ± 4.0	21.83 ± 4.1	.861	$p < .354$
Body mass index category *n* (%)					
Underweight	39 (22.0%)	60 (18.6%)	99 (19.8%)		
Normal weight	102 (57.6%)	204 (63.2%)	306 (61.2%)		
Overweight	29 (16.4%)	46 (14.2%)	75 (15.0%)		
Obese	7 (4.0%)	13 (4.0%)	20 (4.0%)		

*Mean ± SD. World Health Organization's (WHO) classification system is; underweight (≤18.5 kg/m^2), normal (≥18.5–24.9 kg/m^2), overweight (≥25–29.9 kg/m^2), and obese (≥30 kg/m^2) [10]

Table 2. Differences in physical fitness testing levels between remote and face-to-face participants (n = 500).

Men	Remote (n = 177)	Face to face (n = 323)	F	p-value	Cohen's d
Standing long jump (cm)	154.01 ± 83.1	172.34 ± 27.0	13.26	$p < 0.001$	$d = 2.60$
Sit-up (reps/60 sec)	13.85 ± 8.21	15.28 ± 4.01	6.82	$p < 0.001$	$d = 0.19$
Burpee (reps/30 sec)	6.76 ± 6.52	27.29 ± 6.61	112.3	$p < 0.001$	$d = 2.41$
Pull-up and Push-up (number)	11.36 ± 8.0	14.76 ± 9.47	16.39	$p < 0.001$	$d = 0.65$

A Cohen's d value of 0.8 or greater indicates a large effect size

tests between the remote (11.36 ± 8.0 numbers) and onsite (14.76 ± 9.47 numbers) participants (F [1498] = 16.39; p <0.001).

Large effect sizes were observed for differences in the standing long jump and burpee tests (d = 2.60 and d = 2.41, respectively). A moderate effect size was observed (d = 0.65) for differences between the remote and the onsite participants in the pull-up and push-up tests. However, small effect sizes were observed for differences in the sit-up test between the two groups (d = 0.19) (Table 2).

Discussion

E-exams have profoundly changed educational history and continue to be used in universities around the globe [11]. Before the COVID-19 pandemic, many educational institutions in Saudi Arabia had been using electronic tests as a kind of assessment-based on-campus e-exams. As a result, since the pandemic, it has become extremely difficult for educational institutions and faculties to organize exams and ensure that students can advance in their studies [12]. This study aimed to compare the results of tests for admission to the sport sciences department at UQU between traditional onsite face-to-face testing and online-based remote testing.

The results of the current study revealed that applicants with normal weight made up 61.2% of the sample (n = 306) and that the number of underweight applicants (n = 99, 19.8%) was higher than that of overweight (n = 75, 15.0%) and obese applicants (n = 20, 4.0%). This is consistent with the types of students who apply to a sport sciences department and meet the requirements disclosed to them.

This finding provides support for the hypothesis that motivation greatly influences an individual's performance in situations where one is physically capable of performing a task but is uncertain about one's capabilities and needs more personal motivation to achieve the best performance [13]. According to our results, there were significant differences in the participants' physical fitness levels (long jump, sit-up, burpee, and pull-up/push-up) between the remote and the onsite participants (p <0.001). Unexpectedly, although the remote participants had the opportunity to attempt a test more than once and then submit their best attempt, the onsite students had better results. This is consistent with earlier research that showed the impact of extrinsic incentives on physical fitness tests. Researchers have used a variety of motivational techniques by manipulating the environment (e.g., competition among individuals and groups, the presence of an audience, punishment, and reward systems, group affiliation, and social responsibility). For instance, Dea Karaba et al. [14] evaluated 30 young male medical students using the Wingate anaerobic test. Verbal encouragement was offered to all individuals throughout the test as a motivational component. Anaerobic power, relative anaerobic power, the slope of the power, and relative anaerobic capacity were tested in all individuals, and changes in the parameters when the test was conducted with and without verbal encouragement were recorded. When the Wingate test was administered with verbal encouragement, the findings demonstrated a statistically significant rise in the test parameter showing that conventional encouragement and feedback during the test could affect its outcome.

