Changing the level of mental health and fundamental movement skills on pencak silat athletes through game-based circuit training

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How to Cite

Abstract

Purpose: The decline in mental health and fundamental movement skills of athletes in the COVID-19 era has become a crucial issue and limited research on the effects of game-based circuit training towards changes in mental health levels and fundamental movement skills was a gap in this research. This study aims to investigate the effects of game-based circuit training in changing mental health levels and fundamental movement skills.

Material and methods: This study adapted a quantitative approach with experimental methods. The participants in this study were pencak silat athletes at the Makassar State University located in Indonesia (n=40). Participants were divided into 2 groups, an experimental group that received game-based circuit training (n=20) and a control group that only did their usual daily training (n=20). Instrument that used to measure mental health was depression, anxiety and stress while fundamental movement skills used the gross motor development test. Data was analyzed with IBM SPSS to find the normality, mean and standard deviation. Meanwhile, Paired sample t-test was used to test differences in mental health and fundamental movement skills scores in the experimental and control groups.

Results: This study has obtained several findings. First, game-based circuit training was proven to significantly change mental health levels (p<0.05). Second, game-based circuit training could also change the level of fundamental movement skills became better (p<0.05), but different results were shown in the control group which had no effect on mental health and fundamental movement skills (p>0.05).

Conclusions: This research has a great contribution to the development of sports, especially in pencak silat and provide solutions for coaches and athletes in maintaining the quality of mental health and fundamental movement skills through game-based circuits.

Keywords: game-based circuit training, mental health, fundamental movement skills

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https://doi.org/10.58962/HSR.2023.9.3.50-60
Анотація
Судірман Бурхануддін, Еді Сетіаван, Лалу Мох Юдха Існаїні, Хасануддін Джумаренг, Іхсан Абдул Патах. Зміна рівня психічного здоров'я та основних рухових навичок спортсменів у пінчак сілат за допомогою ігрових кругових тренувань
Мета: погіршення психічного здоров'я та основних рухових навичок спортсменів в епоху COVID-19 стало критичною проблемою, а обмежені дослідження впливу циклових тренувань, заснованих на іграх, на зміни рівня психічного здоров'я та основних рухових навичок були проблем і у цьому це дослідження. Це дослідження має на меті дослідити вплив ігрових кругових тренувань на зміну рівня психічного здоров'я та основних рухових навичок.
Матеріал і методи: це дослідження адаптувало кількісний підхід із використанням експериментальних методів. Учасниками цього дослідження були спортсмиен пенчак сілат з Макассарського державного університету, розташованого в Індонезії (n=40). Учасники були розподілені на 2 групи: експериментальну групу, яка проходила ігрові кругові тренування (n=20), і контрольну, яка проводила лише звичайні щоденні тренування (n=20). Інструментом, який використовувався для вимірювання психічного здоров'я, були депресія, тривога та стрес, тоді як для основних рухових навичок використовувався тест розвитку грубої моторики. Дані були проаналізовані за допомогою IBM SPSS, щоб знайти нормальность, середне значення та стандартное отклонение. Тим часом t-критерій парної вибірки використовувався для перевірки відмінностей у психологічному здоров'я та основних рухових навичках в експериментальній і контрольній групах.
Результати: це дослідження отримало кілька висновків. По-перше, було доведено, що ігрові кругові тренування значно змінюють рівень психічного здоров'я (p<0,05). По-друге, ігрове кругове тренування також можливо змінило рівень базових рухових навичок (p<0,05), але в контрольній групі були показані інші результати, які не вплинули на психічне здоров'я та основні рухові навички (p=0,05).
Висновки: це дослідження має великий внесок у розвиток спорту, особливо в pencak silat, і пропонує рішення для тренерів і спортсменів у підтримці якості психічного здоров'я та основних рухових навичок за допомогою ігрових схем.
Ключові слова: ігрове колове тренування, психічне здоров'я, фундаментальні рухові навички

