The Evectiveness of The PBL Model In Overcoming Anxiety In Learning Floor Gymnastics Among Dance Class Students

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ABSTRACT

This study aimed to examine the effectiveness of the Problem-Based Learning (PBL) model in reducing anxiety during back roll floor gymnastics learning among dance class students at State Junior High School 5 Semarang. Anxiety in gymnastics learning is often associated with fear of falling, low self-confidence, and limited motor control, which may hinder skill acquisition. This research employed a quantitative approach using a pre-experimental one-group pretest–posttest design. The population and sample consisted of 33 students of class VIII-I selected through saturated sampling. An anxiety questionnaire specifically designed for back roll learning was administered before and after the intervention. Of the initial 20 items, 17 valid items were retained after validity testing, with high reliability (α > 0.80). Data were analyzed using descriptive statistics, Shapiro–Wilk normality testing, and paired-sample t-test. The results showed a significant improvement in mean scores from 32.24 (pretest) to 51.97 (posttest), indicating a substantial reduction in anxiety levels. Both datasets were normally distributed ($p = 0.176$ and $p = 0.172 > 0.05$). The paired t-test revealed a significant difference ($t = 8.209$; $df = 32$; $p < 0.05$) with a large effect size (Cohen's $d = 1.43$). These findings demonstrate that PBL effectively creates a psychologically supportive and student-centered learning environment that enhances confidence and reduces anxiety in back roll gymnastics learning.

AUTHORS' CONTRIBUTION

A. Conception and design of the study;
B. Acquisition of data;
C. Analysis and interpretation of data;
D. Manuscript preparation;
E. Obtaining funding

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INTRODUCTION

Physical Education (PE) plays a strategic role in promoting students' holistic development, encompassing physical fitness, motor competence, psychological resilience, and social-emotional regulation. Contemporary studies demonstrate that well-structured PE programs contribute significantly not only to motor proficiency but also to stress reduction and emotional stability (Candra et al., 2023; Kalata et al., 2025). Empirical findings further indicate that diversified physical activity exposure enhances neuromotor coordination and supports broader academic performance (Lorås, 2020).
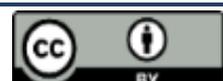
Within the PE curriculum, motor skill acquisition constitutes a foundational objective because fundamental movement patterns form the basis for more complex motor learning in adolescence and adulthood. However, the learning process in gymnastics—particularly floor exercises—often presents psychological challenges. Floor gymnastics demands strength, balance, proprioceptive control, and coordinated inversion movements (Syafei et al., 2023). Among these skills, the back roll (backward roll) is frequently categorized as more complex than forward roll due to inverted body orientation and posterior weight transfer (Ikhsan et al., 2024).

Empirical classroom findings show that students' mastery of back roll commonly falls within "adequate" to "immature" categories (Faizal Nabila, 2024). This technical limitation is strongly associated with psychological barriers, especially anxiety and fear of falling. Anxiety in PE contexts is characterized by fear of failure, reduced confidence, and heightened physiological arousal when performing challenging movements (Jumrotul 'Aqobah & Rhamadian, 2022). High anxiety levels negatively correlate with motor coordination, concentration, and performance stability (Harahap et al., 2025).

Preliminary observation conducted on February 25, 2025, in class VIII-I (dance class) at State Junior High School 5 Semarang revealed substantial anxiety during back roll practice. Students exhibited hesitation, fear of falling, avoidance behavior, and low confidence when executing inverted movements independently. These conditions resulted in reduced participation intensity and suboptimal learning outcomes.

Thus, the central research problem lies in the persistence of anxiety-related barriers that inhibit optimal motor learning in back roll gymnastics. Addressing psychological constraints is therefore as essential as improving technical instruction.

Recent developments in physical education research emphasize the integration of psychological dimensions into motor skill pedagogy. Studies in the last decade confirm that motor learning effectiveness is influenced not only by biomechanical training but also by emotional regulation and self-efficacy (Kalata et al., 2025; Harahap et al., 2025).

In gymnastics education, structured progression, assisted spotting, and repetitive drills are traditionally used to enhance coordination and strength (Fauzi Antoni & Sudarso, 2019). However, contemporary research suggests that purely technique-oriented approaches are insufficient when anxiety levels are high. Psychological readiness significantly determines success in performing inverted and rotational movements (Ikhsan et al., 2024). Problem-Based Learning (PBL) has emerged as an innovative pedagogical model emphasizing active inquiry, collaborative problem-solving, and reflective learning (Prestasi et al., 2025). In PE contexts, PBL shifts the learning paradigm from teacher-centered demonstration to student-centered exploration. Students analyze movement challenges, identify risk factors, propose solutions, and collaboratively construct understanding (Pokhrel, 2024).