The COVID-19 pandemic had a significant impact on evaluations in many educational programs [15]. Proctoring in an online assessment environment can be difficult and time-consuming. The need to ensure safe, academically important online exams is more significant than ever [16]. Although they are widely used in online courses and formative assessments, they have yet to be utilized in physical fitness evaluations. Most research has focused on the potential benefits of using remote exams to protect academic integrity and test-taker behavior as well as how to combat inappropriate behavior [17]. In contrast, some studies have investigated usability and user reactions to remote exams, focusing on potential implementation issues and possible technical difficulties [18]. The literature compares proctored to traditional onsite face-to-face test outcomes in terms of evaluation research and investigating the impact of remote exams on students' results [19]. According to some studies, cheating is more likely to take place online than

face-to-face exams, and the outcomes are better [20]. Surprisingly, this study found that physical fitness levels (long jump, sit-up, burpee, pull-up/push-up) in onsite exams were significantly higher than those in remote exams. Despite the success of the admission test steps in the distance sport sciences department, the findings of this study confirm that physical fitness tests are preferred by face-to-face participants for various reasons, which include 1) motivation, 2) model friction, and 3) the general atmosphere of competition.

Lastly, it is a limitation of this study that anxiety was not measured in the students who participated remotely. Anxiety can influence physical outcomes. In addition, technical issues, such as using a mobile phone to film the physical fitness tests and then sending the link to the sport sciences department, were not addressed in this study. It is possible that the students sent more than one test attempt and that a technical error was attempted with a minor result received by the admission committee.

Conclusions

Due to the COVID-19 pandemic, physical fitness tests (long jump, sit-ups, burpees, pull-ups/push-ups) had to be conducted remotely. Comparing the test results for remote and onsite participants, there were significant differences in participants' fitness levels (long jumps, sit-ups, burpees, pull-ups/push-ups).

Acknowledgement

We want to thank Professor Hesham S .Abd Alfatah for his guidance and comments, as well as feedback.

