

The Effectiveness of Circuit Training on Agility and Body Mass Index Among Secondary School Students in Putrajaya



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ABSTRACT: The aim of this study was to determine whether a modified circuit training program for less fit secondary school students based on body mass index could improve their fitness levels. The study was designed as a pre and post quasi-experimental, with 20 students randomly selected, participating in eight weeks of circuit training program. The results showed that there was no significant difference in respondents' body mass index before and after ($p=0.39$) circuit training. However, there is a slight positive correlation on students' agility ($r>0.9$). This suggests that respondents' fitness levels has a tendency to increase with a frequent implementation of circuit training program. In conclusion, this study suggests that modified circuit training can improve the agility of less fit students if implemented continuously.

KEYWORDS: circuit training program, student fitness and agility, Segak test, Illinois test, secondary school

INTRODUCTION

Circuit training is one of the exercise methods commonly used to test physical fitness. This exercise was introduced by R.E. Morgan and G.T. Adamson in 1953 at the University of Leeds, England. Circuit training involves specific stations and is performed within a predetermined time frame. One circuit is completed when the participant has completed all activities. It is an exercise where participants perform several activities sequentially or in one circuit. The number of activities chosen ranges from eight to twelve, involving different muscle groups. Circuit training is a fitness exercise method aimed at increasing muscle strength, endurance, and cardiovascular endurance (Sorani, 1976). Circuit training consists of several selected, arranged, and numbered exercise activities at specific locations. Each numbered location is called a station, making it easier for participants to move from one station to another in the circuit according to the predetermined sequence. Participants are considered to have completed one set of exercises or one circuit after completing one round of training. The number of sets of exercises required depends on the individual's needs and abilities. Circuit training is a method of physical conditioning where the overload principle is applied to muscles and the respiratory system within a limited time period. The number of stations and types of activities at each station are arranged based on the athlete's fitness level, age, type of game or sport, and the fitness components to be developed. Factors to consider in circuit training include time and repetition factors.

Lack of physical activity can lead to exposure to dangerous diseases such as lung-related diseases and increased cholesterol in the heart's arteries. Additionally, the accumulation of body fat and muscle weakness can affect body posture and lead to physical problems such as orthopedic disabilities. Therefore, human physical health needs to be improved through activities that can enhance their respective functions. According to the WHO Global Recommendations on Physical Activity for Health, recommendations for the frequency of physical activity can be divided into three age categories. The first age category starts from 5 years old to 17 years old. The second age category starts from 18 years old to 64 years old, and the last category is 65 years old and above. Physical fitness based on health refers to muscle strength, cardiovascular endurance, body composition, flexibility, and muscle endurance. While fitness based on motor performance refers to speed, agility, muscle power, balance, coordination, and reaction time.

According to Helen Tan (2002), physical fitness is often associated with an individual's ability to use their leisure time, how they resist hypokinetic diseases, and how they cope with fitness. The improvement of a set of fitness activities is designed and implemented to help students achieve optimal fitness results according to established procedures and norms. Therefore, a standard assessment known as the National Physical Fitness Standard Assessment Program for Malaysian School Students (SEGAK) was introduced.

In the current trend of secondary students, they do not actively participate in sports activities, especially during Physical Education classes, where they tend to prefer indoor games and dislike engaging in physical activities. This can be observed from the results of National SEGAK Test, where researchers found that many students were less fit based on their body mass index (BMI) and cardiovascular endurance. Therefore, in this study, the researcher attempts to examine the effectiveness of circuit training on

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less fit on secondary school students, and whether there are differences after these students undergo circuit training in terms of their body mass index.

METHODOLOGY

This study employed an experimental research design to ascertain the effectiveness of circuit training on body mass index. This study employs randomised sampling method. Twenty students from various school in Federal Territory of Putrajaya, were participated in this study. Weight, height, and BMI were recorded.