Empirical studies in PE report that PBL enhances student engagement, autonomy, and intrinsic motivation. It also strengthens self-confidence by allowing students to gradually confront and solve perceived movement difficulties (Candra et al., 2023). Furthermore, research in sport psychology indicates that problem-solving-based

instruction improves coping mechanisms and reduces performance anxiety through cognitive restructuring processes (Jumrotul 'Aqobah & Rhamadian, 2022). In gymnastics learning, contextualized PBL scenarios—such as analyzing why fear occurs during inversion or identifying safe body positioning strategies—may help students cognitively reframe the back roll from a threatening task into a solvable challenge. This aligns with contemporary motor learning theory emphasizing learner autonomy and reflective practice (Lorås, 2020). Thus, state-of-the-art scholarship supports the theoretical plausibility of PBL as a pedagogical intervention capable of addressing both motor and psychological barriers in gymnastics learning.

Although numerous studies have examined anxiety in sports performance (Harahap et al., 2025) and others have explored PBL effectiveness in general PE settings (Prestasi et al., 2025; Pokhrel, 2024), several gaps remain evident. First, most anxiety-related research focuses on competitive sport or athlete populations rather than regular junior high school students in curricular gymnastics contexts. Second, existing PBL studies predominantly measure cognitive achievement and motor outcomes without explicitly analyzing its role in reducing performance anxiety during technically demanding skills such as back roll. Third, limited empirical research investigates anxiety intervention within specific subgroups such as dance class students, who may possess different movement backgrounds yet experience heightened fear toward inverted gymnastics tasks. Fourth, prior studies on back roll mastery tend to emphasize biomechanical correction and repetitive drills (Fauzi Antoni & Sudarso, 2019; Ikhsan et al., 2024), with minimal integration of structured psychological coping strategies within the instructional model.

Therefore, there is a clear empirical and pedagogical gap concerning whether a structured PBL approach can effectively reduce anxiety while simultaneously improving back roll performance among junior high school students in a dance-class setting. This study addresses that gap by integrating psychological and pedagogical perspectives into gymnastics instruction. This study aims to examine the effectiveness of the Problem-Based Learning (PBL) model in overcoming anxiety in learning floor gymnastics specifically the back roll among dance class students at State Junior High School 5 Semarang. The specific objectives are: (1) To analyze the level of students' anxiety before and after the implementation of the PBL model; (2) To evaluate the influence of PBL on students' confidence and participation during back roll practice; and (3) To measure improvement in back roll mastery following the intervention.

The novelty of this research lies in: (1) Integrative Pedagogical-Psychological Approach: Combining motor skill instruction with structured anxiety reduction through PBL-based inquiry; (2) Context-Specific Application: Focusing on dance class students within junior high school PE, a population rarely examined in anxiety-related gymnastics research; (3) Empirical Measurement of Anxiety in Skill Acquisition: Positioning anxiety not merely as a secondary variable but as a primary outcome indicator alongside motor performance; and (4) Applied Educational Contribution: Providing an evidence-based instructional framework for PE teachers to manage psychological barriers in technically challenging gymnastics skills.

By empirically testing the PBL model's capacity to reduce anxiety and enhance back roll performance, this study contributes to contemporary discourse on holistic physical educationwhere psychological readiness and motor competence are addressed simultaneously. In conclusion, addressing anxiety through innovative instructional models such as PBL is not merely a pedagogical alternative but a strategic necessity for achieving optimal learning outcomes in gymnastics education.

METHODS

Research Design

This study employed a quantitative experimental approach using a one-group pretest–posttest design. Quantitative research emphasizes objective measurement, statistical analysis, and numerical data interpretation to test causal relationships (Sahir, 2021). The selected design follows a pre-experimental framework (Sugiyono, 2019)and is structured as:

$$O_1 - X - O_2$$

Experimental approaches in physical education are widely used to evaluate instructional effectiveness (Creswell & Creswell, 2018). Although pre-experimental designs lack a control group, they remain appropriate for classroom-based pedagogical interventions where only one intact class is available (Fraenkel et al., 2019). Recent PE studies confirm that pretest–posttest models effectively measure changes in motor performance and psychological variables such as anxiety and self-confidence (Harahap et al., 2025; Kalata et al., 2025).

