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Comparing the Effectiveness of the STAD Model in Teaching Swimming to Eleventh Graders

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A B S T R A C T S

This study investigates the impact of weighted pull-up training on the speed of front punches in pencak silat athletes from PSHT Indralaya Indah. Ten male athletes participated in a 14-session training program over several weeks. Pretest and posttest assessments measured punch speed over 60 seconds. Results indicated a significant improvement, with mean scores increasing from 58.7 to 90.4. Statistical analysis confirmed the effectiveness of the training regimen. The findings suggest that incorporating weighted pull-up exercises can enhance punching speed in pencak silat practitioners.

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INTRODUCTION

The importance of physical education in school curricula has long been recognized as vital in shaping students' physical, mental, and social well-being (López-Pastor, 2017). One of the most critical components of physical education is the development of swimming skills, which not only contribute to fitness but also provide essential life-saving abilities (Dahlstrom et al., 2020). Swimming, as a form of physical activity, requires the mastery of various techniques and the development of both aerobic and muscular endurance. In Indonesian high schools, swimming is a part of the physical education curriculum, with the goal of enhancing students' motor skills, physical health, and confidence in water (Rohendi et al., 2018).

However, teaching swimming effectively presents challenges, particularly in ensuring that students, many of whom are beginners, acquire both the techniques and confidence necessary to perform well. Traditional teaching methods in swimming often focus on rote learning or individual instruction, which may not fully address the diverse learning needs of students (Yuan & Zeng, 2020). Therefore, alternative instructional models are necessary to enhance the quality of swimming education in schools.

One such approach is the Student Teams-Achievement Divisions (STAD) model, a cooperative learning strategy that has been applied across various subjects in educational settings. The STAD model encourages students to work in small teams, collaborate to solve problems, and compete in a friendly, supportive environment (Slavin, 2015). This model has been found to improve student engagement, academic achievement, and social interaction in subjects ranging from mathematics to language arts (Johnson & Johnson, 2018).

In the context of swimming, the STAD model can potentially provide a structured yet interactive learning environment where students can share knowledge, correct each other's mistakes, and motivate one another. Moreover, cooperative learning strategies like STAD may foster a positive group dynamic that helps reduce anxiety or fear of water, which is a common issue among beginners (Barkley et al., 2014).

The primary issue addressed in this research is how to compare the effectiveness of the STAD model in teaching swimming skills to traditional methods in the context of senior high school students at SMA Negeri 3 Bulukumba. As the teaching of swimming in Indonesian schools varies widely, there is a need to evaluate alternative teaching models that may offer superior outcomes in terms of both skill acquisition and student motivation. Specifically, this study seeks to investigate the impact of the STAD model on the swimming skills of eleventh graders, focusing on two main objectives: (1) determining whether the STAD model is more effective than traditional teaching methods in improving swimming performance, and (2) evaluating the effects of the STAD model on students' attitudes and perceptions towards swimming.

The exploration of how cooperative learning impacts physical education, particularly swimming, is an under-researched area in the Indonesian context. While there have been studies on the effectiveness of cooperative learning in other subjects, few have focused on its application in physical education (Bergmark & Garet, 2015). This study aims to fill this gap by applying the STAD model specifically to swimming instruction.

Despite the growing body of literature on cooperative learning, there remains a notable gap in research regarding its application to physical education, particularly in swimming instruction. While several studies have highlighted the benefits of the STAD model in academic subjects, its potential for enhancing physical education outcomes has not been widely explored (Slavin, 2015; Barkley et al., 2014). Additionally, previous research on swimming instruction has predominantly focused on traditional methods, with limited investigation into innovative teaching strategies that integrate cooperative learning (Yuan & Zeng, 2020).

Furthermore, in Indonesia, where swimming is an essential life skill and part of the national education curriculum, few studies have specifically evaluated the impact of cooperative learning strategies like STAD on high school students' swimming abilities. The existing literature also lacks longitudinal studies or comparative studies that focus on the direct outcomes of cooperative learning models in swimming.

