THE EFFICACY OF CIRCUIT TRAINING IN INCREASING MUSCLE ENDURANCE AMONG GRADE FIVE MALES IN A PRIMARY SCHOOL

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ABSTRACT

This study investigates the effectiveness of circuit training in enhancing muscle endurance among fifth-grade boys in a primary school setting. 50 male students were randomly selected, with 25 assigned to the control group and the remaining 25 to the experimental group. The intervention program, consisting of shuttle runs, sit-ups, and burpees, was conducted for 8 weeks. An independent t-test showed a significant difference ($p<0.05$) between the mean scores of the control and experimental groups. The study contributes to existing knowledge on the benefits of circuit training for muscle endurance among young boys. The intervention program targeted various muscle groups and improved overall endurance. The use of intact sampling ensures the study's representativeness of the broader population of standard five boys in primary schools. The random assignment of students to control and experimental groups minimizes potential bias and increases the reliability of the study's results. These findings can be used by physical education instructors, school administrators, and policymakers to develop targeted exercise programs that enhance the physical fitness levels of primary school students.

Keywords: Circuit Training, Muscle Endurance, School Children, Primary School Students

INTRODUCTION:

Physical education (PE) is a mandatory component of primary school curricula, necessitating the participation of all pupils. However, there is a concern regarding whether the current PE syllabus adequately addresses the assessment of pupils' muscle endurance during a 30-minute period. It has been observed that the existing PE program in schools fails to effectively enhance the muscle endurance of pupils. Given that muscle development and endurance are crucial for achieving success in various sports events, as mandated by the Malaysian Ministry of Education, it is imperative to prioritize the improvement of pupils' muscle endurance. This will enable them to actively participate and excel in their preferred sports disciplines. The efficacy of the current PE syllabus in assessing and improving pupils' muscle endurance remains questionable. Muscle endurance refers to the ability

of muscles to sustain prolonged contractions over a specified period. It is an essential component of physical fitness and plays a significant role in athletic performance and overall health. The failure of the current PE program to adequately address and enhance muscle endurance suggests a need for reevaluation and modification of the existing syllabus. The Malaysian Ministry of Education recognizes the importance of muscle enhancement training in enabling pupils to excel in sports events. These training programs aim to develop not only muscular strength but also the ability to sustain muscular contractions over extended periods. By targeting specific muscle groups and employing progressive overload principles, these training regimens can significantly improve muscle endurance, thereby equipping pupils with the physical capabilities required for their desired sports activities. To ensure the comprehensive development of pupils' muscle endurance, it is crucial to incorporate appropriate training methods and exercises within the PE syllabus. This may involve a combination of aerobic exercises, resistance training, and circuit training, tailored to the specific needs and age group of the pupils. By implementing a well-designed and progressive training program, schools can provide pupils with the necessary tools to enhance their muscle endurance effectively. By focusing on the improvement of pupils' muscle endurance, schools can foster a culture of physical fitness and sports participation. This, in turn, promotes overall health and well-being among pupils, instills discipline, and encourages an active lifestyle from an early age. Moreover, the inclusion of scientifically proven training methods within the PE syllabus ensures that pupils receive evidence-based physical education, enabling them to reach their full athletic potential. The current PE syllabus in primary schools may not effectively assess and enhance pupils' muscle endurance. However, recognizing the importance of muscle enhancement for sports success, it is crucial to prioritize the development of pupils' muscle endurance through appropriate and scientifically supported training methods. By doing so, schools can empower pupils to excel in their preferred sports disciplines and foster a culture of physical fitness and well-being. Malathi (2003) and Balasubramaniam (2011) conducted studies on female and male students in Malaysia, focusing on physical fitness components such as cardiovascular endurance, muscular endurance, flexibility, strength, and fat composition. Balasubramaniam's study showed a positive change in cardiovascular components in male students. However, there is limited research on primary school pupils in Malaysia, particularly circuit training and its impact on muscular endurance. This study aims to investigate the efficacy of additional exercises in improving muscular endurance among male pupils in Year 5. The findings can contribute to existing knowledge on physical fitness in primary school settings and provide insights into targeted exercises for specific muscle groups in the upper extremities. The study aims to inform physical education curriculum development and assist educators in designing evidence-based interventions to enhance muscular endurance among primary school pupils.

Circuit training

Circuit training, introduced by Morgan and Anderson in the 1950s at the University of Leeds, involves a series of training activities arranged in a specific sequence. It aims to build muscle and cardiovascular fitness, utilizing principles such as varying weights and repetitions to assess behavioral changes over time (Morgan RE& Adamson GT, 1961). The key principles of circuit training include tailoring exercises to individual fitness levels, aligning activities with training objectives, incorporating all body parts in a non-consecutive manner, and ensuring correct technique implementation (Morgan RE& Adamson GT, 1961). Circuit training has been found to increase fitness levels related to health, including aerobic and anaerobic power, making it suitable for school pupils. It can be a valuable tool in primary school physical exercise programs and sports training for teams (Kravitz LH et.al., 1992). By incorporating challenging sports skills within the circuit, players' excitement and participation can be enhanced. The sequencing of activities should engage all muscle groups for optimal effectiveness (Foster DR, &Overholt JL, 1994). Circuit training was initially developed by Morgan and Adamson in 1953 at the University of Leeds (Stone MH et.al., 2007). It is particularly beneficial for short-term preparatory phases and is well-suited for novice groups involved in weightlifting-based sports training (Fleck SJ 2004). circuit training is a versatile and effective exercise method that combines various activities to enhance muscle and cardiovascular fitness. It can be tailored to individual fitness levels and objectives, and its application is suitable for school pupils, team training, and short-term preparatory phases in sports programs.