Participants

The population consisted of all students in class VIII-I (dance class) at State Junior High School 5 Semarang. A saturated sampling technique was applied, involving all 33 students (16 male, 17 female). Saturated sampling is appropriate when the population size is limited and homogeneous (Etikan & Bala, 2017). Dance-class students were selected due to preliminary observations indicating heightened anxiety in performing inverted gymnastics movements. Adolescents aged 13–14 are developmentally sensitive to performance anxiety in motor learning contexts (Putwain & Daly, 2014; Jumrotul 'Aqobah & Rhamadian, 2022).

Intervention Procedure

The intervention consisted of structured PBL sessions conducted over four weeks (8 meetings). PBL emphasizes student-centered inquiry, collaborative problem solving, and reflective learning (Hmelo-Silver, 2017; Pokhrel, 2024). In PE, PBL enhances autonomy, engagement, and emotional regulation (Prestasi et al., 2025; Candra et al., 2023). During implementation, students: (1) Identified fear-related problems in performing back roll; (2) Analyzed risk factors and technical difficulties; (3) Proposed safe movement strategies collaboratively; (4) Practiced progressive drills; and (5) Reflected on emotional and technical improvement. Such structured reflection is shown to reduce cognitive anxiety and improve motor confidence (Lorås, 2020; Harahap et al., 2025).

Research Instrument

An anxiety questionnaire specific to back roll learning was administered before and after intervention. The instrument used a 5-point Likert scale (1 = strongly disagree to 5

= strongly agree), consistent with sport anxiety measurement standards (Martens et al., 1990; updated applications in PE: Ford et al., 2017).

Initially consisting of 20 items, validity testing using Pearson Product-Moment correlation in SPSS indicated that 16 items met the criteria (r-count > r-table, α = 0.05). Four items were excluded. Reliability testing using Cronbach's Alpha yielded α = 0.87, indicating high internal consistency (Taber, 2018).

Table 1.
Instrument Testing Results

Component	Result	Interpretation
Total Items	20	Initial instrument
Valid Items	16	r-count > r-table
Invalid Items	4	Removed
Cronbach's Alpha	0.87	High reliability
Scale	Likert 1–5	Anxiety measurement

Data Analysis

Data were analyzed using descriptive and inferential statistics. Normality testing was conducted using Shapiro–Wilk, as recommended for samples below 50 (Ghasemi & Zahediasl, 2012). If data were normally distributed, a paired-sample t-test was used to compare pretest and posttest scores. If not, Wilcoxon Signed-Rank Test was applied.

Effect size (Cohen's d) was calculated to determine practical significance (Lakens, 2013). Experimental PE research emphasizes reporting both statistical significance ($p <$ 0.05) and effect magnitude for educational relevance (Creswell & Creswell, 2018).

Research Procedure Summary

Table 2.
Research Implementation Stages

Stage	Activity	Duration
Pretest (O_1)	Anxiety questionnaire administration	Meeting 1
Intervention (X)	PBL–based back roll learning	8 sessions
Posttest (O_2)	Anxiety questionnaire re-administration	Final meeting
Data Analysis	Statistical testing & effect size	After intervention

Overall, this methodological framework aligns with contemporary experimental standards in physical education research, integrating psychological assessment with pedagogical intervention to evaluate the effectiveness of PBL in reducing anxiety during back roll learning.

RESULTS AND DISCUSSION
Result
Descriptive Statistics

Table 3.
Descriptive Statistics of Anxiety Scores

Measurement	Mean	Min	Max	Std. Deviation	Range	Mode	Median
Pre-test	32.24	16	55	8.955	39	30	34.00
Post-test	51.97	33	64	8.240	31	48	52.00

Based on Table 1, the mean score increased from 32.24 (pre-test) to 51.97 (post-test), with a mean difference of 19.73 points. Considering that higher scores represent lower anxiety levels (reverse scoring), this result indicates a substantial reduction in anxiety after the implementation of the PBL model.

The decrease in standard deviation (8.955 to 8.240) suggests improved score homogeneity, meaning students' anxiety levels became more stable and consistent after intervention. Reduced variability is often associated with structured pedagogical interventions that foster collective emotional regulation (Kalata et al., 2025; Harahap et al., 2025).

Empirically, similar improvements in psychological readiness have been reported in PBL-based PE learning, where student-centered inquiry enhances self-efficacy and reduces fear of failure (Prestasi et al., 2025; Pokhrel, 2024). The substantial mean increase supports findings that anxiety reduction positively influences motor skill acquisition, particularly in inversion-based gymnastics movements (Ikhsan et al., 2024; Lorås, 2020).