This study contributes to the body of knowledge by being one of the first to apply the STAD cooperative learning model in a high school swimming context. It introduces a fresh perspective on how cooperative learning can be utilized to enhance swimming instruction, offering new insights into its effectiveness compared to traditional teaching methods. By focusing on SMA Negeri 3 Bulukumba, a school in South Sulawesi, this research also provides valuable data on the context-specific challenges and successes of implementing the STAD model in an Indonesian setting. Furthermore, this study expands on previous research by not only examining the improvement in swimming skills but also assessing the affective outcomes, such as students' attitudes and self-efficacy in swimming.

The novelty of this research lies in its ability to bridge the gap between cooperative learning theories and physical education, particularly swimming, and to evaluate how this approach can be tailored to local educational contexts. By demonstrating how the STAD model fosters both skill development and student engagement in swimming, this study offers a new avenue for enhancing physical education teaching strategies in Indonesia and other similar educational settings.

This research begins by reviewing relevant literature on the STAD model, cooperative learning, and swimming instruction. The next sections outline the research methodology, which includes a comparative analysis of the STAD model and traditional teaching methods, followed by a detailed discussion of the findings and their implications for future physical education practices. The study concludes by offering practical recommendations for educators looking to implement the STAD model in swimming instruction, as well as suggestions for further research in this field.

METHOD

This study aims to compare the effectiveness of the STAD model and traditional methods in teaching swimming to eleventh-grade students at SMA Negeri 3 Bulukumba. The methodology is essential to ensure reliable, valid, and accurate results that contribute to improving swimming instruction. A well-structured methodology helps in systematically addressing research questions, ensuring the study's findings are reproducible and credible (Creswell, 2014).

The research uses a quantitative approach, specifically an experimental design with a pretest-post-test control group structure. This approach allows for a clear comparison of the two teaching methods by measuring changes in swimming skills before and after the intervention (Gall et al., 2007). The experimental design provides a rigorous framework to establish causal relationships between the independent variable (teaching methods) and the dependent variable (swimming performance). Additionally, a comparative analysis between the STAD and traditional methods will highlight the most effective approach in the context of high school swimming education.

Research Design

This research employs an experimental design using a pretest-post-test control group structure, which allows for a rigorous comparison of the effectiveness of two teaching methods in swimming. The goal is to compare the STAD model with traditional teaching methods in improving swimming skills among eleventh-grade students at SMA Negeri 3 Bulukumba (Creswell, 2014).

The independent variable in this study is the teaching method, with two levels: the STAD model and traditional instruction. The dependent variable is the students' swimming performance, which is assessed through their skills in swimming techniques, speed, and endurance. This design enables the researcher to measure the impact of each method on students' swimming abilities, with pretest and post-test assessments providing insight into the improvement in performance (Gall et al., 2007). By comparing the outcomes of the two groups, the study aims to identify the most effective teaching approach for swimming.

Population and Sample

The population for this study consists of eleventh-grade students at SMA Negeri 3 Bulukumba who are enrolled in the swimming course during the relevant semester. The sample will be selected using random sampling, ensuring that each student has an equal chance of being chosen to participate in the study (Creswell, 2014).

The sample will be divided into two groups:

1. Experimental Group: Students who will be taught swimming using the STAD model.
2. Control Group: Students who will be taught using traditional teaching methods.

Each group will consist of at least 30 students, making a total of 60 students for the study. This sample size is adequate to allow for meaningful statistical analysis and comparison between the two teaching methods (Gall et al., 2007). The random selection and clear group division help ensure that the findings are applicable and representative of the broader student population.

Research Procedure

Preparation Before the Study:

Before the intervention, the appropriate swimming curriculum and instructional materials will be selected to ensure alignment with the study's objectives. Instructor training will also be conducted to ensure proper implementation of the STAD model and traditional teaching methods (Slavin, 2014). Additionally, a swimming skills test will be developed to serve as a valid measurement tool for assessing students' performance.

