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Aerobic Fitness Level Among University Athletes During Movement Control Order in Malaysia

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ABSTRACT

Aerobic fitness level is one of the important components to maintain and improve athletes' performance. Movement Control Order (MCO) is hypothesized to affect athletes in terms of sustaining their aerobic fitness level. The purpose of this present study was to identify the aerobic fitness level among university athletes during the MCO. Fifty university athletes (age: 19 – 26 years old) from Sultan Idris Education University (UPSI) had participated in this study. The athletes completed a CLINIMEX aerobic fitness questionnaire through Google Form to estimate their aerobic fitness level. As the result, the minimum and maximum values of aerobic fitness obtained from the 50 university athletes were 9 and 16 METs. The aerobic fitness level among university athletes overall was 10.89 ± 1.83 METs. The aerobic fitness level among university athletes for males was 11.01 ± 1.89 METs while for females 10.41 ± 1.56 METs. It has been identified that aerobic fitness level among university athletes during movement control order is at a vigorous-intensity activity that is 6.0 METs and above. In conclusion, high level of aerobic fitness among university athletes during MCO shows that despite the limitation of space and exercise equipment, they still involved in physical activity.

Keywords: Aerobic fitness, Movement control order

INTRODUCTION

Physical fitness is one of the important elements in life because it can affect a person's lifestyle and physical performance. It is defined as the body's ability to function efficiently and effectively (Corbin et al., 1997). Being efficient means being able to do daily activities with least amount of effort. Physical fitness is associated with a person's ability to work effectively, enjoy leisure time, be healthy, resist hypokinetic diseases or conditions, and meet emergency situations. Although the development of physical fitness is affected by many factors such as proper nutrition and sufficient rest, optimal physical fitness is not possible to be achieved without regular exercise (de Groot and Fagerström, 2010; Malina, 2010; Tremblay et al., 2010).

Physical fitness can be divided into two categories, which are health-related physical fitness and skill-related physical fitness and they have at least 11 components, each of which contributes to total quality of life. The health-related physical fitness has five components that are directly associated with good health while skill-related physical fitness has six components that are associated more with physical performance. The five components of health-related physical fitness are cardiovascular fitness, muscular endurance, flexibility, strength, and body composition. Each health–related fitness

characteristic has a direct relationship to good health and reduced risk for hypokinetic disease. The components of skill-related physical fitness are agility, balance, coordination, power, reaction time, and speed. People who possess all of skill-related components find it easy to achieve high levels of performance in motor skills, such as those required in sports and in specific types of jobs (Corbin et al., 1997).

Cardiovascular fitness is one of the important components for health related physical fitness. According to Corbin and colleagues, cardiovascular fitness is defined as the ability of the heart, blood vessels, blood, and respiratory system to supply nutrients and oxygen to the muscles and the ability of the muscles to utilize fuel to allow sustained exercise. Cardiovascular fitness is sometimes referred as cardiovascular endurance because a person who has this type of fitness can persist in physical activity for long periods of time without undue fatigue. It has also been referred as cardiorespiratory fitness because it requires delivery and utilization of oxygen. The term aerobic fitness has also been used for cardiovascular fitness because aerobic capacity is considered to be the best indicator of cardiovascular fitness and aerobic physical activity is the preferred method for achieving it (Corbin et al., 1997).

Several long-term cohort studies have clearly shown a strong and direct association between cardiorespiratory (aerobic) fitness and a better and longer survival in adult men and women from different countries (Kodama et al., 2009; Mandsager et al., 2018). Quantified in mL $O_2.kg^{-1}min^{-1}$ or simply as metabolic equivalents or METs, aerobic fitness is also associated with lower chances of developing major clinically relevant diseases, such as coronary artery disease, arterial hypertension and several types of cancer. Aerobic fitness has also been recently recognized as a clinical vital sign (Araújo, Castro, and Franca, 2019).

