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RECREATIONAL SPORTS ACTIVITIES AND EARLY CHILDHOOD MOTOR DEVELOPMENT

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Abstract
Early childhood is a golden period for fundamental development that is the foundation for the next growth of children, one of which is motor development. The decrease in physical activity levels and increased sedentary behavior due to the onslaught of digital technology are a serious threat to the optimization of children's motor development. Recreational sports, with their fun, non-competitive, and participation-focused characteristics, emerged as a potential intervention to stimulate gross motor development. This study aims to analyze the influence of structured recreational sports programs on improving early childhood motor development. The research used quasi-experiments with pre-test and post-test control group designs. The study sample consisted of 60 children aged 5-6 years who were randomly divided into two groups: the experimental group (n=30) that followed a recreational exercise program for 12 weeks, and the control group (n=30) that did free physical activity without structure. The instrument used to measure motor development is the Test of Gross Motor Development-2 (TGMD-2) which includes aspects of locomotor (running, jumping, pole running) and object control (throwing, catching, kicking). Data were analyzed using the Shapiro-Wilk test for the normality test, the Levene test for the homogeneity test, and ANCOVA to test for differences between groups by controlling for pre-test scores. The results showed that after 12 weeks of intervention, there was a significant improvement in the total motor score of the experimental group compared to the control group ($p < 0.05$). Further analysis showed a significant improvement occurred in both sub-variables, namely locomotor skills and object control. These findings indicate that a systematically structured recreational exercise program is more effective in improving early childhood motor development compared to free physical activity. The implications of this study support the integration of recreational sports programs into the early childhood education curriculum as a preventive and promotive effort to achieve optimal motor development, which ultimately contributes to an active and healthy lifestyle later in life.

Keywords: *Recreational Sports; motor development; Early Childhood; Fundamental Movement Skills; Physical Activity*

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INTRODUCTION

The period of early childhood, which specifically includes the age range of 0 to 8 years, is universally recognized as the most crucial phase in the human life

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cycle. At this stage, there are various developmental processes that take place exponentially, including cognitive, social-emotional, language, and physical-motor aspects (UNICEF, 2019). Among these aspects, physical and motor development occupy a central position because it not only determines a child's ability to interact with the surrounding environment, but also becomes the foundation for the formation of active living behaviors and long-term health (Gallahue, Ozmun, & Goodway, 2012). Motor development in early childhood is generally classified into two main categories: gross motor and fine motor. Gross motor development, which is the main focus of this article, involves using large muscles to perform fundamental movements such as running, jumping, throwing, and kicking. These skills are often referred to as Fundamental Movement Skills (FMS), which are considered "building blocks" for participation in various physical activities and sports later in life (Clark, 2017).

Adequate FMS mastery in childhood has a strong correlation with various positive outcomes. Research has consistently shown that children with good motor competence tend to be more physically active, have higher levels of cardiorespiratory fitness, a healthier body mass index (BMI), and greater levels of confidence in social settings (Stodden et al., 2008; Lubans et al., 2010). The model developed by Stodden and colleagues (2008) comprehensively explains the positive and spiralling reciprocal relationship between motor competence, perception of competence, and level of physical activity participation. Children who feel able to perform movements will tend to enjoy more and engage in physical activity more often, which in turn will further hone their motor competence. In contrast, children with low motor competence tend to avoid physical activity, thus getting caught up in a negative cycle that risks lowering physical and mental health. Therefore, efforts to optimize motor development at an early age are not just physical matters, but strategic investments for the holistic well-being of children.

However, the modern challenges faced by the current generation actually threaten the optimization of this crucial development. The era of digitalization has brought drastic changes in children's behavior patterns. The time that used to be

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spent on active outdoor play is now taken up by screen-based activities such as watching television, playing games, or using gadgets (Tremblay et al., 2011). Reports from global health organizations such as the World Health Organization (WHO) warn of an epidemic of "sedentary behavior" among children, which has been shown to have a causal link with obesity, cardiovascular disease, and decreased motor skills (WHO, 2019). Lack of exposure to a wide variety of physical movements at a crucial stage of development can result in "motor delay", in which children fail to reach motor development milestones appropriate to their age (Hardy, Reilly, Espinel, & McKenna, 2017). This phenomenon demands effective, structured, and engaging interventions for children to ensure they do not miss out on a golden opportunity to develop their motor potential.