Аннотация
Судирман Бурхануддин, Эди Сетиаван, Лалу Мох Юдха Иснаини, Хасануддин Джумаренг, Ихсан Абдул Патах. Изменение уровня психического здоровья и основных двигательных навыков у спортсменов в пенчак силате с помощью круговых игровых тренировок
Цель: Ухудшение психического здоровья и основных двигательных навыков спортсменов в эпоху COVID-19 стало серьезной проблемой, и ограниченные исследования влияния круговых тренировок на основе игр на изменения уровня психического здоровья и основных двигательных навыков были пробелом в это исследование. Это исследование направлено на изучение влияния круговой игровой тренировки на изменение уровня психического здоровья и основных двигательных навыков.
Материалы и методы: это исследование адаптировало количественный подход к экспериментальным методам. Участниками этого исследования были спортсмены пенчак силат из Макассарского государственного университета, расположенного в Индонезии (n=40). Участники были разделены на 2 группы: экспериментальную группу, которая проходила круговую тренировку на основе игры (n=20), и контрольную группу, которая занималась только своими обычными ежедневными тренировками (n=20). Инструментом, который использовался для измерения психического здоровья, была депрессия, тревога и стресс, в то время как основные двигательные навыки использовали тест на развитие крупной моторики. Данные были проанализированы с помощью IBM SPSS, чтобы найти нормальность, среднее значение и стандартное отклонение. Между тем, t-критерий парной выборки использовался для проверки различий в показателях психического здоровья и основных двигательных навыков в экспериментальной и контрольной группах.
Результаты: Это исследование получило несколько выводов. Во-первых, было доказано, что круговая тренировка, основанная на играх, значительно меняет уровень психического здоровья (p<0,05). Во-вторых, игровая круговая тренировка также могла изменить уровень основных двигательных навыков, стал лучше (p<0,05), но в контрольной группе были показаны другие результаты, которые не повлияли на психическое здоровье и основные двигательные навыки (p>0,05).
Выводы: Это исследование внесло большой вклад в развитие спорта, особенно пенчак силат, и предложило тренерам и спортсменам решения для поддержания качества психического здоровья и основных двигательных навыков с помощью игровых схем.
Ключевые слова: круговая игровая тренировка, психическое здоровье, основные двигательные навыки.
Introduction

All countries in the world are currently experiencing the impact of the COVID-19 pandemic. Based on data, COVID-19 has disrupted all activities, such as market, offices, schools and universities must be stopped [1, 2], postponed and cancelled sport competitions at national and international level [3, 4, 5], prohibited training in public places [6, 7, 8], until training restrictions among athletes and coaches [9, 10]. All of these regulations have a negative impact on several aspects, such as a decrease in physical health [11] until mental health [12, 13, 14]. Previous studies reported that mental health disorders occurred globally [15, 16, 17]. In addition, policies on lock down or stay at home during the pandemic caused 52% of athletes experienced depression and increased the risk of mental health disorders [18]. In addition, the data reported that another impact of the COVID-19 pandemic caused fundamental movement skills decreased significantly [19].

Mental health is a psychological state associated with feelings of anxiety, depression and stress [20, 21]. A person who has a good mental health will not experience mental disorders. On the other hand, a person who has a bad mental health has the potential to trigger symptoms of anxiety, depression and stress [22, 23]. The World Health Organization defines mental health as a state of well-being, in which the individual can cope with the normal stresses of life or free from mental illness [24, 25]. Data reported that COVID-19 has attacked mental health of all people in the world and it is a global problem that must be addressed immediately [26, 27, 28]. Athletes who have mental health disorders would experienced performance decline [29, 30], whereas athletes with good mental health levels would obtain more optimal performance [31]. This is in accordance with a recent report which highlighted that mental health problems can impact sports performance decline in Tokyo Olympic athletes [32].

Fundamental movement skills is a global issue that is considered crucial and related to three basic movements, namely locomotor skills, stability skills and manipulative or object control skills [33, 34]. The data shows that most of people experience a decrease on fundamental movement skills during the current COVID-19 pandemic [35, 36]. In addition, Ma et al [19], reported that the level of fundamental movement skills among young people worldwide was still low. Several factors that cause the decrease on fundamental movement skills were lockdown and stay at home policies [37, 38]. Improving the ability of fundamental movement skills has the potential to create an active lifestyle [39] and the basic capital for engaging in physical activity [40], physical education and sports. For example, when the fundamental movement skills is low, it will cause athletes difficult to learn and develop skills in sports [41, 42]. Considering the importance of mental health and fundamental movement skills aspects for athletes to be successful in sports, therefore it is needed an appropriate and effective training through game-based circuit training.