The gold standard for aerobic fitness determination is the measurement of maximum oxygen uptake (VO_2max). A person's VO_2max, commonly referred to as aerobic capacity, and is determined by measuring the amount of oxygen a person can utilize in maximal exercise. In order to measureVO_2max, Baumgartner and Jackson (1998) have recommended that the workload increases gradually until the participant is unable to continue the activities. There are two types of tests that have been used as an indicator to measure aerobic fitness, which are laboratory tests and field tests. In laboratory tests such as maximal cardiopulmonary exercise test (CPET), aerobic fitness can be determined by progressively increasing exercise intensity in an ergometer, most often a treadmill or a leg cycle ergometer, until volitional exhaustion, while collecting and analyzing expired gases (Araújo, Castro, and Franca, 2019). There are also field tests of aerobic fitness, which require substantially less equipment and therefore less expensive than laboratory tests. The examples of this test are 12-minute run test, 1.5-mile run test, 20-meter shuttle run test, Rockport 1-mile fitness walking test and step tests (Kraemer, Fleck, and Deschenes, 2015).

Alternatively, aerobic fitness can also be estimated using questionnaire, particularly Veterans Specific Activity Questionnaire (VSAQ) and CLINIMEX Aerobic Fitness Questionnaire (C-AFQ) (Araújo, Castro, and Franca, 2019; Myers et al., 1994). This method can be used when there is a limitation to conduct an exercise test in getting a person aerobic fitness level. For instance, Movement Control Order (MCO) due to Covid-19 pandemic is an example of limitation to conduct an exercise test. MCO is the movement restriction of people into or out of a defined geographic area, such as a community, region, or country that implemented as a preventive measure by the federal government of Malaysia in response to the COVID-19 pandemic in the country on 18 March 2020 ("2020 Malaysia movement control order"). The order was commonly referred to in local and international media as a "lockdown" or "partial lockdown". The MCO is hypothesized to affect athletes in terms of sustaining their aerobic fitness level.

Restriction of movement caused by the implementation of movement control order limits exercise related activity among athletes. Limited exercises equipment and space at home might further influence the limitation of aerobic activities. Therefore, it might affect the aerobic fitness level of athletes during the movement control order. Thus, this study was designed to identify the aerobic fitness level among university athletes during movement control order.

METHODOLOGY

Participants

Participant of this study is 50 university athletes (age: 19 – 26 years old) from Sultan Idris Education University (UPSI), Malaysia. CLINIMEX Aerobic Fitness Questionnaire (C-AFQ) was used in this study as an instrument to estimate aerobic fitness of the participant. C-AFQ has been shown to be a valid tool to estimate aerobic fitness, and it is a non-exercise alternative when cardiopulmonary exercise test is not available or cannot be conducted (Araújo, Castro, and Franca, 2019). The data collection process is carried out by distributing questionnaires to 80 participants (based on a sample size calculation that represent 102 of total athletes, 95% confidence level), through online survey using Google Form. This survey only involved athletes who are actively represent the University for at least one competition during the year this study was conducted. Before the questionnaire is answered, explanation about the questionnaire is given to participants to provide clarity and avoid confusion. Only respondents who volunteer to participate in answering the questionnaire were made up as participants.

Procedures

This study was conducted during the phase 1 of Recovery Movement Control Order (RMCO). Malaysian government enacted the RMCO after completed 4 phases of Movement Control Order (MCO; 2 months duration) and 2 phases of Conditional Movement Control Order (CMCO; 1 month duration). In the conduction of this study, the CLINIMEX Aerobic Fitness Questionnaire (C-AFQ) was applied in a two-step sequence following standard instructions. Participants need to answer two questions in this survey that was step one and step two. In step one, participants must identify which of the number corresponding to the most intense exercise or physical activity they are likely to do with their current aerobic fitness. The objective of step one was to identify the range or zone to which the individual belongs. After the correct zone was identified, participants will proceed to the next question that was step two. In step two, participants must identify and choose which of the maximum or most intense exercise or physical activity that best represents what they would be able to perform with their current aerobic fitness. This two-step approach allowed refining the estimate of maximal exercise capacity and, consequently, maximal aerobic power in METs. By applying C-AFQ, it was possible to estimate aerobic fitness in one or two minutes, from < 1 to > 20 METs, with 0.5 intervals from 2 to 5 METs and thereafter, from one in one MET increments up to 20 or more METs. The interpretation of METs value was light intensity activity (< 3.0 METs), moderate intensity activity (3.0 to 6.0 METs) and vigorous intensity activity (> 6.0 METs) (11). The participants typically took about 3 to 5 minutes to complete the questionnaires. Each completed questionnaire from the participants was collected, coded, and analysed as one sample.