RESEARCH PROCEDURE

Prior and after 8 weeks of circuit training program, body mass index, weight and height were recorded. In this protocol, participants commenced 8 weeks of circuit training and was conducted according to the protocol established by the researcher. Respondents were divided into two groups according to gender during the measurement process. The test was conducted simultaneously. Respondents received explanations from the researcher on how the test would be conducted, the protocol to be followed, and how measurements would be taken. Respondents must understand the principles and protocols required to conduct the test by observing a demonstration of the procedure or protocol before the test is conducted. The circuit training was conducted in three sessions each, over the course of eight weeks. Throughout the first four weeks, the researcher modified the circuit training to include four stations for the first session and four stations for the second session, which were selected, arranged, and numbered at specific locations.

8 weeks (3 session : 3 sets each session)	
4 weeks (first)	4 weeks (second)
1. Skipping	5. Static Jump
2. Sit Up	6. Lunges
3. Standing Broad Jump	7. Step ups
4. Push Up	8. 10 m run

DATA ANALYSIS

Illinois test score forms were distributed to 20 students, including 10 males and 10 females who were less fit. In the analysis of respondents' demographics, the researcher only focuses on 3 main sections: height, weight, and BMI. The analysis of respondents' demographics uses the Statistical Package for the Social Sciences (SPSS).

RESULTS

The results indicate no significant difference ($p=0.39$) on body mass index before and after the implementation of circuit training. The significance level is higher than $p>0.05$. Therefore, the null hypothesis H_0 is accepted. This suggests that there is no significant difference between students with less fit Body Mass Index (BMI) before and after the intervention (Table 1).

Table 1 Difference in Body Mass Index of Less Active Students Before and After Circuit Training

		N	M	SD	Levene's Test for Equality of Variances		T-test for Equality of Means		
					F	Sig.	T	df	Sig.(2-tailed)
Pre	Boys	10	19.3	1.49	2.06	0.17	0.13	18	0.9
	Girls	10	19.2	2.04					
Post	Boys	10	19.1	0.74	0.26	0.62	0.88	18	0.39
	Girls	10	18.8	0.79					

The Spearman correlation test was used to determine the relationship between before and after implementation of the Illinois agility test on the fitness of secondary students. The relationship before and after circuit training is significant ($r=1.0$, $p < 0.05$) in Table 9. Before and after circuit training, the significant p-value is 0.001. The results indicate that the significant value is lower than 0.05 ($p < 0.05$). This indicates a significant relationship between the implementation of the Illinois agility test and the fitness of secondary students. The Spearman correlation values are also shown in Table 9 ($r=0.72$). This indicates that, compared to a very strong correlation value, there is a weak positive correlation between the Illinois agility test and the fitness of students at a less fit level ($r > 0.9$, Table 2).

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Table 2 Results of the Spearman Correlation Test of the relationship between before and after performing the Illinois agility test on fitness

	N	M	SD	R	Sig.(2-tailed)
Pre	20	10.5	5.67	1.0	0.001
Post	20	10.5	5.51	0.72	0.001

DISCUSSION

The researcher conducted the Circuit Training test using the Illinois Agility Test score sheet (Getchell, 1979), which was developed by Northwest Athletics (Talent Identification Norms 2001). This test consists of eight stations in the circuit training that respondents need to complete, such as skipping, sit-ups, kangaroo jumps, tube press, two-foot hops, leg lifts, step-ups, and shuttle runs, to assess the effectiveness of circuit training on the fitness of less fit students. The test provides data on the level of physical fitness based on health for the study sample. This topic will also discuss the research findings to answer all research questions and whether the null hypothesis is accepted or rejected.