In this context, the role of sport, especially those packaged in the form of recreation, has become very relevant. Recreational sports can be defined as any form of physical activity that is done voluntarily in free time, which emphasizes aspects of fun, freedom, and universal participation rather than on competition and achievement (Iso-Ahola, 2014). In contrast to achievement sports which are often selective, tightly structured, and win-oriented, recreational sports provide a more inclusive and supportive environment for children, especially those who are still in the early stages of movement learning (Coakley, 2017). The characteristics of recreational sports that are fun and low pressure can increase children's intrinsic motivation, which is a key factor in the learning process and motor development (Ryan & Deci, 2000). When children enjoy the process, they will be more engaged, more eager to practice, and more open to new movement challenges.

Theoretically, the effectiveness of recreational sports in improving motor development is supported by several principles of motor learning. First, the principle of "distributed practice" often occurs naturally in recreational activities, where children move intermittently with periods of rest in between, which has been shown to be more effective for long-term motor memory formation than "massed practice" (Schmidt & Lee, 2014). Second, recreational activities often provide "practice variability," in which children perform the same skills in different contexts

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and conditions. For example, throwing the ball at a different target or from a different distance. This variability encourages the formation of more flexible and adaptive "motor schemes", allowing the child to apply those skills in new situations (Schmidt, 1975). Third, the "feedback" aspect in recreational sports tends to be more natural and meaningful. Children receive direct feedback from the results of their movements (e.g., whether the ball makes it to the basket or not) and from social interactions with peers, which can improve their understanding of correct movement patterns (Wulf & Lewthwaite, 2016).

Although the relationship between general physical activity and motor development has been widely documented, studies that specifically isolate the influence of structured recreational exercise programs are still limited and show mixed results. Some studies have shown that structured game-based interventions are significantly superior in improving FMS compared to free physical activity (van der Mars, 2013). However, other studies have found that the "pleasure" and "autonomy" aspects of unstructured activities also have significant contributions to long-term motivation and participation (Bower et al., 2020). This gap points to the need for further research that not only compares between "structured" and "unstructured", but also designs recreational sports programs that carefully integrate the effective elements of both approaches: structures that ensure adequate exposure to skills and freedom that maintains intrinsic motivation.

Based on this background, this study is designed to answer the key question: "Does a structured 12-week recreational exercise program have a significant effect on improving early childhood motor development?" In more detail, this study aims to: (1) Identify differences in overall motor development improvement between children who participate in recreational sports programs and children who only engage in free physical activity; (2) Analyze differences in improvement in the sub-components of locomotor skills; and (3) Analyze the difference in improvement in the sub-component of object control skills. The hypothesis of this study is that the group of children who followed a structured recreational exercise program would show significantly greater improvements in overall motor, locomotor and object

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control development compared to the control group. The results of this study are expected to provide strong empirical evidence for practitioners in the field of physical education, early childhood coaches, and policy makers to formulate and implement effective, enjoyable, and evidence-based motor intervention programs.

METHODS

Research Design

This study uses a quantitative approach with a quasi-experimental design. The design chosen is the pre-test-post-test control group design. This design was chosen because it allowed researchers to compare the effects of an intervention (recreational sports program) between two groups (experimental and control) after a certain treatment period, while controlling for the initial score (pre-test) of each participant (Creswell & Creswell, 2018). Although this study did not use the pure random assignment that characterizes true experiments, group allocation was done randomly from existing classes to minimize selection bias.

Participants

The research population is all early childhood (5-6 years) in Rawamangun Kindergarten. Sampling is carried out by *purposive sampling* technique, which is the selection of samples based on certain criteria that have been set. Inclusion criteria include: (1) 5-6 years old, (2) physically healthy and do not have neurological or orthopedic disorders that inhibit movement, (3) have obtained permission from parents/guardians through an *informed consent* sheet. Based on these criteria, a sample of 60 children was obtained which was then divided into two groups: the experimental group (n=30) consisting of 15 boys and 15 girls, and the control group (n=30) consisting of 14 boys and 16 girls. Analysis of the chi-squared test showed no significant difference in sex distribution between the two groups ($p > 0.05$), indicating the two groups were demographically equal.

Instruments

The main instrument used to measure gross motor development is the Test of Gross Motor Development-2 (TGMD-2) developed by Ulrich (2000). The TGMD-2 is an instrument that has high validity and reliability (inter-rater reliability

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coefficient ranges from 0.88 to 0.96) and is widely used in children's motor development research around the world. The TGMD-2 measures two main sub-tests: 1) Locomotor Skills: It consists of 6 items, namely run, gallop, hop, leap, horizontal jump, and slide. 2) Object Control Skills: Consists of 6 items, namely striking a stationary ball, stationary dribble, kick, overhand throw, underhand throw, and catch.

