

Effectiveness of Tactical Games Model Based on Teaching by Invitation for Enhance Learning Motivation and Physical Activity in Primary School Students

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Abstract

The aim of this research was to examine the effectiveness of the Tactical Games learning model combined with the Teaching by Invitation technique in boosting both learning motivation and physical activity among elementary school students. This quasi-experimental study included three groups: the first group utilized the Tactical Games model integrated with the Teaching by Invitation technique, the second group applied solely the Tactical Games learning model, and the third group, serving as the control, followed the conventional learning model. Participants were fifth-grade students from three different schools in Tasikmalaya, Indonesia. To measure outcomes, three research instruments were employed: the Electronic Rubric for Motivation in Physical Education (eRMoPE) to assess learning motivation, the Polar GPS RC3, and the Polar Heart Rate Sensor H3 to evaluate the category of students' physical activity. Findings indicated that while all three approaches effectively enhanced learning motivation and physical activity, the combination of the Tactical Games model with the Teaching by Invitation technique yielded superior improvements. This integrative method grants students the autonomy to select skills they wish to learn and master, aligning with their abilities and understanding of game tactics adapted to specific game situations and environments. This freedom fosters a more engaging and personalized learning experience, ultimately enhancing both

motivation and physical activity levels among students. The study highlights the potential benefits of blending tactical learning strategies with motivational techniques, suggesting a valuable approach for educators aiming to improve physical education outcomes in elementary schools.

Keywords: motivation, sport pedagogy, physical activities, tactical games, teaching by invitation.

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1. INTRODUCTION

The new normal era poses significant challenges for students who must readjust after two years of online learning due to the pandemic (Bozkurt & Sharma, 2020). This transition has notably impacted students' learning motivation, leading to a decline in their eagerness to engage in educational activities (Listiano et al., 2021; Sin & Hudayani, 2020; Suherman, 2021). Researchers have been particularly concerned about this issue because decreased motivation in physical education can negatively affect both students' academic outcomes and their physical activity levels during school (Dishman et al., 2018). Additionally, previous studies have established that motivation is crucial for maintaining physical activity (Hutmacher et al., 2020; Nur et al., 2022). Other research further underscores the need for children to engage in regular physical activity, emphasizing that students are driven more by autonomous motivation compared to regulated types of motivation (Costa et al., 2021). In the educational process, Kraft & Culver (2021) explain that a crucial factor influencing students' success in achieving learning objectives is the approach used by educators. As stated by Gaspar et al. (2021), the process of education and learning should be student-centered, with teachers designing learning experiences based on their students' particular requirements. According to Metzler and Colquitt (2021), the tactical method is a particularly effective option because it satisfies students' needs by providing a learning environment that emphasizes enthusiasm, solving problems, and making decisions.

Numerous studies have highlighted the benefits of game-based learning models. For instance, Báguena-Mainar et al. (2014) found that the Teaching Games for Understanding (TGfU) model significantly increased student engagement compared to the Direct Instruction (DI) model. Similarly, Gil-Arias et al. (2017) reported that the TGfU model not only improved learners' autonomy and competence but also yielded higher self-determined motivation scores than the DI model. Further research on TGfU in elementary schools demonstrated that this model enhances cognitive, affective, and psychomotor learning outcomes while also boosting students' enthusiasm for learning (Waffak et al., 2022). Additionally, a study exploring a 16-week TGfU volleyball intervention in elementary schools showed significant improvements in body fat percentage, muscle mass, flexibility, vertical jump, sprint speed, agility, and VO₂max compared to a control group (Stojanović et al., 2023). However, contrasting research on the differences between Game-Based and Traditional Instructional methods revealed no significant differences in physical activity enjoyment or competence, despite increased physical activity levels in the moderate to

high-intensity categories for the Game-Based group (Ghari et al., 2021). This suggests that while Game-Based learning can boost physical activity, it may not necessarily enhance students' enjoyment or active participation, highlighting the need for varied learning strategies to better engage students.

Current study, researchers aimed to combine the tactical games instructional approach with the teaching by invitation strategy. Teaching by invitation is a motivating technique that permits learners to decide what activities or task limits suit their skills, fostering intrinsic motivation by enabling them to engage in activities they excel at or wish to improve (Palmer & Hildebrand, 2005). Previous research supports the effectiveness of this technique in motivating children and enhancing their movement coordination (Nur et al., 2019a). Sierra-Díaz et al. (2019) found that intrinsic motivation is essential for active engagement in various activities, including physical education and sports training. The Tactical Games model is designed to make learning engaging and relevant, particularly for elementary students, by promoting active participation and improving learning outcomes. Nonetheless, there remains a scarcity of studies examining the impact of game-based learning models grounded in motivational techniques.

