

EFFECT OF VIRTUAL PHYSICAL ACTIVITY ON PHYSICAL FITNESS DURING THE COVID-19 PANDEMIC AMONG UNIVERSITY STUDENTS

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ABSTRACT

Physical activity is well known as an activity that benefits human health and fitness. Many physical activities can be practised among people. However, there is an increasing health problem in many developing countries, and Malaysia is no exception. The ongoing COVID-19 pandemic is a global crisis of unprecedented affected social life and daily routine. The government announced the Restricted Movement Order to minimize people in crowded areas and contact other individuals for safety precautions. Due to this situation, people were not allowed to do physical activity at the recreation park or the gymnasium. One suggestion for improving university students' lifestyle during a pandemic is virtual physical activity approaches. The virtual physical activity was designated according to the systematic plan suitable for beginners. This paper investigated the effectiveness of physical activity on physical fitness among university students. Fourth-eight university students participated in cardio exercise ($n = 24$), and a control group ($n = 24$) were recruited. The intervention group received an eight-week intervention of about 60 minutes of exercise. The types of cardio exercise comprised brisk walks, jogging, skipping and jumping. The control group involved an educational program of physical activity. Outcome measures in physical fitness were cardiovascular endurance, flexibility, muscular endurance and muscular strength. Results showed there was a significant difference between before and after intervention exercise. Performing physical activity virtually during the pandemic would increase physical fitness and maintain quality of life.

Keywords: *Cardio exercise, Physical Fitness, University students, Virtual physical Activity*

INTRODUCTION

As reported in the National Health and Morbidity Survey (2019) students' sedentary lifestyle leads to health problems such as obesity. According to Loewen et al., (2019) a sedentary lifestyle is inactive or lacks physical activity. It uses less energy like sitting, watching television, playing a video game, reading or socializing for much of the day. These can lead to obesity, diabetes, hypertension or coronary heart diseases (Monteiro et al., 2015). They are engaging in physical activity benefits to improve physical fitness and perform daily routines more effectively. The benefits gained are due to

movements while performing physical activity. Virtual physical activity involves the use of technology to a systematic plan of exercise performed at own home. Advanced technology allows people to feel like they were in the studio with an instructor. Engaging in physical activity can improve physical fitness, especially in cardiovascular endurance, flexibility, muscular endurance and muscular strength.

Physical activity has many benefits to children, adolescents, and the elderly, especially in improving physical fitness (Duncan, Herndon & Liao, 2019; Harveson et al., 2016). According to Lang et al. (2018), cardiorespiratory endurance fitness comprises body function of the heart, lungs, muscles in order to sustain prolonged exercise time. Flexibility measures muscle elasticity and joint range of motion. Muscular endurance exerts muscle force to perform repetitive contractions and remain active for a long time (Vaara et al., 2012). At the same time, muscle strength can be referred to as maximum force in a single physical activity effort (Henriksson et al., 2020).

Virtual physical activity is an alternative approach to keeping fit, although people would not work out at the gymnasium or recreation parks. Previous studies showed participation in physical activity could manage body weight (Aadland et al., 2019; De Lyon, Neville, Armour 2017; Lavie et al. 2019). Blundell et al. (2016) and Ozaki et al. (2016) agreed that engaging in physical activity also increases metabolism. Increases in metabolism allow the body to burn more calories fat mass in the body, which benefits from becoming healthier and fit. Several types of physical activity or exercise can be applied to become fit, such as aerobic, strength training and flexibility (Adigüzel & Canli, (2019); Mendes et al. (2019). In this study, the virtual physical activity approaches were conducted according to the current situation. The government ordered for Movement Control Order due to the pandemic Covid-19 and people's limited access to physical activity. The main aim of this study is to determine the impact of virtual physical activity on physical fitness among university students pretest and posttest. The current study attempts to answer the following questions:

1. What is the university students' physical fitness after 8 weeks of virtual physical activity?
2. Does a virtual physical activity approach improve university students' physical fitness after 8 weeks?

This research has a few limitations. It contains no randomized controls because this is quasi-experimental. Therefore, this study limits the study's ability to conclude a causal association between a virtual physical activity and the outcome.