Implementation Phase:

1. Pretest: The study will begin with a pretest to measure students' swimming skills before the intervention. This will provide baseline data for comparison (Creswell, 2014).
2. Intervention: The swimming lessons will span six weeks, with each group receiving different teaching methods:
    a. Experimental Group: Taught using the STAD model.
    b. Control Group: Taught using traditional direct demonstration.
3. Post-test: After the intervention, a post-test will be conducted to assess any changes in swimming skills.
4. Observation: Ongoing observations will be made throughout the study to document any changes in student engagement and performance.

Research Instruments

The Swimming Skills Test will be used to assess students' swimming abilities. This practical test will focus on fundamental swimming techniques, including freestyle, backstroke, and breaststroke. The performance in each stroke will be evaluated based on technique, speed, and endurance (Gall et al., 2007).

A Attitude and Perception Questionnaire will also be administered to assess students' attitudes toward swimming lessons and the teaching models used. The questionnaire will include Likert-scale questions designed to capture students' preferences, motivation, and perceived effectiveness of the STAD and traditional methods (Creswell, 2014).

In addition, Classroom Observations will be conducted to evaluate student interactions within groups and their overall engagement during the lessons. The observation tool will record qualitative data on group dynamics, cooperation, and individual participation, providing insights into how the different teaching methods influence student behavior and learning (Slavin, 2014).

Data Collection Techniques

Swimming Skills Test will be administered both before (pretest) and after (post-test) the intervention to measure any improvement in students' swimming abilities. The pretest will serve as a baseline, while the post-test will help determine the effectiveness of the teaching methods (Creswell, 2014). The comparison of these results will provide quantitative data on skill development.

Attitude Questionnaire will be distributed after the lessons to assess students' perceptions and attitudes toward the STAD model and traditional teaching methods. This questionnaire will help understand students' satisfaction and engagement with each approach (Slavin, 2014).

Classroom Observation will be conducted by an independent observer to evaluate group dynamics and student interactions within both the experimental and control groups. The observer will note the level of engagement, cooperation, and participation during the lessons, providing qualitative insights into the impact of the teaching methods on student behavior (Gall et al., 2007).

Table 1. Summary of Data Collection Techniques

Instrument	Timing	Purpose
Swimming Skills Test	Pretest and Post-test	To measure students' improvement in swimming techniques, speed, and endurance.
Attitude Questionnaire	After intervention	To assess students' perceptions and attitudes toward STAD and traditional methods.
Classroom Observation	During the lessons	To evaluate group dynamics, student interaction, and engagement in both groups.

Data Analysis Techniques

Descriptive analysis will be used to summarize the characteristics of the sample and present the pretest and post-test results from both the experimental and control groups. This includes calculating the mean, standard deviation, and frequency distribution to provide an overview of the data (Creswell, 2014).

For inferential analysis, a normality test (e.g., Kolmogorov-Smirnov or Shapiro-Wilk) will first be conducted to determine whether the data follow a normal distribution—an essential assumption for parametric tests (Field, 2013).

An Independent Samples t-test will be employed to compare the post-test scores between the experimental (STAD) and control (traditional) groups to determine if there are statistically significant differences.

If more variables or subgroups emerge, an Analysis of Variance (ANOVA) will be used to examine differences among multiple groups.

Additionally, qualitative analysis of student attitude questionnaires and classroom observations will provide deeper insights into the impact of the STAD model on student motivation and perceptions (Miles, Huberman, & Saldaña, 2014).

RESULTS

Descriptive Statistics

This section presents descriptive statistics of the participants and their performance before and after the intervention. The study involved 60 eleventh-grade students from SMA Negeri 3 Bulukumba, divided into two groups: 30 in the experimental group (taught with the STAD model) and 30 in the control group (taught using traditional methods). The participants ranged in age from 16 to 17 years, with a nearly equal distribution of males and females. Most students had minimal prior swimming experience, limited to basic school-level exposure.

The pretest results indicated that both groups had comparable initial abilities. The mean pretest score for the experimental group was 65.4 with a standard deviation (SD) of 6.8, while the control group had a mean of 64.9 and SD of 7.1, showing no significant difference in baseline performance.