Given this background, the present study aims to explore the efficiency of a tactical games instructional approach based on the teaching by invitation strategy in increasing motivation for learning and physical activity of primary school pupils in the new normal era. The integration of these two approaches is hypothesized to create a more dynamic and engaging learning environment, catering to individual student needs and preferences. This, in turn, is expected to result in higher levels of intrinsic motivation and more active participation in physical education classes. By focusing on the combination of Tactical Games and Teaching by Invitation, the study seeks to address the current gaps in research and provide a more comprehensive understanding of how these methods can be effectively implemented in physical education. The ultimate goal is to develop teaching strategies that not only increase physical activity levels but also foster a genuine interest and enjoyment in learning among students. This approach has the potential to significantly improve educational outcomes and overall student well-being, making it a valuable contribution to the field of physical education.

2. METHOD

2.1 Participants

The study involved 75 fifth-grade students from three schools in Tasikmalaya, Indonesia, selected through random sampling. Due to equipment limitations, only eight students from each school had their physical activity measured. These students were divided into three groups: the first group utilized the tactical games model integrated with the teaching by invitation strategy, the second group applied only the tactical games approach, and the last group followed a traditional learning model.

2.2 Research Design

The study used a quasi-experimental approach, especially the matching-only pre-test and post-test control group approach, to investigate the efficiency of the tactical games model combined with the teaching by invitation strategy. This experimental method was chosen based on the study's primary objective: to compare the efficacy of this integrated approach with other learning models in enhancing learning motivation and physical activity among primary school

students. The study's experimental group received the combined tactical games model and teaching by invitation strategy, while the control group experienced either the tactical games model alone or conventional learning methods. The interventions were administered over 12 sessions, adhering to the schools' schedules. This approach allowed for a comprehensive evaluation of the different instructional methods' impact on students' motivation and physical activity, aiming to determine the most effective strategy for engaging young learners in physical education.

2.3 Instruments

Motivation in physical education was assessed through the Electronic Rubric for Motivation in Physical Education (eRMoPE), and physical activity was measured using Polar devices (GPS RC3 and Heart Rate Sensor H3). The eRMoPE comprised 37 questions designed to evaluate various aspects of learning motivation, such as perseverance in learning, resilience in overcoming challenges, interest and focus in learning, academic achievement, and independence in the learning process (Nur et al., 2019b). These detailed questions provided a comprehensive understanding of the students' motivational levels. Meanwhile, Polar instruments were used to track and measure children's physical activity. These instruments offered precise and reliable data on the students' activity levels, capturing essential metrics such as movement patterns and heart rate fluctuations during physical education sessions. By combining these tools, the study aimed to draw a clear correlation between the learning models used and the resulting levels of motivation and physical activity in elementary school students. This comprehensive approach allowed for a nuanced analysis of how different teaching methods can impact both the psychological and physical aspects of student engagement in physical education.

2.4 Procedures

The students were equipped with Polar GPS RC3 watches to track their position and movement throughout the learning sessions. This device allowed for precise monitoring of their physical activity levels by capturing data on their movements during physical education. Additionally, students wore the Polar Heart Rate Sensor H3 on their bodies, which measured their heart rates in real-time. This sensor transmitted the heart rate data to an online platform, enabling researchers to analyze the students' cardiovascular responses during physical activities (Nur et al., 2019c; Nur et al., 2021). By utilizing Polar tools (GPS RC3 and Heart Rate Sensor H3), this research can obtain comprehensive and accurate measurements of students' physical activity and movements.

2.5 Data Analysis

The study's data were evaluated using the paired sample t-test, which is a statistical technique for comparing differences between pre-test and post-test findings within the same group. This analysis aimed to identify any significant changes in the students' learning motivation and physical activity levels after implementing the various learning models. By employing the paired sample t-test, researchers were able to determine the effectiveness of each instructional approach, specifically focusing on the improvement in outcomes from the initial assessment (pre-test) to the final evaluation (post-test). This method provided a clear comparison of the impact of the tactical games instructional approach combined with the teaching by invitation strategy to the other methods utilized in the study.

3. RESULTS

This study included seventy-five children in primary school who were put into three groups: Group 1 with 24 students, Group 2 with 26 students, and Group 3 with 25 students. Each group exhibited varying test scores in terms of learning motivation and physical activity as seen in table 1.

Table 1.