Virtual Physical Activity

Basically, the virtual physical activity was planned according to the aerobic exercise. The aerobic exercise can be referred to as the presence and utilization of oxygen to meet energy demands during exercise through aerobic metabolism energy production (Tahhan et al., 2018). In this study, the physical activity of aerobic exercise was performed at low to moderate intensity, between 20% to 60% of heart rate reserve (A.C.S.M., 2013). The 5 to 10 minutes of warm-up consisted of static slow jog and stretching followed by 50 minutes of moderate-intensity physical exercise that employed the students to perform a variety of motor skills such as brisk walking, hopping from target to target, jogging slow and fast pace (Palmer et al., 2013). Before starting the exercise programs, the exercise heart rate zone was calculated. In this study, heart rate was monitored using their carotid pulse to ensure students performed exercise according to the intensity range.

Physical Fitness

In this study, physical fitness refers to health-related fitness components as it promotes a healthy lifestyle and is active among people. The health-related fitness is important to make people become fit, healthy, functional and productive in performing the daily routine. The components of cardiovascular endurance, flexibility, muscular endurance and strength were a part of this study.

METHODOLOGY

This study had two groups, an intervention group that received the Aerobic exercise training program as physical activity and a control group that received an educational program regarding physical activity.

Protocol of Virtual Physical Activity

The Aerobic exercise group was trained with low to a moderate intensity at 20% - 60% of heart rate reserve two times per week in the evening. The Aerobic exercise was started with a general warm-up and dynamic stretching session in 10 minutes. All participants were slow jog for 5 minutes. Dynamic stretching such as backpedal jog to the prepared body for vigorous activity. The first activity was a brisk walk for 15 minutes at their pace and in a suitable space at home. The second activity consisted of 4 different drills, i) static jogging, ii) skipping, iii) interval sprint and iv) jumping jack. The static jogging, skipping, and jumping jack was performed in 1 minute for 3 sets, while for interval sprints 3 sets. Lastly, 10 minutes cool down or stretching session allows for a gradual recovery of heart rate, blood pressure and promote relaxation.

Protocol of Control Group

The control group consisted of two main activities without participating in any vigorous physical activity. All participants went through their normal routine as university students and, at the same time, attended a special education program. The first activity was a seminar regarding "Benefits of Physical Activity". A qualified facilitator on exercise was recruited to give a talk and handle the seminar. Two days after the seminar, participants would watch a video of exercise training within 30 minutes. The researcher already prepared different types of exercise in a different session. This control group was conducted within eight weeks. The main objective was to inform and train them on exercise activities and proper techniques to perform. The researcher also provided a diary to all participants to write down their activities. The diary was used to observe their physical activity and nutrition consumption in general.

Research Design and Participants

In this study, participants were enrolled as university students. The researcher used a quasi-experimental method using intact sampling (Palaniappan, 2009; Best & Kahn, 1998; Chua, 2014). The researcher recruited a sample from the existing classes without making a random sample selection. The present diploma-level classes at the Faculty of Sports Science were recruited as a sample. Participants were aged between 18 to 24 years old, and all were in diploma year one. This quasi-experimental study used the equivalent groups' pre-post test design and consisted of two groups of participants was not randomly selected. A total of two groups were selected as a convenience sample, and each group consisted of 24 students.

Procedure of The Study

Prior to data collection, a formal letter was sent to the university administration to get permission. Criteria of sample, objectives and procedures of programs were explained to ensure information was delivered very clear. The coordinator recommended several classes of year one diploma. The total number of students in the class was not less than 20 to get a normal distribution of the mean. The researcher assigned all classes to be Aerobic and Control groups. All groups were briefed at different times on the virtual meeting. A week before the study started, all participants were performed physical fitness pretest. The physical fitness components included cardiovascular endurance, muscular strength, muscular endurance and flexibility. Results of the mean scores were similar between classes before being selected apart of this study. In each group, one trainer would have 6 participants to be handled in virtual exercise. The small group gives more advantages in personal

attention, motivation, focus, adherence, and result (Wayment, & McDonald, 2017). During data collection, all trainers carried out the interventions program and were supervised by the researcher two times per week, over 8 weeks (Adiguzell et al. 2019). After completing 8 weeks (16 sessions) of interventions, the posttest was conducted.