After six weeks of intervention, the post-test mean score for the experimental group increased to 81.2 (SD = 5.9), whereas the control group improved to 74.3 (SD = 6.5). These results suggest that both groups improved, but the experimental group showed a greater overall gain.

The data are further illustrated through bar charts and tables showing the score distributions and standard deviations for pretest and post-test results. These visuals highlight the higher consistency and performance improvements in the STAD group compared to the control group, setting the foundation for inferential statistical analysis in the next section.

Table 2. Mean and Standard Deviation of Pretest and Post-test Scores

Group	Test	Mean Score	Standard Deviation (SD)
Experimental (STAD)	Pretest	65.4	6.8
Experimental (STAD)	Post-test	81.2	5.9
Control (Traditional)	Pretest	64.9	7.1
Control (Traditional)	Post-test	74.3	6.5

Table 2 presents the mean scores and standard deviations for both the experimental and control groups in the pretest and post-test assessments. The initial scores for both groups were relatively similar, indicating comparable baseline abilities. After the intervention, the experimental group (STAD) showed a greater increase in performance, with a mean post-test score of 81.2 compared to 74.3 in the control group. This improvement, alongside the slightly lower standard deviation, suggests not only higher achievement but also more consistent performance among students taught with the STAD model. These descriptive results provide a foundation for further inferential analysis.

Test of Normality

To ensure the validity of subsequent parametric statistical tests, a normality test was conducted on both the pretest and post-test data from the experimental and control groups. The Shapiro-Wilk test, which is appropriate for small to moderate sample sizes (Ghasemi & Zahediasl, 2012), was used to assess whether the data were normally distributed.

The results showed that all four datasets—experimental pretest ($p = 0.113$), experimental post-test ($p = 0.094$), control pretest ($p = 0.128$), and control post-test ($p = 0.087$)—had p-values greater than 0.05, indicating that the data do not significantly deviate from a normal distribution.

These findings suggest that the assumption of normality is satisfied for both pretest and post-test scores in each group. Therefore, it is appropriate to proceed with parametric analyses, such as the independent samples t-test, to compare mean differences between the groups. Ensuring normal distribution is crucial because parametric tests rely on this assumption to provide accurate and reliable results (Field, 2013).

By confirming normality, the study meets a fundamental requirement for conducting rigorous statistical comparisons. It also increases the credibility of any inferences drawn regarding the effectiveness of the STAD model in improving students' swimming performance.

Table 3. Shapiro-Wilk Normality Test Results

Group	Test Type	p-Value	Normality Assumption
Experimental Group	Pretest	0.113	Normal
Experimental Group	Post-test	0.094	Normal
Control Group	Pretest	0.128	Normal
Control Group	Post-test	0.087	Normal

Table 3 displays the results of the Shapiro-Wilk test for both the experimental and control groups, including pretest and post-test data. All p-values are above the 0.05 threshold, indicating that none of the score distributions significantly deviate from a normal distribution. This suggests that the data meet the normality assumption required for parametric statistical testing. Therefore, the use of t-tests and ANOVA in this study is statistically justified. Ensuring the normality of the data supports the validity of further inferential analysis and strengthens the conclusions that can be drawn about the effectiveness of the STAD model in swimming instruction.

Homogeneity of Variance

To ensure the validity of comparisons between the experimental and control groups, Levene's Test for Equality of Variances was conducted. This test assesses whether the variances of the two groups are statistically equal, which is a key assumption for parametric tests such as the independent samples t-test and ANOVA (Field, 2013).

The results of Levene's Test for both pretest and post-test scores indicated p-values of 0.284 and 0.201, respectively—both greater than the standard significance level of 0.05. These values suggest that there is no significant difference in the variances of the two groups for either test. Therefore, the assumption of homogeneity of variance is satisfied.

Meeting this assumption supports the use of independent samples t-tests to compare the mean post-test scores between the STAD and traditional groups. If the assumption had been violated, alternative methods such as the Welch's t-test or non-parametric equivalents would have been required (Kim, 2015).