Descriptive Statistics for Each Group

		Motivation		Displacement		Pulse	
		Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.
Group 1	Pre-test	22,48	4,49	0,67	0,4	155,73	6,12
	Post-test	29,16	4,64	0,71	0,47	166,62	5,86
Group 2	Pre-test	22,53	4,47	0,64	0,08	157,17	4,8
	Post-test	27,92	3,65	0,68	0,07	164,47	4,81
Group 3	Pre-test	22,80	5,44	0,65	0,51	158,11	4,54
	Post-test	26,92	4,83	0,67	0,5	162,08	4,68

The test results, summarized in Table 1, highlighted the differences in pre-test and post-test scores among these groups. In the assessment of student motivation, Group 1 received an average pre-test result of 22.48 and a post-test result of 29.16. In contrast, Group 2, the control group, received an average pre-test score of 22.53 and a post-test score of 27.92, whereas Group 3 obtained a pre-test score of 22.80 and a post-test score of 26.92.

In terms of physical activity, the measurement of displacement and pulse rate revealed distinct scores for each group. Group 1's average displacement score was 0.67 in the pre-test and 0.71 in the post-test. Group 2 had pre-test and post-test displacement scores of 0.64 and 0.68, respectively, while Group 3 had scores of 0.65 and 0.67. Regarding pulse rate, Group 1's average pre-test was 155.73, which increased to 166.62 in the post-test. Group 2's pulse rate averaged 157.17 in the pre-test and 164.47 in the post-test, and Group 3's rates were 158.11 in the pre-test and 162.08 in the post-test. These results indicate the varying levels of physical exertion and activity among the students across the different groups.

Analyzing the differences between the pre-test and post-test results indicated the extent of the impact of each instructional approach. The N-Gain values showed that Group 1, which received the integrated Tactical Games learning model with the Teaching by Invitation technique, had superior improvements compared to the other groups. Specifically, Group 1 exhibited an N-Gain value of 6.7 in motivation, 0.04 in displacement, and 10.9 in maximum pulse rate, outperforming the control group in all measures. Although the displacement scores in the tactical games combined with teaching by invitation group were similar to those in the Tactical Games-only group, the overall results highlighted the enhanced effectiveness of the combined approach in boosting both learning motivation and physical activity among the students. Figure 1 illustrates these comparative N-Gain results, emphasizing the benefits of the integrative learning model over

conventional methods.

Figure 1.

N-Gain Value for Each Group

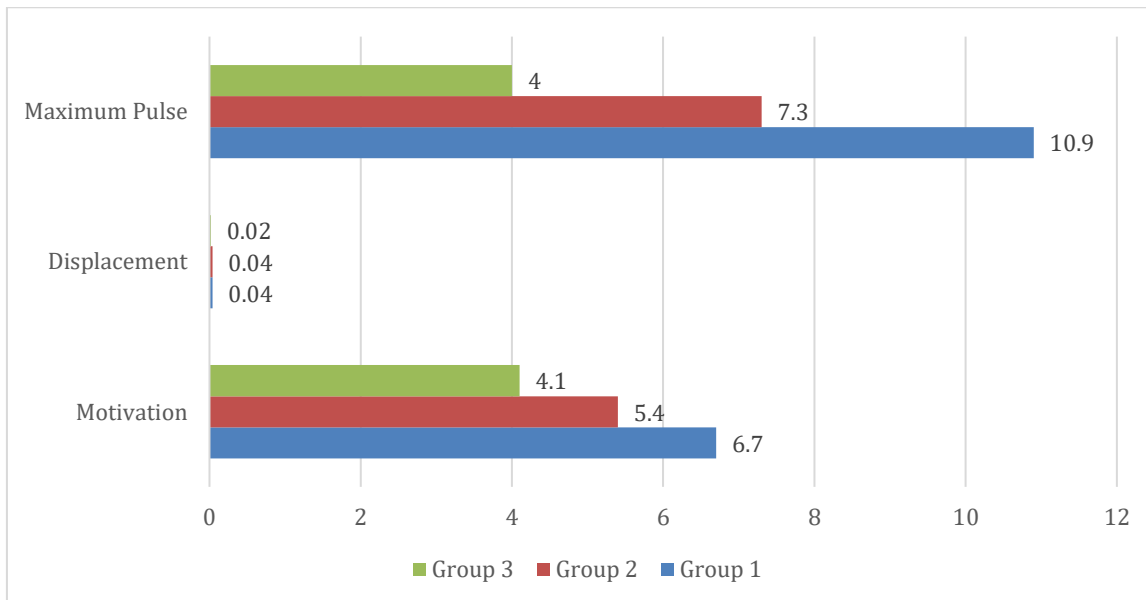


Table 2.