Instrumentation

a) Three (3) Minutes Step Test

Participants were stepped followed to the metronome's beat using the same lead leg in a UP, UP, DOWN, DOWN rhythm (Van Kieu et al., 2020). The metronome was set for 24 beats (96 steps) per minute for 3 minutes. In the ready position, participants would face the step, and they were allowed to pick up the beat of the metronome by marching in place. Participants would be informed of the time as it passes two minutes, one minute, or 30 seconds left. Within 30 seconds remaining, all participants would be informed to sit down quickly at the end of the test, and the heart rate was taken using the carotid pulse count.

b) One-Minute Push-Ups Test

Participants had placed their hands slightly wider than shoulder-width apart, with fingers pointing forward in a ready position on the floor (Hassan, 2018). For men push up, the feet would be together and were not crossed, unless for a modified push for females. The movement starts from the up position, lower the body until the upper arms parallel with elbows bend to the ground in the down position. Continue to the up position, in which the elbows must be extended, to be counted as one repetition, and participants could take a rest interval during the up position. The total number of correct push ups in one minute was recorded.

c) Half Sit Up - Abdominal Crunch

The test was conducted on a flat surface such as on the floor to support back muscles. Participants lay on the assessment area with knees bent 90° with hip-width apart (Garcia & Benavidez, 2016). Placing hands behind head or across at chest according to their comfort condition. Slowly up with abdominal crunch position and exhale would be in the up position and hold the movement for a few seconds, breathing continuously. Slowly lower back down and repeat in one minute. The test stopped if participants felt uncomfortable. The scores were recorded as many sit up can be performed.

d) Toe Touch

The toe touch test of the hip joint and muscular flexibility was conducted without wearing shoes on a box or platform (Kuszewski et al., 2006). Participants stand straight with their feet slightly apart and progressively bend forward until their fingers contact the ground. The finger was extended and the hand was flat. The greatest distance that may be covered by bouncing was not permitted. The position of the ruler on the ground and the zero markings at ground level. The distance between the fingers and the platform surface was measured as zero, indicating muscle flexibility. Then there was a positive number once the person went beyond the platform's surface, indicating that the individual had a lot of flexibility. The participants has three chances to perform, with the highest score determining the final score. The result was written down in centimetres (cm).

Normality

Normal distributions were assumed for all physical fitness in the Aerobic and Control groups. Violation of the assumption of normality test can be referred to by checking the skewness and kurtosis. If the value was in the range of ± 2 , the assumption could be declared as not violated and considered normal (Pallant, 2016).

Data analysis

Descriptive analysis was used to describe the level of students’ physical fitness. In order to determine the level of students’ physical fitness, the mean score for each of the components in the physical fitness was calculated. The fitness level was categorized into five levels, which are poor, average, above average, good and excellent.

Table 1 shows the level of physical fitness components. Table 2 shows the mean score and standard deviation of each physical fitness component before and after physical Activity of Aerobic exercise.

Table 1
Level of Physical Fitness in Posttest

Outcomes measure	Norm	Rating	Group
Toe touch (cm)	0 to +5	Excellent	Physical Activity / Control
Push up (times)	19 – 34 35 - 46	Average Above average	Control Physical Activity
Sit up (times)	25 - 30	Poor	Physical Activity / Control
Plank (sec)	60 – 120 121 - 240	Average Above average	Control Physical Activity
Step test (ml/kg/min)	47 - 56	Good	Physical Activity / Control

Above Table 1 shows the level of physical fitness in the posttest based on the groups among university students. The level of the toe touch in all groups was excellent rating, which scores between 0 to +5. The excellent can be referred that all participants were flexible when performing the toe touch test, which reached or beyond the toe point between 1 - 3 cm score (Kipper et al., 1987).