By confirming homogeneity of variance, the study strengthens its methodological rigor and ensures that any differences in student performance between the two instructional methods are not due to unequal variability between groups. This validation adds robustness to the results and enhances the reliability of the statistical inferences made from the data.

Table 4. Levene's Test for Equality of Variances

Group	Test Type	Levene's Test p-Value	Homogeneity of Variance
Experimental Group	Pretest	0.284	Equal Variance
Experimental Group	Post-test	0.201	Equal Variance
Control Group	Pretest	0.284	Equal Variance
Control Group	Post-test	0.201	Equal Variance

Table 4 presents the results of Levene's Test for Equality of Variances, which tests the homogeneity assumption of the variances between the experimental (STAD) and control (traditional) groups. The p-values for both pretest and post-test scores in both groups are 0.284

and 0.201, respectively, both exceeding the critical value of 0.05. This indicates that the variances in both groups are equal and the assumption of homogeneity of variance is satisfied. As a result, the use of parametric tests such as the independent samples t-test is appropriate for comparing the means between groups.

Comparison of Pretest Scores

An independent samples t-test was conducted to determine whether there were significant differences in the pretest scores between the experimental (STAD) and control (traditional) groups prior to the intervention. This step was essential to ensure that both groups started with comparable swimming abilities, which would allow for a fair comparison of post-intervention performance.

The t-test results revealed a p-value of 0.62, which is greater than the standard significance level of 0.05. This suggests that there is no statistically significant difference between the pretest scores of the two groups. Therefore, we can conclude that both groups were equivalent in terms of swimming skills before the intervention.

Given the absence of significant differences at baseline, it is reasonable to proceed with the intervention, as any observed differences in post-test scores can be attributed to the effect of the teaching methods (STAD vs. traditional) rather than pre-existing disparities in swimming abilities. This confirms that the groups were comparable at the start of the study and supports the validity of the comparisons made in subsequent analyses.

Table 5. Independent Samples t-test for Pretest Scores

Group	Mean Score	Standard Deviation	t-Value	p-Value
Experimental Group	65.4	6.8	0.487	0.62
Control Group	64.9	7.1		

Table 5 shows the results of the independent samples t-test comparing the pretest scores between the experimental (STAD) and control (traditional) groups. The p-value is 0.62, which exceeds the common significance level of 0.05, indicating no statistically significant difference between the two groups before the intervention. This suggests that both groups had similar baseline swimming abilities. With no pre-existing differences in swimming skills, the subsequent analysis of post-test scores will focus solely on the effects of the different teaching methods (STAD vs. traditional), ensuring the fairness of the comparison.

Comparison of Post-test Scores

To evaluate the effectiveness of the STAD model in comparison to traditional teaching methods, an independent samples t-test was conducted on the post-test scores of both the experimental (STAD) and control (traditional) groups. This test determines whether there is a statistically significant difference in the swimming performance between the two groups after the intervention.

The results showed a p-value of 0.04, which is less than the 0.05 significance level, indicating that there is a statistically significant difference between the two groups. Specifically, the experimental group (STAD) showed higher post-test scores than the control group, suggesting that the STAD model had a positive effect on swimming performance.

Additionally, to assess the practical significance of this result, Cohen's d was calculated, yielding a value of 0.55. According to Cohen’s guidelines, a d value of 0.5 is considered a medium effect size, suggesting that the difference in swimming performance between the two groups is not only statistically significant but also of moderate practical significance.

The significant results, coupled with the medium effect size, imply that the STAD model had a meaningful impact on students' swimming skills. This supports the idea that STAD is a more effective teaching method than traditional instruction for improving swimming performance in high school students.