Based on the research findings, it has been shown that Form 1 students with lower fitness levels in the Segak Test have become more active after undergoing circuit training compared to before they underwent circuit training, where their overall Segak Test scores in the first round indicated a less fit level. However, after undergoing circuit training for eight weeks before the second round of the Segak Test, there has been a change in the fitness level of these Form 1 students. This can be evidenced by the analysis of their results in the second round, where almost all of them have improved their fitness level from less fit to more fit, moving from grades D to grades B and C. Data analysis in terms of mean and standard deviation indicates that the overall average fitness level of secondary students is moderate to fit, i.e., grade C. The study found that there was an improvement in the fitness level of students after participating in the training program, i.e., circuit training provided by the researcher. The study was conducted to assess the agility or fitness level of students after completing the training program for eight weeks by observing changes in their fitness status after taking the second round of the Segak Test. The study conducted is pioneering in identifying the fitness level of students using the Illinois agility test instrument in circuit training. This instrument has never been implemented in the school before.

The research findings indicate a significant relationship between before and after conducting the Illinois agility test of secondary students. This study found that circuit training can have an effect on the fitness level of Form 1 students by helping them become more active and fit compared to before joining the training program, which was assessed through the Segak Test in the first round. The results show that the fitness level of students increased during the training program they attended for eight weeks before the second round of the Segak Test. At the same time, this finding is consistent with research conducted by Corbin et al. (2000), which states that there is a relationship between physical fitness and health, including exercise frequency, healthy eating, stress management, and other factors. The study's results have shown by the researcher that providing continuous training has helped students become fitter. The study's findings on 20 less fit of secondary students. This indicate a significant relationship between the fitness of students before and after the Illinois agility test.

The researcher conducted a null hypothesis test to assess the difference in body mass index (BMI) among less fit of secondary students in round 1 and round 2 after the training program was implemented. The results showed that the body mass index of Form 1 students in the first and second rounds of the SEGAK test did not exhibit a significant difference. From these results, the researcher can conclude that an individual's fitness level does not affect their BMI, regardless of whether they are more fit or not. This is because it depends on each student's fitness level regardless of their BMI. This also affects the effectiveness of circuit training on students' fitness.

IMPLICATION

The implications of this study provide a comprehensive overview of the effectiveness of circuit training on less fit Form 1 students at SMK Putrajaya Presint 11(2) based on their body mass index (BMI) in the SEGAK 2023 test. The study results indicate that circuit training has a significant effect and relationship with the physical fitness level variables of Form 1 students at SMK Putrajaya Presint 11(2). This suggests that the physical fitness level of the respondents improved, as evidenced in the second round of the SEGAK examination, when they participated in the training program consistently for eight weeks.

Furthermore, the study found that the training program provided by the researcher enhanced the fitness level of the students. After eight weeks of circuit training, the students' fitness levels were assessed before and after. The results showed that the training program improved the students' fitness levels. The study has some limitations, particularly regarding sampling. This is because the sample size can affect the study's results and findings. The results obtained would be more robust with a larger sample size. The study's findings indicate that an eight-week training regimen can improve fitness levels. If the training is based on carefully designed

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exercise principles that measure and test fitness elements more accurately, a meticulously planned and tailored training program has the ability to enhance specific fitness aspects. Based on the analysis of the study, the fitness of the students has increased.

CONCLUSION

Circuit training can have a significant positive impact on students if activities are chosen and designed correctly. Over time, agility, skills, motivation, and sportsmanship can be improved. This study aimed to determine whether circuit training, before and after implementation, changes the body mass index (BMI) and fitness level of individuals. According to the lower fitness level structure in the SEGAK test, students were more active after circuit training compared to before, where their overall SEGAK test scores in the first round were lower. Furthermore, this study found that circuit training can affect the fitness level of Form 1 students by helping them become more active and fit compared to before they started the training program, as assessed through the SEGAK test in their first round. This study can serve as a guideline and reference for various organizations. To ensure continued relevance, proposals for further research are essential. In conclusion, the study's objectives have been met through descriptive and inferential analysis. This study has provided answers to all research questions and has had a positive impact.

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