Statistical Analysis

Descriptive analysis is used to identify the aerobic fitness level of all the participants. All values are expressed as mean ± standard deviation (SD). Statistical analysis was done by using the Microsoft Excel (Microsoft Corporation™, Redmond, Washington, USA).

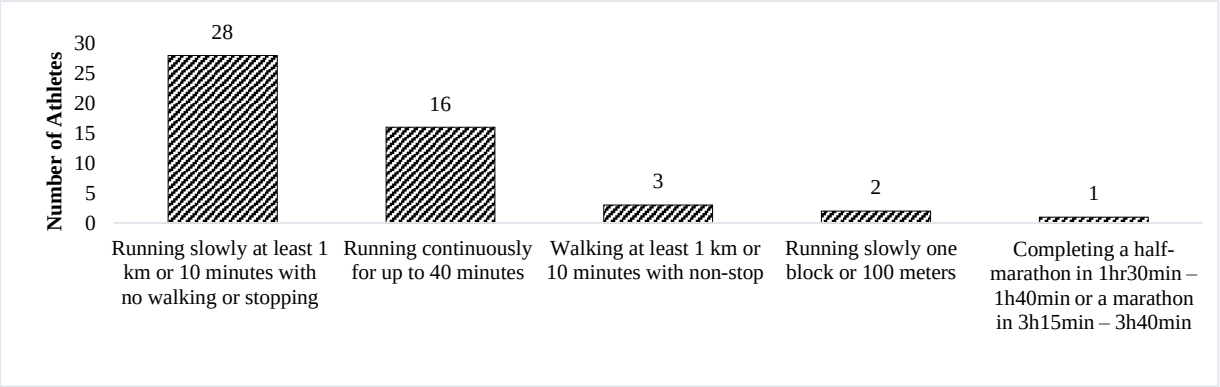

Figure 1. Number of corresponding to the most intense exercise that athlete likely to do with current aerobic fitness. Values represent athletes (n=50) between running slowly at least 1km or 10 minutes with no walking or stopping, running continuously for up to 40 minutes, walking at least 1km or 10 minutes with non-stop, running slowly one block or 100 meters and completing a half-marathon in 1hr30min-1h40min or a marathon in 3h15min - 3h40min.