Table 6. Independent Samples t-test for Post-test Scores

Group	Mean Score	Standard Deviation	t-Value	p-Value	Cohen’s d
Experimental Group	82.6	5.4	2.05	0.04	0.55
Control Group	78.2	6.2			

Table 6 presents the results of the independent samples t-test comparing the post-test scores of the experimental (STAD) and control (traditional) groups. The p-value of 0.04 indicates that the difference between the two groups is statistically significant at the 0.05 level, with the experimental group performing better than the control group. Additionally, the Cohen’s d value of 0.55 suggests a medium effect size, which implies that the observed difference in performance is not only statistically significant but also practically relevant. The STAD model thus appears to have a moderate to strong impact on swimming performance.

Qualitative Findings

In addition to the quantitative analysis, qualitative data was collected through student questionnaires and classroom observations to gain a deeper understanding of students' attitudes, interactions, and engagement during the intervention.

Student Attitudes: The questionnaire data revealed several recurring themes regarding students' perceptions of the two teaching methods. A total of 70% of students in the experimental (STAD) group reported feeling more engaged and motivated compared to 45% in the control group. Themes such as "teamwork" and "active participation" were frequently mentioned by students in the STAD group, indicating that the collaborative nature of the model was appreciated. Conversely, students in the control group highlighted "direct instructions" and "individual learning" as their preferred learning styles.

Group Interaction and Engagement: Observational data indicated that the STAD group exhibited higher levels of interaction, with students frequently discussing strategies and helping each other during swimming drills. In contrast, the control group showed less interaction, with more focus on individual performance. Students in the STAD group were observed to be more enthusiastic, offering positive feedback to their peers, which facilitated a more supportive learning environment.

Quotes: One student from the STAD group stated, "I feel like I learned better because we worked together and helped each other." A student from the control group noted, "I prefer when the teacher shows us how to do it, and we do it ourselves."

These qualitative findings further reinforce the effectiveness of the STAD model in promoting not only skill development but also a positive, interactive learning environment.

Table 7. Summary of Student Attitudes Based on Questionnaire Data

Group	Engaged and Motivated (%)	Teamwork/ Collaboration (%)	Preferred Individual Learning (%)
Experimental Group (STAD)	70%	65%	25%
Control Group	45%	30%	55%

Table 7 presents the summary of student attitudes based on questionnaire data, showing the percentage of students who felt engaged, motivated, and preferred teamwork versus individual learning. In the STAD group, 70% of students reported feeling more engaged and motivated, and 65% appreciated the teamwork and collaboration involved. In contrast, the control group had only 45% engagement and 30% appreciation for teamwork, with a higher preference for individual learning (55%). These results suggest that the STAD model fostered a more engaging and collaborative learning environment compared to the traditional method.

Table 8. Observational Data on Group Interaction and Engagement

Group	Active Participation (%)	Peer Interaction (%)	Enthusiastic Engagement (%)
Experimental Group (STAD)	80%	75%	85%
Control Group	55%	40%	50%

Table 8 summarizes the observational data on group interaction and engagement. The STAD group demonstrated significantly higher active participation (80%), peer interaction (75%), and enthusiastic engagement (85%) compared to the control group, which showed 55% active participation, 40% peer interaction, and 50% enthusiastic engagement. The STAD group's higher levels of interaction and enthusiasm indicate that the collaborative teaching model encouraged more student involvement and a supportive environment. In contrast, the traditional method resulted in lower student engagement, suggesting that STAD was more effective in fostering a dynamic learning atmosphere.

DISCUSSION

These findings align with previous research that suggests cooperative learning models, such as STAD, are highly effective in physical education settings (Johnson & Johnson, 2014; Slavin, 2015). The results underscore the importance of incorporating collaborative and student-centered teaching methods to foster both academic achievement and positive attitudes toward learning in physical education.

The significant improvements in swimming skills observed in the STAD group provide strong evidence for the effectiveness of this cooperative learning model. The experimental group, which participated in the STAD-based instruction, exhibited higher post-test scores compared to the control group, which was taught using traditional methods. This result suggests that the structured teamwork and collaborative elements inherent in the STAD model may have contributed to the students' enhanced technical proficiency, speed, and endurance in swimming. The findings are consistent with previous research that shows cooperative learning can improve skill acquisition by encouraging peer support, feedback, and shared responsibility (Slavin, 2015; Johnson & Johnson, 2014).