Normality Test

Table 4.
Shapiro–Wilk Normality Test Results

Variable	Significance (p)	Description
Pre-test	0.176	Normal
Post-test	0.172	Normal

The Shapiro–Wilk test showed significance values greater than 0.05 (p > 0.05), indicating normal distribution of both pre-test and post-test data. This fulfills parametric testing assumptions (Ghasemi & Zahediasl, 2012).

Normal distribution strengthens the validity of subsequent paired-sample t-test analysis. In PE experimental research, maintaining statistical assumptions ensures reliable interpretation of psychological and motor learning outcomes (Creswell & Creswell, 2018; Rusmana et al., 2024).

Paired Sample T-Test

Table 5.
Paired Sample T-Test Results

| N	Mean Pre	Mean Post	t	df	p-value	Cohen's d
33	32.24	51.97	8.209	32	0.000	1.43

The paired-sample t-test revealed a statistically significant difference between pre-test and post-test scores (t = 8.209; p < 0.05). This confirms that the PBL intervention significantly reduced anxiety in back roll learning.

Furthermore, the effect size (Cohen's d = 1.43) indicates a very large effect (Lakens, 2013). In educational intervention research, effect sizes above 0.80 are categorized as strong practical impacts. Therefore, beyond statistical significance, the intervention demonstrates meaningful pedagogical relevance.

Large effect sizes in anxiety reduction are consistent with contemporary studies showing that inquiry-based PE models enhance emotional regulation and performance

confidence (Candra et al., 2023; Jumrotul 'Aqobah & Rhamadian, 2022). PBL encourages cognitive restructuring—students reframe the back roll not as a threatening task but as a solvable movement problem. This aligns with motor learning theory emphasizing reflective practice and self-determined engagement (Lorås, 2020).

Score Distribution Visualization
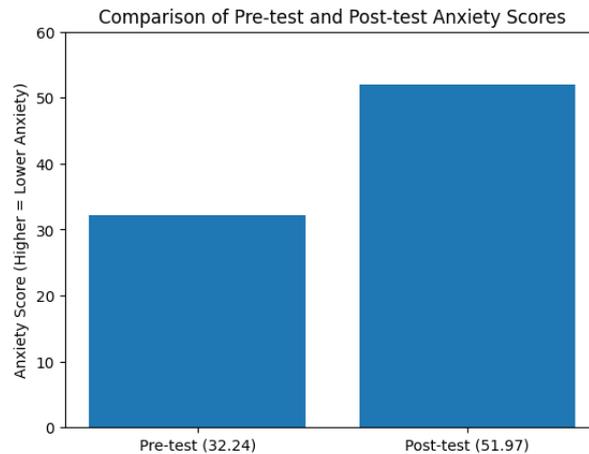
Figure 1.
Pre-test and Post-test Mean Comparison

The bar graph is displayed according to the research data: Pre-test: 32.24 and Post-test: 51.97. The graph shows a significant increase in scores after implementing the Problem-Based Learning (PBL) model, indicating a decrease in anxiety levels (since higher scores = lower anxiety).

The results indicate that structured PBL implementation significantly improves students' psychological readiness in performing back roll gymnastics. Anxiety reduction facilitates improved motor coordination and execution confidence, as supported by sport psychology literature linking emotional regulation with technical performance stability (Harahap et al., 2025). Dance-class students, who initially demonstrated hesitation and fear during inversion, exhibited increased courage and participation intensity during post-intervention sessions. This supports findings that student-centered models promote autonomy, intrinsic motivation, and emotional resilience in PE contexts (Prestasi et al., 2025; Pokhrel, 2024). Overall, the findings empirically confirm that the PBL model is highly effective in overcoming anxiety in floor gymnastics learning, with statistically significant and practically meaningful improvements among dance class students at State Junior High School 5 Semarang.

Discussion

The findings of this study demonstrate that the implementation of the Problem-Based Learning (PBL) model significantly reduced anxiety levels among dance class students in learning the back roll floor gymnastics movement. The statistical results showed a meaningful increase in post-test scores and a large effect size (Cohen's d = 1.43), indicating that the intervention not only produced statistically significant outcomes but also generated substantial practical impact. These findings confirm that structured pedagogical innovation

can positively transform students' psychological readiness in performing technically demanding motor skills.