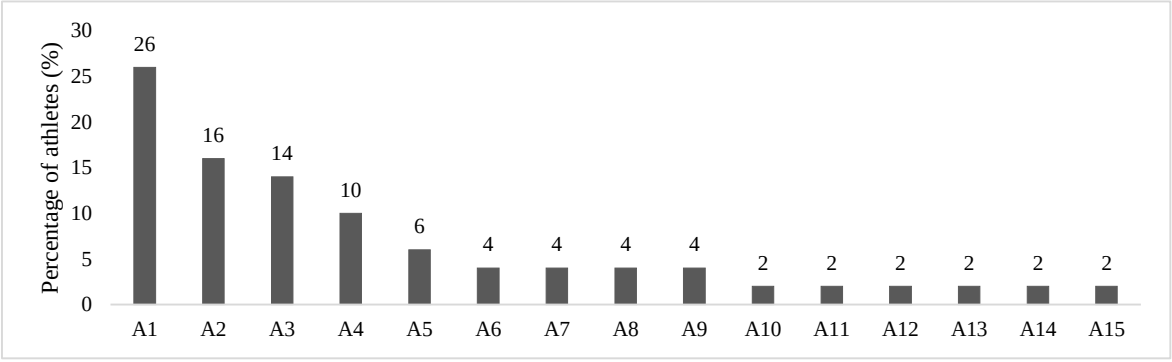

Figure 2. Most intense exercise that best represents what athlete would be able to perform with their current aerobic fitness. Values represents athletes (n=50) between A1 (answer one) = running continuously for 10 to 15 minutes; A2= running slowly at least 1 km or 10 minutes with no walking or stopping; A3= running 10 km in about 1 hour; A4= attending spinning or step aerobics classes with low or moderate intensity; A5= engaging in martial arts for at least one hour with short breaks only; A6= running for at least one minute at 10 km/h (167 m/min) outdoors or 10.5 km/h on the treadmill; A7= pedaling outdoors or on the road at 20 and 25 km/h for up to half an hour; A8= running continuously for up to 40 minutes; A9= playing ball sports at very intense pace and for at least 30 minutes without breaks; A10= running at least one minute at 11 km/h (184 m/min) outdoors or 11.6 km/h on the treadmill; A11= attending fast-pedaling spinning or running classes; A12= pedaling outdoors or on the road at 20 and 25 km/h for more than one hour; A13= running 10 km in 53 to 57 minutes or completing a half-marathon in about 2h15min; A14= running a half- marathon in about 2 hours or a marathon in about 4 1⁄2 hours; A15= running for at least one minute at 16 km/h (266 m/min) outdoors or 17.2 km/h on the treadmill.

Table 1: Aerobic fitness level among university athletes

	Overall	**Male**	**Female**
Aerobic fitness level (METs)	10.89 ± 1.83	11.01 ± 1.89	10.41 ± 1.56

Values represents mean ± standard deviation (SD) (n=50).

RESULTS

Population that involved in this research was university athletes from Sultan Idris Education University (UPSI); 50 participants out of 80 athletes that received the questionnaire (response rate is 62.5%). The participants consist of 40 males (80%) and 10 females (20%), with age range between 19 to 26 (21.98 ± 1.56) years old. The highest percentage of participant's age was 23 years old (28%) and the lowest percentage of participant's aged 26 years old (2%).

In step one of CLINIMEX Aerobic Fitness Questionnaire (C-AFQ), athletes need to identify the number of corresponding to the most intense exercise that they are likely to do with current aerobic fitness. The result of the step one C-AFQ is shown in figure 1. It showed that 28 athletes (56%) choose running slowly at least 1 km or 10 minutes with no walking or stopping, 16 athletes (32%) choose running continuously for up to 40 minutes, 3 athletes (6%) choose walking at least 1 km or 10 minutes with non-stop, 2 athletes (4%) choose running slowly one block or 100 meters and one athletes (2%) choose completing a half-marathon in 1hr30min – 1h40min or a marathon in 3h15min – 3h40min.

In step two of CLINIMEX Aerobic Fitness Questionnaire (C-AFQ), athletes need to identify specifically the maximum or most intense exercise that best represents what athlete would be able to perform with their current aerobic fitness. The result of step two C-AFQ is shown in figure 2. The most preferred exercise that athletes would be able to perform with their current aerobic fitness is running continuously for 10 to 15 minutes (26%), followed by other exercise activities which are running slowly at least 1 km or 10 minutes with no walking or stopping (16%), running 10 km in about 1 hour (14%), attending spinning or step aerobics classes with low or moderate intensity (10%), engaging in martial arts for at least one hour with short breaks only (6%), running for at least one minute at 10 km/h (167 m/min) outdoors or 10.5 km/h on the treadmill (4%), pedaling outdoors or on the road at 20 and 25 km/h for up to half an hour (4%), running continuously for up to 40 minutes (4%), playing ball sports at very intense pace and for at least 30 minutes without breaks (4%), running at least one minute at 11 km/h (184 m/min) outdoors or 11.6 km/h on the treadmill (2%), attending fast-pedalling spinning or running classes (2%), pedalling outdoors or on the road at 20 and 25 km/h for more than one hour (2%), running 10 km in 53 to 57 minutes or completing a half-marathon in about 2h15min (2%), running a half-marathon in about 2 hours or a marathon in about 4 ½ hours (2%) and running for at least one minute at 16 km/h (266 m/min) outdoors or 17.2 km/h on the treadmill (2%).