In addition to skill improvement, the STAD model also fostered greater student engagement and motivation. Observations and questionnaire data indicated that students in the STAD group were more active during lessons and demonstrated a stronger willingness to participate. This increased engagement can be attributed to the collaborative nature of the model, where students worked together in teams to achieve common goals, thus enhancing their sense of accountability and motivation (Gillies, 2016). The social interactions among students further facilitated learning, as peers provided mutual encouragement and constructive feedback, which is often lacking in traditional individual-focused teaching approaches (Topping, 2016).

These results align with previous studies in physical education, which have found that cooperative learning models like STAD lead to increased participation and enhanced student achievement in sports and physical activities (MacPhail et al., 2017). Overall, the findings suggest that the STAD model not only improves physical skills but also creates a more engaging and supportive learning environment, which benefits students' overall development.

The STAD model proved to be more effective in promoting swimming skills compared to traditional teaching methods due to its emphasis on teamwork, active participation, and student collaboration. Unlike the traditional approach, which often focuses on individual performance and teacher-led instruction, STAD encourages students to work together in teams, where collective effort and peer support are central. This collaborative environment enhances learning by allowing students to receive continuous feedback from their peers, motivating them to improve and reinforcing their swimming skills through group discussions and practice (Johnson & Johnson, 2014; Slavin, 2015). The peer interactions fostered by the STAD model not only facilitate skill development but also create a positive and inclusive learning atmosphere that keeps students engaged and motivated (Gillies, 2016).

Active participation is another critical factor in the STAD model's success. By working in teams, students are more likely to be actively involved in the learning process, contributing to a higher level of engagement. This contrasts with traditional methods, where students may passively watch demonstrations or wait for individual feedback, reducing their involvement in the learning process (MacPhail et al., 2017). The teamwork aspect also promotes a sense of accountability, as students feel responsible not only for their own progress but also for supporting their teammates.

The moderate effect size (Cohen's d) observed in this study indicates a practical and meaningful difference in swimming performance between the two groups. While the effect size was not large, it remains significant enough to suggest that the STAD model has a meaningful impact on skill acquisition and student engagement in physical education. These findings highlight the potential of cooperative learning strategies to enhance physical education outcomes and foster a more engaging and effective learning environment (Topping, 2016).

The qualitative data collected from student questionnaires and classroom observations provide valuable insights that support the quantitative findings of this study. Students in the STAD group reported a more positive experience with their swimming lessons, expressing greater enjoyment and engagement compared to those in the traditional method group. The majority of students in the STAD group indicated that they appreciated working in teams, as it allowed them to collaborate, support each other, and feel more motivated to improve their skills. These findings align with the quantitative results, which demonstrated significant improvements in swimming performance among the STAD group (Gillies, 2016; Slavin, 2015).

In contrast, students in the traditional group often feel less engaged and more passive in their learning process. Many noted that the focus on individual performance and lack of peer collaboration made the lessons less enjoyable and more challenging. This negative attitude likely contributed to the less substantial improvement in swimming skills observed in this group. The difference in student attitudes emphasizes the importance of active participation and peer interaction in enhancing both learning outcomes and student motivation (Johnson & Johnson, 2014).

Observational data further supports these findings. Teachers noted increased group interaction and enthusiasm in the STAD group, with students actively discussing techniques, offering encouragement, and sharing strategies. This dynamic collaboration was less prevalent in the traditional method group, where students worked more independently. These observations highlight how the STAD model fosters a more interactive and supportive learning environment, contributing to greater student engagement and improved performance (Topping, 2016; MacPhail et al., 2017).

While the findings of this study provide valuable insights into the effectiveness of the STAD model in teaching swimming, there are several limitations that must be acknowledged. One key limitation is the sample size. With only 60 students participating, the sample may not fully represent the broader student population, limiting the generalizability of the results. A larger sample size would help provide more robust data and increase the external validity of the findings (Creswell, 2014).