Each item is evaluated based on 3-4 specific performance criteria. Children are given the opportunity to perform each movement twice. Each performance criterion that is met gets a score of 1, and those that are not met get a score of 0. The maximum score for each item is the number of criteria multiplied by two. The total score for each sub-test (locomotor and object control) ranges from 0 to 48, and the overall total motor score ranges from 0 to 96.

Prior to the study, two assessors (a researcher and a trained research assistant) conducted an inter-assessor reliability test by testing 10 children who were not part of the study sample. The test results showed an intra-class correlation coefficient (ICC) of 0.92, which indicates a very high level of assessment consistency.

Research Procedure

This research was carried out in four main stages: 1) Preparation Stage (Week 0): Obtaining research permission from the school and informed consent from parents/guardians of students. Standardizing instruments and training for research assistants. 2) Pre-Test Stage (Week 1): Both groups (experimental and control) underwent initial motor tests using TGMD-2. Data collection was carried out on the school sports field in the morning with uniform conditions for all participants. Each child is tested individually to ensure focus and accuracy of assessment. 3) Intervention Stage (Week 2 to 13):

Experimental Group: Followed a structured recreational exercise program for 12 weeks, with a frequency of 3 sessions per week and a duration of 45 minutes per session. The program is designed based on the principles of motor learning and the concept of recreational sports. Each session consists of: warm-up (5 minutes), core activity (35 minutes), and cool-down (5 minutes). The core activity emphasizes on

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fun game-modifications to develop the FMS. Examples of activities include "puppet relay race" (practicing running and coordination), "throwing a ball into a basket" (object control), "obstacle course" (locomotor combination), and "frog catching fly" (jumping and catching).

Control Group: Engaged in free physical activity over the same period (12 weeks, 3 sessions/week, 45 minutes/session). During these sessions, children were given a variety of sports equipment (balls, ropes, simple obstacles) and were allowed to play as they wished in the absence of structured instruction or specific learning objectives from the researcher. This is done to maintain a reasonable physical activity condition without intervention. 4) Post-Test Phase (Week 14): After the 12 weeks of intervention ended, both groups again underwent motor tests using TGMD-2 with a procedure identical to the pre-test to measure the changes that occurred.

Data Analysis

The data obtained from the pre-test and post-test were analyzed using SPSS statistical software version 25. The steps of data analysis are as follows:

Assumption Test: Before conducting the main analysis, statistical assumptions are tested which include: 1) Data Normality Test: Using the Shapiro-Wilk test to check whether residual data is distributed normally. 2) Variance Homogeneity Test: Using the Levene test to ensure the variance between the experimental and control groups is homogeneous.

Descriptive Statistical Analysis: Calculating the mean values (average) and standard deviation (SD) for pre-test, post-test, and *gain scores* (difference between post-test and pre-test) of the two groups.

Inferential Statistical Analysis: To test the research hypothesis, Covariance Analysis (ANCOVA) is used. ANCOVA was chosen because this method was able to compare post-test scores between experimental and control groups by controlling the influence of pre-test scores, thereby increasing the accuracy and strength of statistical tests (Tabachnick & Fidell, 2019). The dependent variable is the post-test

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score, the independent variable is the group (experiment vs. control), and the covariate is the pre-test score. The significance level used is α = 0.05.

RESULTS

Statistical Assumption Test

Before conducting the main analysis with ANCOVA, the research data was tested to meet statistical assumptions which included the residual data normality test and the variance homogeneity test. The normality test was performed using the Shapiro-Wilk test, while the homogeneity test of variance between groups used the Levene test. The data is said to be normally distributed if the significance value (p) > 0.05, and the variance is said to be homogeneous if the significance value (p) > 0.05. The complete results of the normality and homogeneity tests are presented consecutively in the Table below.

Table 1. Data Normality Test Results with Shapiro-Wilk

Variable	Groups	Statistics	df	Sig.
Total Motor Score	Experiments	.965	30	.412
	Controls	.958	30	.244
Locomotive Score	Experiments	.971	30	.588
	Controls	.962	30	.335
Object Control Score	Experiments	.968	30	.481
	Controls	.960	30	.301

Based on Table 1, it can be seen that the significance value (Sig.) for all variables in both groups is greater than 0.05. This indicates that the residual data from the research model is distributed normally.