The level of push up in the Control groups was average rating, which ranged between 19 - 34 times. While the Physical Activity group was above average rating, ranging between 35 – 46 times. Range levels in the push up were recognized by AAHPERD (1988). The push up test is used to measure upper body strength and endurance. Students in the Physical Activity group was showed improvement in strength and endurance after 8 weeks of training.

Next, the level of sit up in the Physical Activity and Control groups was poor rating, which ranges between 25 – 30 times. Both groups were shown low in abdominal muscular strength and endurance.

Then, the plank level in the Control group was average rating, which ranged between 60 – 120 seconds. Physical activity was above average, with ranged between 121 – 240 seconds, showing the ideal results (Stand & Reeder, 1996). Lastly, the step test level in all groups was good, ranging between 47 – 56 ml/kg/min, showing the activities increased cardiovascular endurance (Van Kieu et al., 2020).

Table 2
Physical Fitness Pretest-Posttest Based on Groups

Outcome measures	Groups	Pretest Mean ± (SD)	Posttest Mean ± (SD)
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Toe touch (cm)	Aerobic	0.00 ± 4.022	1.92 ±2.948
	Control	1.00 ± 2.782	1.63 ±2.871
Push up (times)	Aerobic	28.42 ± 10.261	37.67 ±11.742
	Control	33.00 ± 11.237	33.42 ±11.417
Sit up (times)	Aerobic	22.92 ± 8.330	30.21 ± 9.829
	Control	27.25± 9.474	24.29 ± 5.034
Plank(sec)	Aerobic	75.23 ± 33.863	122.30 ± 47.707
	Control	71.83 ± 35.978	75.32 ± 31.155
Step test (ml/kg/min)	Aerobic	49.52 ± 6.782	50.87 ± 4.321
	Control	49.77 ± 5.038	47.06 ± 4.321

Above Table 2 shows the descriptive analysis of physical fitness in pretest-posttest based on groups of university students. In the Physical Activity group, the pretest of toe touch result was $M = 0.00$, $SD = 4.02$. In the posttest result, $M = 1.92$, $SD = 2.95$. The Control group of pretest showed $M = 1.00$, $SD = 2.78$. Then the posttest result, $M = 1.00$, $SD = 1.63$. Flexibility among students increased in both groups can be explained because the range of joint and muscular extensibility could increase without training and can be influenced by gardening, lifting and housekeeping activities.

Next was the push up in the pretest of Physical Activity, $M = 28.42$, $SD = 10.26$. In the Control group showed $M = 33.00$, $SD = 11.24$. While in the posttest of Physical Activity exercise group, $M = 37.67$, $SD = 11.74$. Then in the Control group showed $M = 33.42$, $SD = 11.42$. The Physical Activity group has shown great improvement in upper body strength.

The third physical fitness component is abdominal strength measured by sit up test. In the pretest of the Physical Activity exercise group, $M = 22.92$, $SD = 8.33$. The Control group showed $M = 27.25$, $SD = 9.47$. While in the posttest of Physical Activity exercise group, $M = 30.21$, $SD = 9.83$. Then the Control group showed $M = 24.29$, $SD = 5.034$. The mean of sit up results showed that the Physical Activity exercise group slightly increased compared to the Control groups. The abdominal strength involves several muscles to support the core muscle to execute a movement.

The fourth physical fitness component is muscular endurance measured by plank test. In the pretest of the Physical Activity exercise group, $M = 75.23$, $SD = 33.86$. The Control group showed $M = 71.83$, $SD = 35.978$. While in the posttest of Physical Activity exercise group, $M = 122.30$, $SD = 47.71$. Then the Control group showed $M = 75.32$, $SD = 31.16$. Both groups were increased, but the Physical Activity exercise group indicated the greatest improvement from pretest to posttest. Exercises in the Physical Activity group enhance the component of muscular endurance.