Game-based circuit is a training that uses 6 to 12 posts or workstations [43], each post contains an exercise, activity or game. The activity types that can be applied in the post such as push-ups, sit-ups, squat-jumps to physical activities, games/sports or the use of weights. Each post was performed within a predetermined time for example 1-5 minutes after completion then proceeded to the next exercise. The duration of circuit training ranged from 20 minutes to 60 minutes [44]. Previous studies had shown that circuit training was beneficial for increasing sport motivation [45], strength [46], physical fitness [47]. Research on circuit training has been widely conducted internationally [48, 49, 50], but it had not investigated about this effect on mental health and fundamental movement skills and limited previous studies on the effects of game-based circuits on changes in athlete's mental health and fundamental movement skills levels which underlying the urgency in this research. This research contributes to the training development in the sports field, so that the mental health and fundamental movement skills levels of athletes will be increase in the current pandemic crisis era. The purpose of this study was to analyze the effect of game-based circuit training on changing the mental health and fundamental movement skills levels of athletes.

Material and methods

Participants

Participants that involved in this study were pencak silat athletes at the State University of Makassar (Indonesia) (n=40) and they were selected using a random sampling technique. Considering the relationship between researchers and participants,
they were recruited by sending invitation letters via WhatsApp. There were 40 out of 60 pencak silat athletes who were sent an invitation letter, responded and showed interest to involve in this research. Participants were divided into 2 groups, the experimental group (n=20) who received a game-based circuit training program and the control group (n=20) who did their daily training or did not participate in any program. Detail characteristics of participants is presented in Table 1.

### Table 1

Demographic participant of pencak silat athletes

<table>
<thead>
<tr>
<th>Information</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>20</td>
<td>50</td>
</tr>
<tr>
<td>Female</td>
<td>20</td>
<td>50</td>
</tr>
<tr>
<td>Age (y)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;15</td>
<td>20</td>
<td>50</td>
</tr>
<tr>
<td>16-20</td>
<td>15</td>
<td>37</td>
</tr>
<tr>
<td>&gt;21</td>
<td>5</td>
<td>13</td>
</tr>
<tr>
<td>Height (cm)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;145</td>
<td>13</td>
<td>33</td>
</tr>
<tr>
<td>146-155</td>
<td>20</td>
<td>50</td>
</tr>
<tr>
<td>156&gt;</td>
<td>7</td>
<td>17</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;50</td>
<td>21</td>
<td>53</td>
</tr>
<tr>
<td>51-55</td>
<td>15</td>
<td>37</td>
</tr>
<tr>
<td>&gt;56</td>
<td>4</td>
<td>10</td>
</tr>
<tr>
<td>Status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elite Athlete</td>
<td>20</td>
<td>50</td>
</tr>
<tr>
<td>Amateur Athlete</td>
<td>20</td>
<td>50</td>
</tr>
</tbody>
</table>

### Procedures

This study adapted the quantitative type by using experimental methods. This research was conducted from October to November 2022 at the State University of Makassar (Indonesia). This study followed the guidelines of the World Medical Association Code of Ethics (Helsinki Declaration for humans). The first meeting was held on October 1, 2022, all participants took a pre-test (mental health and fundamental movement skills tests). The second meeting on October 4, 2022, the experimental group carried out a game-based circuit training program while the control group only carried out their usual daily activities until the 13th meeting (October 29, 2022). In the 14th meeting (1 November 2022), all participants carried out post-test activities, namely the mental health and fundamental movement skills tests. Game-based circuit training program was held on Tuesday, Thursday and Saturday at 02.00-03.00 p.m. This research was carried out strictly by implementing the COVID-19 health protocol, all participants and the research team were checked for body temperature and used hand sanitizers. Game-based circuit training programs are presented in Table 2.

### Table 2

Game-based circuit training program of pencak silat athletes

<table>
<thead>
<tr>
<th>Workstations</th>
<th>Game</th>
<th>Playing method</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Workstations 1</td>
<td>Lifting Box</td>
<td>Athletes are required to carry the box using both hands at a distance of 3 meters.</td>
<td>This game is carried out for 2 minutes and 1 minute rest.</td>
</tr>
<tr>
<td>Workstations 2</td>
<td>Jump over old tires</td>
<td>Athletes are required to jump over old tires using both feet.</td>
<td>This game is carried out for 3 minutes and 1 minute rest.</td>
</tr>
<tr>
<td>Workstations 3</td>
<td>Throwing old tires</td>
<td>Athletes are required to throw old tires as far as possible.</td>
<td>This game is carried out for 4 minutes and 2 minutes rest.</td>
</tr>
</tbody>
</table>