The Paired Sample T-Test

	Motivation			Displacement			Pulse		
	t-table	t-count	Sig. (p)	t-table	t-count	Sig. (p)	t-table	t-count	Sig. (p)
Group 1	1,7108	-6,763	0	1,8945	-8,793	0	1,8945	-6,04	0,001
Group 2	1,7081	-8,578	0	1,8945	-4,782	0,002	1,8945	-5,057	0,001
Group 3	1,7108	-6,251	0	1,8945	-3,638	0,008	1,8945	-2,634	0,034

Table 2 shows the findings of the paired sample T test, which reveal an increase in motivation, displacement, and maximal heart rate in all sample groups. The significance value in group 1 was found to be lower than the value 0.05 for motivation ($0 < 0.05$), displacement ($0 < 0.05$), and maximum pulse rate ($0.001 < 0.05$). Therefore, it can be concluded that the integration of the Tactical Game learning model with Teaching Through Invitation produces effects that are comparable to both the use of the Tactical Game learning model and conventional learning approaches.

The findings in table 2 show that, while all three strategies successfully increased learning motivation and physical activity, combining the teaching by invitation with tactical games model resulted in even greater improvements. This shows that combining these two tactics resulted in better outcomes than using either method alone. This research highlights the potential synergy between teaching by invitation strategy and the tactical games model for increasing the effectiveness of physical education programs.

4. DISCUSSIONS

The primary objective of this research was to evaluate the effectiveness of the teaching by invitation with tactical games approach in primary school, with a specific focus on increasing pupil motivation to learn and physical activity levels in physical education class. Across the three experimental groups, it was evident that the interventions implemented had a positive influence on elevating both motivation and physical activity among the students. Notably, the results indicate that while all three groups experienced improvements in these aspects, the application of the Teaching by Invitation-based Tactical Games model yielded greater enhancements compared to both the Tactical Games model and conventional instructional approaches. The Tactical Games model, characterized by game-based activities focused on tactical understanding and decision-making, is complemented by the Teaching by Invitation approach, allowing students to tailor task parameters to their individual skill sets, thereby fostering enthusiasm and engagement (Palmer & Hildebrand, 2005). Additionally, this model emphasizes age-appropriate game understanding and skill development, ensuring students grasp the technical aspects of sports relevant to their stage of development (Gaspar et al., 2021).

Further analysis reveals that Group 1, which received the Teaching by Invitation-based Tactical Games model, and Group 2, which received only the Tactical Games model, exhibited greater increases in average activity levels compared to the conventional approach. This is attributed to the nature of tactical games, which simulate real-game scenarios and consequently promote increased movement among participants compared to traditional methods. Moreover, the Teaching by Invitation approach encourages skill acquisition at a pace aligned with individual abilities, thereby preventing discouragement and facilitating continuous skill progression. The implementation of the Tactical Games model serves as a holistic approach to fostering physical, cognitive, and emotional development through play, thereby enhancing motivation and promoting multifaceted learning alongside tactical understanding (Ghari et al., 2021). Previous research has validated the advantageous influence of tactical learning approaches on skill growth and motivational aspects among students (Nevett et al., 2001; Gil-Arias et al., 2017). On the contrary, a separate investigation reported an upsurge in physical activity subsequent to the implementation of the tactical game learning model. However, Smith et al., (2015) found that this augmentation in physical activity did not lead to the same increase in motivation between female and male students.

The utilization of Teaching by Invitation approaches in conjunction with tactical games has proven to be effective in raising motivation levels. Prior research has highlighted the efficacy of Teaching by Invitation in fostering motivation and improving movement coordination among children, as it empowers students to progress through learning stages at their own pace (Nur et al., 2019a; Lynch et al., 2017). By allowing students to choose learning tasks based on their skill advancement, Teaching by Invitation fosters intrinsic motivation, which is crucial for active participation in physical activities and sports training (Sierra-Díaz et al., 2019). Additionally, employing motivational strategies such as goal setting with SMART criteria has been identified as effective in boosting motivation and performance in physical education contexts (Johnson et al., 2014).

The incorporation of tactical games into Teaching by Invitation is a determined attempt

to create an environment that promotes student motivation and physical activity levels in physical education. By fostering autonomy and satisfaction within a supportive environment, this approach not only promotes intrinsic motivation but also predicts students' engagement and efforts during physical education sessions (Standage et al., 2005; Chen et al., 2014). Thus, the synergistic combination of these instructional methodologies holds promise for optimizing learning experiences and outcomes in elementary school physical education settings.

5. CONCLUSIONS

The Tactical Games learning paradigm, along with the Teaching by Invitation motivational strategy, is effective in increasing both motivation and physical activity levels in elementary school kids, including displacement and maximum heart rate. This technique is as effective as the solo Tactical Games learning model and traditional instructional methods in increasing physical activity and motivation. However, significant improvements are shown when the Tactical Games paradigm is combined with Teaching by Invitation. This integration gives students the freedom to learn skills at their own pace while also understanding game tactics customized to the obstacles and scenarios found in the gaming environment.

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