The aerobic fitness level among university athletes was analysed using descriptive analysis. The minimum and maximum values obtained from the 50 university athletes using C-AFQ was 9 and 16 METs. Table 1 showed the aerobic fitness level among university athletes for overall participants, and for each gender. The aerobic fitness level among university athletes for overall was 10.89 ± 1.83 METs. The aerobic fitness level among university athletes for male was 11.01 ± 1.89 METs while for female 10.41 ± 1.56 METs.

DISCUSSIONS

The present study raises the possibility that exercise limitation due to lockdown during the pandemic of Covid-19 may affect athletes' aerobic fitness level. The movement control order (MCO) implemented by the Malaysian government disallowed several activities including sport activity to be conducted, except for essential services. Due to this situation, limited space and equipment to do exercise and any sport specific training have become the main obstacles for athletes. This situation reduced the total and level of physical activity among athletes, as supported by previous studies that reported decrease physical activity during Covid-19 pandemic in all age groups and especially in men (Castañeda-Babarro et al., 2020; Maugeri et al., 2020). Physical activity and cardiorespiratory fitness are intimately linked (Marques, Hillman, and Sardinha, 2018), hence, reduced engagement in physical activity may consequently influence the aerobic fitness level.

It was surprising that this study found no effects of MCO on athletes' aerobic fitness level. A possible explanation for this might be because of the home-based exercise that have been practiced by the athletes themselves during MCO. Coaches also took initiative to conduct online training sessions with their athletes, which may reduce the detraining effect particularly on their aerobic capacity. This statement is in accord with recent studies that indicate online training tools associated with higher frequency, duration of training and intensity level (Schneider et al., 2022; Moreno-Tenas et al., 2021). In addition to that, Parpa and Michaelides (2021) showed that home-based individual physical training during 7-weeks of covid-19 was effective in keeping physical fitness of professional soccer players. Home-based training such as high-intensity interval training (HIIT) and high-intensity circuit training (HICT) repeatedly associated with the improvement in aerobic fitness (Lu et al., 2021; Androulakis-Korakakis et al., 2018). Research conducted by Klika & Jordan (2013) also stated that HICT seems to be an efficient means of exercise to improve VO_2max, muscular fitness and help to decrease body fat, improve insulin sensitivity.

However, in contrary to the result of this study, several studies showed that lockdown reduced the aerobic fitness of team sport athletes as compared to before lockdown, even though they continuously did individual training at home. The main hypothesis for this finding is that athletes from team sport might require organised training and team training instead of home-based training program to maintain their aerobic fitness (Fikenzer et al., 2020; Kalinowski, Myszkowski, and Marynowicz, 2021). Additionally, Singh and colleagues (2022) reported a significant reduction in aerobic capacity post-covid-19 lockdown among competitive athletes despite maintaining home-based physical activity. This study highlighted the importance of incorporating an indoor-based supervised program including aerobic exercises to guide and monitor athletes.

Several limitations of this study are acknowledged. Most notably, aerobic fitness level of the athletes involved in this study were not measured before the MCO. Due to this, direct comparison between before and during MCO cannot be done. Hence, this study cannot conclude that the athletes' aerobic performance is not affected during the MCO. Further, this study did not include evaluations on the home workout, which cannot provide further information on the participation of the athletes in doing more suitable exercise due to the limitations caused by the MCO.

CONCLUSIONS AND RECOMMENDATIONS

In conclusion, high level of aerobic fitness among university athletes during MCO shows that despite the limitation of space and exercise equipment, they still involved in physical activity. It has been identified that aerobic fitness level among university athletes during movement control order is at vigorous intensity activity that is 6.0 METs and above. Further study is required to determine the aerobic fitness level on larger populations, and factors influence athletes to increase, maintain or decrease their fitness level during the pandemic.

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