### Instrument

#### Mental Health

The instrument for measuring mental health was the DASS-21 with three subscales: (1) depression related to hopeless, passivity, low-self-esteem, dysphoria and anhedonia, (2) anxiety related to feeling of situational anxiety and autonomic arousal and (3) stress related to nervous arousal, relaxing, irritable, and upset [23]. According to Ghani, Zainuddin, Ibrahim, Hashim & Van [51], the depression subscale consisted 3, 5, 10, 13, 16, 17 and 21 question items. Depression with normal levels (0-9), mild (10-12), moderate (13-20), severe (21-27) and very severe (28-42). Anxiety subscale with question items from 2, 4, 7, 9, 15, 19 and 20. Anxiety level was categorized as normal (0-6), mild (7-9), moderate (10-14), severe (15-19), and very severe (20-42). As for the stress subscale consisted 2, 4,
7, 9, 15, 19, and 20 question items. Stress level was categorized as normal (0-10), mild (11-18), moderate (19-26), severe (27-34) and very severe (35-42). Based on previous studies, this instrument has a Cronbach's coefficient of depression = 0.81, anxiety = 0.78 and stress = 0.88. To fill this instrument, you can use a Likert scale of 0 = never, 1 = almost never, 2 = sometimes, 3 = quite often and 4 = very often.

**Fundamental Movement Skills**

Instruments that used to measure fundamental movement skills was Gross Motor Development Test. These test items included locomotor and object control tests [1]. TGMD-2 were completed with performance criteria. For example, criteria for locomotor motion: if running, leap, jumping, horizontal jump was according to the assessment norms, then it got score from 1 to 4, while if it did not according the assessment norm it got score of 0. There were three performance criteria for catching: a) the preparatory phase in which the hands were in front of the body and the elbows were bent, b) the arms were outstretched while reaching the incoming ball, and, c) the ball was caught only with hands. Each student tried two trials for each movement skill and it was assessed based on performance criteria. The total score of the children (the sum of their individual scores) was calculated [35]. This instrument has a Cronbach Alpha reliability coefficient of 0.87 and a validity coefficient scale of 0.85 in this study.

**Data Analysis**

Data obtained from the mental health and fundamental movement skills tests results were processed through IBM SPSS version 25.0 (Armonk, NY: IBM Corp), with the following steps: (i) testing data normality (Kolmogorov-Smirnov), (ii) descriptive statistics (mean, standard deviation), (iii) while the Paired Sample t-test was used to test the difference in the pretest-posttest scores on mental health and fundamental movement skills in the experimental and control groups. The level of significance was p<0.05 [52].

**Results**

The normality test result was normally distributed (Table 3). Table 4 shows the statistical descriptive tests results. While the Paired sample t-test result shows that game-based circuit training had a significant effect on changes mental health and fundamental movement skills levels which became better in elite athletes (p<0.05) (Table 5) and amateurs (p<0.05) (Table 6), but there was no significant effect in the control group (p>0.05).

*Table 3*

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Experimental Group</th>
<th>p</th>
<th>Control Group</th>
<th>p</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mental Health</td>
<td>Pre-Post</td>
<td>0.114</td>
<td>Pre-Post</td>
<td>0.133</td>
<td>Normal</td>
</tr>
<tr>
<td>Fundamentals</td>
<td>Pre-Post</td>
<td>0.155</td>
<td>Pre-Post</td>
<td>0.112</td>
<td>Normal</td>
</tr>
</tbody>
</table>

*Table 4*

Descriptive Statistics of indicators of the mental health and fundamental movement skills of pencak silat athletes

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Experimental Group</th>
<th>Control Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male (n =10)</td>
<td>Female (n =10)</td>
<td>Male (n =10)</td>
</tr>
<tr>
<td>Pre</td>
<td>Post</td>
<td>Pre</td>
</tr>
<tr>
<td>$\bar{x}_S$</td>
<td>$\bar{x}_S$</td>
<td>$\bar{x}_S$</td>
</tr>
</tbody>
</table>

Mental Health (points)