References

1. Fehr AR, Perlman S. Coronaviruses: an overview of their replication and pathogenesis *Coronaviruses* 2015; 1–23. https://doi.org/10.1007/978-1-4939-2438-7_1
2. Yu J, Jee Y. Analysis of online classes in physical education during the COVID-19 pandemic. *Educ Sci*. 2020; 11(1):3. https://doi.org/10.3390/educsci11010003
3. Domokos C, Domokos M, Mirică SN, Negrea C, Bota E, Nagel A. Being a student at the faculty of sports and physical education in COVID-19 pandemic times – A moment in life. *Timisoara Physical Education & Rehabilitation Journal*. 2020; 13(24): 45-50. https://doi.org/10.2478/tperj-2020-0007
4. Erdugan F. Investigating readiness levels of sports science faculty students towards e-learning. *Afr Educ Res J*. 2020; 8(2):272–279. https://doi.org/10.30918/AERJ.82.20.070
5. Öncen S, Tanyeri L. Evaluation of the physical activity levels of the students in a physical education and sports science department before and during the coronavirus pandemic. *Int Educ Stud*. 2020; 13(10):148–156. https://doi.org/10.5539/ies.v13n10p148
6. Barwais FA. Physical activity at home during the COVID-19 pandemic in the two Most-affected cities in Saudi Arabia. *Open Public Health J*. 2020;13(1):470–476. https://doi.org/10.2174/1874944502013010470
7. Barwais FA. Assessing physical activity and sedentary time during the COVID-19 pandemic using self-reported measurement. *Natl. J. Physiol. Pharm. Pharmacol*. 2020;10(11):1019–1024. https://doi.org/10.5455/njppp.2020.10.09241202001102020
8. Podstawski R, Kasietczuk B, Boraczyński T, Boraczyński M, Choszcz D. Relationship between BMI and endurance-strength abilities assessed by the 3 minute burpee test. *Int J Sports Sci*. 2013; 3(1):28–35. https://doi.org/10.5923/j.sports.20130301.06
9. Cohen J. *Statistical power analysis for the behavioral sciences*. 2nd ed. Hillsdale, NJ: Lawrence Erlbaum; 1988.
10. WHO. *Obesity: preventing and managing the global epidemic*. World Health Organization technical report series. 2000 (894). https://doi.org/10.1017/S0021932003245508
11. Fluck AE. An international review of eExam technologies and impact. *Comput Educ*. 2019; 132:1–15. https://doi.org/10.1016/j.compedu.2018.12.008
12. 12. Birch E, De Wolf M. A novel approach to medical school examinations during the COVID-19 pandemic. *Med Educ Online*. 2020; 25(1):1785680. https://doi.org/10.1080/10872981.2020.1785680
13. Kondric M, Sindik J, Furjan-Mandic G, Schiefler B. Participation motivation and student's physical activity among sport students in three countries. *J Sports Sci Med*. 2013; 12(1):10.
14. Karaba-Jakovljević D, Popadić-Gaćeša J, Grujić N, Barak O, Drapšin M. Motivation and motoric tests in sports. *Med Pregl*. 2007; 60(5–6):231–236. https://doi.org/10.2298/MPNS0706231K
15. Sahu P. Closure of universities due to coronavirus disease 2019 (COVID-19): Impact on education and mental health of students and academic staff. *Cureus*. 2020; 12(4). https://doi.org/10.7759/cureus.7541
16. Andreou V, Peters S, Eggermont J, Wens J, Schoenmakers B. Remote versus on-site proctored exam: Comparing student results in a cross-sectional study. *BMC Med Educ*. 2021; 21(1):1–9. https://doi.org/10.1186/s12909-021-03068-x
17. Dunn T, Meine M, McCarley J. The remote proctor: An innovative technological solution for online. *International Journal of Technology, Knowledge and Society*. 2010; 6(1):1832–3669. https://doi.org/10.18848/1832-3669/CGP/v06i01/56033
18. Chen V, Sandford A, LaGrone M, Charbonneau K, Kong J, Ragavaloo S. An exploration of instructors' and students' perspectives on remote delivery of courses during the COVID-19 pandemic. *Br J Educ Technol*. 2022; 53(3):512–533. https://doi.org/10.1111/bjet.13205

19. Gudiño Paredes S, Jasso Peña FdJ, De La Fuente Alcazar JM. Remote proctored exams: Integrity assurance in online education? *Distance Educ*. 2021; 42(2):200–218. https://doi.org/10.1080/01587919.2021.1910495

20. Jaap A, Dewar A, Duncan C, Fairhurst K, Hope D, Kluth D. Effect of remote online exam delivery on student experience and performance in applied knowledge tests. *BMC Med Educ*. 2021; 21(1):1–7. https://doi.org/10.1186/s12909-021-02521-1

Information about the authors:

Aiman A. Sarhan; Assistant Professor; https://orcid.org/0009-0009-9492-0767; aaasarhan@uqu.edu.sa; Department of Sport Sciences, Umm Al-Qura University; Makkah, Saudi Arabia.

Faisal A. Barwais; (Corresponding author); https://orcid.org/0000-0002-5146-7255; fabarwais@uqu.edu.sa; Department of Sport Sciences, Umm Al-Qura University; Makkah, Saudi Arabia.

Cite this article as:
Sarhan AA, Barwais FA. Remote versus onsite proctored exams: comparing students' results in physical fitness testing. *Physical Education of Students,* 2023;27(6):334–339.
https://doi.org/10.15561/20755279.2023.0605

Received: 16.10.2023

Accepted: 04.12.2023; **Published**: 30.12.2023