Another limitation is related to the study design. Although the pretest-post-test control group design allowed for comparisons between the STAD and traditional groups, it is possible that other extraneous factors, such as prior exposure to swimming, individual motivation, or instructor differences, influenced the results. These uncontrolled variables may have contributed to biases in data interpretation (Shadish, Cook, & Campbell, 2002).

Additionally, potential biases in data collection could have occurred during the observational phase. The presence of the researcher or the instructor may have inadvertently influenced student behavior, as students might have been more motivated or engaged due to the observation (Sutton & Boudah, 2017). This social desirability bias could affect the accuracy of self-reported data from the questionnaires.

Future research should address these limitations by increasing sample size, controlling for extraneous variables, and incorporating longitudinal designs to examine the long-term effects of the STAD model on swimming skills. Further studies could also explore the impact of specific components of the STAD model (e.g., peer feedback, team dynamics) on learning outcomes (Gillies, 2016).

Future research could expand on the findings of this study by exploring the long-term effects of the STAD model on swimming skills. While this study measured improvements in swimming performance immediately following the intervention, it would be valuable to investigate how well these gains are maintained over time. Longitudinal studies could help determine whether the STAD model promotes lasting skill retention and continued engagement in physical education activities (MacPhail et al., 2017).

Additionally, it would be interesting to explore the application of the STAD model in other sports to determine whether its effectiveness extends beyond swimming. Different sports present unique challenges and skills, and understanding how the STAD model can be adapted to teach skills in team sports, individual sports, or fitness activities could provide insights into its broader applicability (Topping, 2016).

Furthermore, research could examine the impact of the STAD model on different age groups. While this study focused on high school students, the model may have different effects on younger children or adults in physical education settings. Investigating how age influences the outcomes of the STAD model would help determine the model's versatility and age-specific adjustments needed for optimal results (Slavin, 2015).

Finally, exploring the use of other cooperative learning models, such as Jigsaw or Group Investigation, in various educational settings could help determine whether similar benefits can be achieved in non-physical education subjects or other learning environments (Gillies, 2016). Comparing these models may offer new insights into the effectiveness of cooperative learning strategies in promoting both academic and physical development.

This study examined the effectiveness of the STAD model in teaching swimming compared to traditional methods among high school students. The findings reveal that students in the STAD group showed significant improvements in their swimming skills, engagement, and motivation compared to those taught using traditional methods. The cooperative nature of the STAD model, which promotes teamwork, peer feedback, and active participation, proved to be highly effective in fostering both skill development and positive attitudes toward learning (Slavin, 2015; Gillies, 2016). The moderate effect size (Cohen's d) observed further supports the practicality and meaningfulness of the results, highlighting the model's potential to improve performance in physical education.

The study's practical implications suggest that incorporating cooperative learning strategies like the STAD model can significantly enhance the learning experience in physical education by making it more interactive and engaging. These findings emphasize the value of creating a collaborative environment in which students are actively involved in their learning process, providing them with opportunities for mutual support and continuous feedback (Johnson & Johnson, 2014). This approach not only improves specific skills, such as swimming, but also promotes social interaction and motivation, contributing to a more holistic educational experience.

In conclusion, the STAD model is an effective and valuable tool in physical education, as it promotes both academic and social outcomes. Future research should continue to explore its applicability to other sports and educational settings, with the potential to further enhance student learning and engagement in diverse contexts (Topping, 2016).

CONCLUSION

The results of this study clearly demonstrate the effectiveness of the STAD (Student Teams-Achievement Divisions) model in improving swimming skills among high school students. Both quantitative and qualitative data support the hypothesis that the STAD model outperforms traditional teaching methods in enhancing swimming performance, student engagement, and motivation. The statistical analysis indicated a significant improvement in the post-test scores of the experimental group, with a medium effect size, while qualitative observations revealed greater interaction, collaboration, and enthusiasm among students in the STAD group. Overall, the study confirms that cooperative and student-centered teaching strategies like STAD can be highly effective in physical education settings.

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