- Depression: 30.80(2.53), 22.20(2.34), 23.20(2.04), 16.80(2.61), 31.10(3.14), 29.50(4.64), 26.70(2.45), 27.80(4.26)
- Anxiety: 26.10(3.51), 12.90(1.44), 18.40(1.57), 13.30(0.823), 32.60(2.06), 31.20(3.01), 19.60(3.20), 17.40(4.40)
### Differences in pretest-posttest scores on mental health, fundamental movement skills for elite pencak silat athletes

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Experimental Group (n = 10)</th>
<th>Control Group (n = 10)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre-Post</td>
<td>t</td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>Female</td>
</tr>
<tr>
<td>Stress</td>
<td>28.70(1.41)</td>
<td>18.90(0.994)</td>
</tr>
<tr>
<td></td>
<td>1.70(0.483)</td>
<td>3.80(0.422)</td>
</tr>
<tr>
<td>Object Control</td>
<td>1.40(0.699)</td>
<td>3.10(5.68)</td>
</tr>
</tbody>
</table>

### Differences in pretest-posttest scores on mental health, fundamental movement skills for amateur pencak silat athletes

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Experimental Group (n = 10)</th>
<th>Control Group (n = 10)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre-Post</td>
<td>t</td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>Female</td>
</tr>
<tr>
<td>Mental Health (points)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depression</td>
<td>8.60(3.56)</td>
<td>7.628</td>
</tr>
<tr>
<td>Anxiety</td>
<td>13.20(3.58)</td>
<td>11.647</td>
</tr>
<tr>
<td>Stress</td>
<td>9.80(1.03)</td>
<td>30.006</td>
</tr>
</tbody>
</table>

| Fundamental Movement Skills (points) |
| Locomotor          | 2.10(7.738) | 9.000 | 0.000 | 2.00(4.71) | 13.416 | 0.000 | 0.300(6.75) | 1.406 | 0.193 | 200(7.89) | 0.802 | 0.443 |
| Object Control     | 1.70(6.75) | 7.965 | 0.000 | 2.20(6.32) | 11.000 | 0.000 | 0.200(7.89) | .802 | 0.443 | 200(6.32) | 1.000 | 0.343 |

### Table 5

### Table 6
Discussion

The purpose of this study was to investigate the effect of game-based circuit training in changing the mental health and fundamental movement skills levels of pencak silat athletes.

This study has obtained several findings. First, the effect of a game-based circuit training program could change the mental health level became better in the experimental group. This is because circuit training provided a variety of game activities at each workstation, so that athletes felt happy and their mental health level gradually decreases [53]. For example, athletes who initially had high levels of depression, anxiety and stress began to decline because they enjoyed the program presented and forgot all the problems they experienced [54]. According to Mujriah et al [1], activities in form of game had a positive value to change the affective and psychomotor domains became better. Basically, physical activity which interesting, fun, non-competitive characteristics [23] and presents a wealth of motion has the potential to have a positive impact in changing the quality of mental health [55, 56, 57]. The result of this study was in line with a study conducted by Saavedra, Kristjánsdóttir, Gunnarsson, & García-Hermoso [58], who reported that the application of circuit training to 47 participants was proven to reduce levels of depression, anxiety and stress. However, different findings were shown in the control group, the athletes did not experience significant changes in their mental health.

Second, the circuit training also has the capability to change fundamental movement skills levels became better in athletes in the initially low experimental group. This is because the games included in each workstation provided motion experiences for athletes, so that their fundamental movement skills slowly developed [50]. Previous studies reported similar findings, the game-based activities, such as ball games, basic movements games positively increased the fundamental movement skills level [59]. Basically, the main advantage of a game-based circuit was attracted athletes to be more interested and actively involved in the training process [57]. In addition, another advantage was their willingness to continuously perform the exercises in the workstations until the specified time was completed [44]. Different results were found in the control group which showed no changes in fundamental movement skills levels.

Conclusions

Based on the results of this study, it can be concluded that the game-based circuit training program which included lifting box, jump over old tires, throwing old tires, throwing ball into the basket, running to take the flag and kicking the ball into the target, had been proven could provide a positive effect on changing the mental health and fundamental movement skills level of martial arts athletes. This research contributes to the development of training in pencak silat, and athletes can use this training continuously. Apart from that, this study still has limitations in terms of only included one type of sports, so the effect of game-based circuit training on athletes from other sports such as soccer, basketball, volleyball, handball, swimming or other is unknown. In terms of future work, it would be interesting to compare circuit training with tabata training.

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Conflict of interest

All authors confirm that there is no conflict of interest in this study.

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