Lastly, the step test is used to measure cardiovascular endurance. In the pretest of the Physical Activity exercise group, $M = 49.52$, $SD = 6.782$. The Control group showed $M = 49.77$, $SD = 5.04$. While in the posttest of Physical Activity exercise group, $M = 50.87$, $SD = 4.32$. Then the Control group showed $M = 47.06$, $SD = 4.32$. The Physical Activity group was increased in cardiovascular endurance compared to the Control group was decreased. Most of the studies were shown that cardiovascular endurance could be improved through intensive exercise training (Akhavan Rad, Mokhtar & Kiwanuka, 2019; Mazzeo, Tafuri, & Montesano, 2020).

DISCUSSION

This research aimed to determine the alternative of a virtual physical activity approach to improving physical fitness among university students. In this study, two groups presented their physical fitness level, which is the Physical Activity and Control groups. The difference between mean and standard deviation on level of physical fitness in the intervention group was shown by descriptive analysis. In the pretest, the physical fitness was shown to have lower mean scores in the step test, toe touch, sit up, push up, and plank. The Physical Activity group showed an improvement in all physical fitness components in the posttest. On the other hand, the Control group demonstrated inconsistency in all components of physical fitness.

Physical fitness is a marker of one's overall health. A person with a high level of physical fitness has excellent health conditions. All assessments in physical fitness reveal a person's capacity and health status in terms of obesity, heart disease, hypertension, diabetes, and other conditions. Obesity is connected to a lack of physical fitness, which explains why the obesity rate in Malaysia increased from 1975 to 2016. According to the National Health and Morbidity Surveys (2019), 30% of adults are overweight. Gopalakrishnan et al. (2012), one of the key factors leading to the high rate of obesity among university students is their unhealthy lifestyle. Obese persons are commonly linked with poor physical fitness due to their inability to perform well in fitness tests (Wood, 2017). As a result, it is beneficial if people take the effort to begin exercising in order to become healthier and more physically fit.

In this study, the Physical Activity group showed improvement in cardiovascular endurance components in the posttest. This is in line with the finding in the previous study by Park et al. (2020), where the intervention group resulted in a positive increment in oxygen uptake. There is also an agreement from another study, which found that doing 13 minutes of high-intensity interval exercise five times a week for eight weeks enhanced maximum oxygen consumption (Matsuo et al. 2014).

The flexibility component of physical fitness is also beneficial after participating in Physical Activity. Flexibility was shown to improve following Physical Activity as compared to baseline in the current study. Zhu et al. (2020) reported that the physical activity programme improved the hip joint, lumbar muscles, tendons, and ligaments. Sedentary people benefit from more mobility since it allows them to complete everyday tasks.

The other two most significant aspects of physical fitness are muscular strength and endurance. The body needs strength to lift, push, and pull in order to conduct actions and tasks. Muscular endurance permits humans to engage in any activity for an extended period of time. The upper body strength of push-up increased significantly after the exercise programme (Karacan, 2010). Researchers claimed that participating in Physical Activity can increase muscle size and mitochondria activity, which induces muscle strength and endurance (Seong et al., 2020).

Most of the findings in this study were aligned with previous studies. The results of their study showed that participating in Physical Activity would improve physical fitness components. Sedentary people have to take the initiative to be more active to minimize the risk of obesity. Kementerian Kesihatan Malaysia (KKM) proposed walking 10,000 steps per day to make active person.

CONCLUSION

The benefit of physical activity to our health status and fitness would not be denied. The effort in applying the virtual physical activity approach in this study has revealed improvement in physical fitness among university students. All physical fitness was measured by different tests improved after 8 weeks of the programme. Components are cardiovascular endurance, flexibility, muscular strength and endurance. These tests are reliable to measure physical fitness virtually because there is no need to calibrate equipment. All findings were proven to be active can be performed at any time and place. Due to the Movement Control Order (MCO), the limitation to going out has made people start to take unhealthy diet and overeat. Therefore, it seems that the possibility to consider virtual physical activity

as an effective alternative exercise approach to improve health and fitness among university students.

This study's results can only be generalized to one group, which is diploma-level at the Faculty of Sports Science as university students. While the study determined the effect of virtual physical activity on physical fitness without an attempt to study the factors that influence motivation or barriers to exercise. Further research is needed to look into the perception regarding the physical activity that is difficult and painful to perform. More scientific research needs to explore the benefits of physical activity.

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