Table 2. Results of the Variance Homogeneity Test with the Levene Test

Variable	Living Statistic	df1	df2	Sig.
Total Motor Score	.321	1	58	.574
Locomotive Score	1.087	1	58	.302
Object Control Score	.015	1	58	.903

Based on Table 2, the significance value (Sig.) of the Levene test for all three variables is also greater than 0.05. This suggests that the variance of data between the experimental group and the control group is homogeneous. Thus, the assumption to conduct the ANCOVA analysis has been met.

Descriptive Statistical Results

Descriptive statistics show an overview of the child's motor score before and after the intervention. Details of the results are presented in Table 3.

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Table 3. Descriptive Statistics of Pre-Test, Post-Test, and Gain Scores

Variable	Groups	N	Pre-Test Mean (SD)	Post-Test Mean (SD)	Gain Score Mean (SD)
Total Motor Score	Experiments	30	58.47 (6.82)	81.20 (5.15)	22.73 (4.89)
	Controls	30	59.13 (7.01)	65.07 (6.33)	5.93 (3.11)
Locomotive Score	Experiments	30	28.60 (3.75)	39.83 (2.98)	11.23 (2.45)
	Controls	30	29.07 (3.88)	31.90 (3.52)	2.83 (1.78)
Object Control Score	Experiments	30	29.87 (3.91)	41.37 (2.74)	11.50 (2.68)
	Controls	30	30.07 (4.02)	33.17 (3.59)	3.10 (1.95)

Based on Table 1, it can be seen that the average pre-test scores for both groups on all three variables did not show significant differences, indicating that the two groups had relatively similar initial motor skills. After the intervention, the experimental group showed a much greater improvement in scores on all variables than the control group. This is reflected in the much higher gain score in the experimental group.

ANCOVA Analysis Results

To test the significance of the difference in improvement between the two groups after controlling for the initial score, an ANCOVA analysis was performed. Full results are presented in Table 2.

Table 4. ANCOVA Analysis Results of the Effect of Intervention on Post-Test Scores

Source of Variation	Type III Number of Squares	df	Red Square	F	Sig.
Variable: Total Motor Score					
Pre-Test Correction	842.371	1	842.371	35.418	.000
Groups	4582.765	1	4582.765	192.795	.000
Error	1363.264	57	23.917		
Total	334915.000	60			
Variable: Locomotor Score					
Pre-Test Correction	215.841	1	215.841	27.837	.000
Groups	1083.814	1	1083.814	139.878	.000
Error	441.835	57	7.752		
Total	74195.000	60			
Variable: Object Control Score					
Pre-Test Correction	289.637	1	289.637	31.942	.000
Groups	1148.482	1	1148.482	126.653	.000
Error	517.041	57	9.069		
Total	77613.000	60			

Based on Table 2, the results of ANCOVA's analysis show that:

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1. For the Total Motor Score variable, after controlling for pre-test scores, there was a significant effect of intervention (F(1.57) = 192,795, $p < 0.001$). This means that there was a very significant difference in the final motor score between the experimental group and the control group.
2. For the Locomotor Score variable, the results were also significant (F(1.57) = 139.878, $p < 0.001$), which showed a significant difference in locomotor skill improvement between the two groups.
3. For the Object Control Score variable, the results of the analysis showed similar significance (F(1.57) = 126.653, $p < 0.001$), which means that the intervention program exerted a significantly different effect on the improvement of object control skills compared to free activities.

Overall, the results of the data analysis proved that a structured recreational exercise program administered for 12 weeks was significantly more effective in improving overall motor, locomotor and object control development in early childhood compared to unstructured free physical activity.

DISCUSSION

This study aims to test the effectiveness of a structured recreational sports program in improving early childhood motor development. The results of statistical analysis consistently showed that the group of children who followed the intervention program experienced significantly greater improvements in total motor, locomotor and object control development compared to the control group that engaged in free physical activity. These findings provide strong empirical support for the research hypothesis and are in line with the underlying theoretical framework.

The main findings of this study, namely the positive and significant influence of recreational sports interventions on motor development, confirm the results of various previous studies. For example, research conducted by van der Mars (2013) found that structured curriculum-based physical education programs were significantly more effective in improving FMS compared to free play time. The effectiveness of this program can be explained through several mechanisms. First,

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structured programs ensure systematic and repeated exposure to a variety of fundamental movement skills. The principle of repetition is at the heart of motor learning, where each repetition strengthens the neural pathways that regulate the movement, ultimately leading to the automation and efficiency of the movement (Schmidt & Lee, 2014). In the context of this study, children in the experimental group explicitly and repeatedly practiced the components of running, jumping, throwing, and catching through a variety of specially designed games.