METHODOLOGY:

The researchers have employed a quasi-experimental method for this study, incorporating pretest and posttest assessments to compare the treatment group and the control group (Gay LR.1992). The treatment group received circuit training as an additional training component, allowing for a comparison between the treatment and control groups. It is important to note that the non-random sample selection was a limitation of this research, attributable to the differing scheduling of physical education (PE) classes rather than a deliberate sampling strategy. In primary schools, PE lessons are organized by classes rather than by samples. The study spanned a duration of 8 weeks. In the first week, a pretest was conducted to collect data on muscular endurance for both groups. The teaching of PE followed the planned curriculum, but the treatment group underwent an additional intensity program. This intervention program was implemented for 8 weeks during PE classes, aiming to determine whether a significant difference exists between the treatment and control groups. It is worth noting that the quasi-experimental design was chosen due to the constraints of conducting research within the primary school setting, where randomization of samples may not be feasible. Despite this limitation, the study seeks to assess the impact of circuit training as an additional training component on muscular endurance, providing valuable insights into the effectiveness of such interventions within the context of primary school physical education.

STATISTICAL ANALYSIS:

Descriptive statics mean and standard deviation was to observed the general overview of muscular endurance of primary school children. And to compare the mean difference of pre and post-test paired t-test was used. And SPSS was used to for the statistical calculation.

Table 1 Descriptive Statistic for the Pre-Test and Post Test for the Control and Treatment Groups

Component			Control		Treatment	
Muscle Endurance		N	Pre-Test	Post Test	Pre-Test	Post Test
	Mean	25	3.33	3.39	3.35	12.53
	SD	25	2.03	2.06	3.05	1.29

Table 1 presents the descriptive results, specifically the mean scores and standard deviations, for the pretest and posttest measurements of the control and treatment groups in relation to the muscle endurance component. These findings provide an overview of the data and highlight the central tendency of each group.

Table 2 Paired t-Test analysis between the Pre-Test and Post Test in the Control Group

Treatment Group	Mean	Mean Difference	SD	p- value
Pre-Test	3.33	0.06	2.03	0.11
Post-Test	3.39		2.04	

Table 2 displays the mean scores for the pretest and posttest in the control group. To determine the significance of any differences between these mean scores, a paired t-test was conducted as an inferential statistical analysis. The results, as shown in Table 4, indicated a p-value of 0.11 ($p<0.05$). These findings suggest that there is no significant difference in muscle endurance between the pretest and posttest within the control group.

Table4: Paired t-Test analysis between the Pre-Test and Post Test in theTreatment Group

Treatment Group	Mean	Mean Difference	*SD*	*p- value*
Pre-Test	3.35	9.18	3.05	.000
PostTest	12.53		1.29	

Table 4 presents the mean scores for the pretest and posttest measurements in the treatment group. These scores were subjected to a paired t-test to examine whether there exists a significant difference between the mean scores of the pretests and posttests within the treatment group. The results of Table 4 indicate that the mean score for the pretest is 3.35, with a standard deviation of 3.05, while the mean score for the posttest is 12.53, with a standard deviation of 1.29. The mean difference between the pretest and posttest scores is -9.18. Analysis of the paired t-test reveals a p-value of 0.00 ($p<0.05$). Thus, the findings of this analysis demonstrate a significant difference between the pretest and posttest scores within the treatment group, indicating an improvement in muscle endurance.

DISCUSSION AND CONCLUSION:

The purpose of this research was to evaluate the effectiveness of incorporating a circuit training intervention program within the physical education (PE) curriculum in increasing muscular endurance among Year 5 pupils in a primary school setting. The findings of the study indicated that implementing an 8-week circuit training program resulted in a significant improvement in muscular endurance among primary school pupils. This implies that the inclusion of an additional exercise method, such as circuit training, during PE sessions can yield the intended effects.Based on the positive outcomes observed, it is recommended that circuit training exercises be integrated into the PE curriculum across all primary schools to enhance the muscular endurance of pupils. An advantage of circuit training is that it does not require specialized equipment, making it accessible and cost-effective. Additionally, it poses minimal risk of injury compared to certain other physical activities. Furthermore, circuit training can be completed within a relatively short time frame, typically lasting only three minutes. Thus, integrating circuit training into the primary school PE syllabus offers numerous benefits for pupils, allowing them to improve their muscular endurance while optimizing the use of limited time resources.By incorporating circuit training exercises into PE sessions, primary schools can contribute to the holistic development of pupils, promoting their overall physical fitness and well-being. This intervention not only enhances muscular endurance but also cultivates a positive attitude toward physical activity and instills healthy habits from an early age. As a result, integrating circuit training into the PE syllabus aligns with the goal of fostering lifelong fitness and promoting a physically active lifestyle among primary school pupils.

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