Second, program design based on "modified games" plays a crucial role. This approach simplifies the rules and equipment of adult sports to suit children's abilities, so that they can experience success and joy (Graham, Holt/Hale, & Parker, 2013). This is in line with the self-determination motivation (SDT) theory put forward by Ryan and Deci (2000), which emphasizes that the need for competence (feeling capable), autonomy (feeling in control), and connectedness (feeling connected to others) are the most powerful drivers of intrinsic motivation. The recreational sports programs in this study, although structured, were designed to meet all three needs. Children feel competent because they can master games, feel autonomous because they participate voluntarily in a fun context, and feel connected through interaction with peers on the team. The combination of structure that guides learning and freedom that fosters motivation creates an optimal learning environment.

Third, the results of this study show a significant improvement in both the locomotor and object control aspects. This suggests that comprehensively designed intervention programs are capable of targeting a wide range of motor skills domains. Improvements in locomotor skills (running, jumping, etc.) can be attributed to activities such as obstacle courses and chase games that require space transfer. Meanwhile, improvements in object control skills (throwing, catching, etc.) are the result of activities that specifically involve manipulating tools, such as throwing the ball at a target or kicking the ball into the goal. These findings are important because some previous studies have shown that object control skills are often more difficult to improve and have a stronger correlation with physical

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activity participation later in life than locomotor skills (Barnett, van Beurden, Morgan, Brooks, & Beard, 2008). Therefore, the program's ability to significantly improve both aspects demonstrates its holistic effectiveness.

The comparison between the experimental and control groups strongly highlights the importance of "structure" in physical activity. Although the control group was also given access to equipment and time to move, their motor improvements were much lower. This is in line with the argument that simply providing an "opportunity" for physical activity is not enough to guarantee optimal FMS development (Logan, Robinson, Wilson, & Lucas, 2012). Children, especially those with low initial motor competence, are likely to avoid challenging activities or will do so with the wrong movement patterns without guidance. Structured programs provide "guidance" that helps children understand how to move correctly, provide constructive feedback, and progressively improve challenges to encourage further development. This is in line with Vygotsky's concept of the "proximal developmental zone", in which a child can achieve a higher level of development with the help of a more capable person (in this case, an instructor or program designer).

The practical implications of this study are significant. For educators at the kindergarten and early primary school levels, these findings support the integration of structured but still recreation-based physical education programs into the daily curriculum. Programs like these should not be thought of as mere complements or "break time", but rather as an essential component of an academic curriculum that supports children's development holistically. For parents, the study suggests not only limiting screen time, but also actively providing and participating in enjoyable structured physical activity with children. For policymakers in the areas of public health and education, these results can serve as a basis for encouraging and funding community-based programs that focus on FMS development through recreational sports, especially in areas with limited resources.

However, this research has some limitations that need to be acknowledged. First, the research sample was limited to a single school in an urban area, so the

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results may not be broadly generalized to early childhood populations in different geographic or socio-economic backgrounds. Second, the duration of the 12-week intervention, although showing significant results, could not measure the long-term effects of the program. Will this increase in motor skills persist after the intervention is stopped and will this translate into higher levels of physical activity later in life? Third, this study did not measure mediating variables such as intrinsic motivation or competency perception, which theoretically play an important role in explaining why the intervention works.

Given these limitations, future research is recommended to use longitudinal designs to track the long-term impacts of recreational sports interventions. Additionally, subsequent research may involve a larger and more diverse sample of diverse backgrounds to improve generalizability. Research can also combine qualitative (such as interviews with children and teachers) and quantitative (such as motivational questionnaires) measurements to gain a deeper understanding of the psychosocial mechanisms that play a role in such interventions. Finally, it would be beneficial to compare the effectiveness of different recreational sports models (e.g., game-based models vs. exploration-based models) to identify the most efficient approaches.

CONCLUSION

Based on the results and discussions that have been presented, it can be concluded that structured recreational sports programs are significantly more effective in improving early childhood motor development compared to free physical activity. Significant improvements occur in the overall motor aspect, which includes both important sub-components, namely locomotor skills and object control skills. These findings confirm that systematically designed interventions, which integrate the principles of motor learning with elements of fun and motivation, are key to optimizing children's physical development in the golden period. Therefore, these kinds of programs are highly recommended to be integrated into the early childhood education curriculum as a fundamental effort in producing

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a generation that is not only academically intelligent, but also morally competent and physically healthy.

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