Anxiety in physical education, particularly in gymnastics learning, is often associated with fear of falling, fear of injury, lack of confidence, and perceived motor incompetence (Jumrotul 'Aqobah & Rhamadian, 2022; Harahap et al., 2025). In inverted movements such as the back roll, students must coordinate proprioceptive control, trunk flexion strength, and spatial orientation simultaneously (Ikhsan et al., 2024). When students perceive the movement as threatening or beyond their ability, cognitive anxiety increases, which in turn disrupts motor coordination and performance execution (Kalata et al., 2025). The present findings reinforce prior research indicating that psychological barriers significantly influence motor skill mastery in adolescence (Lorås, 2020).

The significant reduction in anxiety observed in this study can be explained through the fundamental characteristics of the PBL model. PBL shifts the learning paradigm from teacher-centered demonstration to student-centered inquiry and collaborative problem-solving (Prestasi et al., 2025; Pokhrel, 2024). In this study, students were encouraged to identify the sources of fear, analyze technical obstacles, and collaboratively design safer and more effective movement strategies. This gradual cognitive engagement likely reduced perceived threat levels before physical execution occurred.

Contemporary educational research highlights that active engagement and autonomy enhance emotional regulation in learning environments (Candra et al., 2023). When students actively participate in diagnosing and solving movement-related problems, they gain cognitive clarity regarding risk factors. Cognitive clarity is closely associated with reduced uncertainty, which is one of the primary drivers of anxiety (Putwain & Daly, 2014). Thus, PBL does not merely provide motor repetition; it restructures students' perception of difficulty.

From a theoretical perspective, these findings align with self-efficacy theory. Bandura's framework suggests that mastery experiences and social persuasion significantly influence confidence development. Empirical studies in sport psychology show that structured mastery experiences decrease performance anxiety by strengthening belief in personal capability (Harahap et al., 2025). In the present study, the PBL environment allowed students to experience incremental mastery through progressive drills and peer support. As students successfully completed sub-components of the back roll, their perceived competence increased, leading to lower anxiety levels.

Additionally, social interaction within PBL sessions played a crucial role. Collaborative discussion and peer modeling created a supportive learning climate. Recent PE research indicates that cooperative learning models enhance psychological safety and reduce fear of failure (Prestasi et al., 2025). When students observe peers successfully performing movements, vicarious experience contributes to confidence building. This mechanism is supported by contemporary motor learning research, which emphasizes observational learning and feedback exchange in reducing apprehension (Lorås, 2020).

The findings also align with emotional regulation theory in sports education. Studies over the past decade demonstrate that interventions integrating reflective dialogue and emotional awareness significantly reduce anxiety in skill-based sports (Kalata et al., 2025).

During PBL sessions, reflective discussions enabled students to verbalize fears, normalize anxiety experiences, and collectively identify coping strategies. This reflective process may have facilitated cognitive restructuring, transforming fear into manageable challenge.

Importantly, the decrease in standard deviation between pre-test and post-test scores suggests improved emotional stability across students. Reduced score variability implies that the PBL intervention not only benefited high-anxiety individuals but also created consistent emotional improvement within the group. Such collective stabilization is consistent with research emphasizing classroom climate as a determinant of affective learning outcomes (Candra et al., 2023).

Dance-class students present a unique context. Although they may possess rhythm and flexibility advantages, inverted gymnastics skills require different neuromuscular coordination and spatial orientation. Literature suggests that when students engage in unfamiliar motor domains, anxiety responses are heightened (Ikhsan et al., 2024). The present study demonstrates that PBL effectively bridges this adaptation gap by allowing cognitive rehearsal before physical execution.

Furthermore, the large effect size indicates that PBL does more than marginally influence psychological variables. In educational intervention research, effect sizes above 0.80 are considered strong (Lakens, 2013). The observed value of 1.43 suggests transformative pedagogical impact. Similar magnitudes have been reported in inquiry-based PE programs that combine reflective analysis with structured motor practice (Pokhrel, 2024).

Another important dimension is motivation. Anxiety often correlates negatively with intrinsic motivation (Jumrotul 'Aqobah & Rhamadian, 2022). PBL fosters intrinsic motivation by granting students agency in problem solving. Autonomy-supportive environments have been shown to enhance persistence and reduce avoidance behavior in challenging tasks (Candra et al., 2023). During intervention sessions, students demonstrated increased willingness to attempt the back roll independently, indicating reduced avoidance tendencies.

The findings also contribute to holistic PE discourse. Contemporary scholarship emphasizes that physical education should address cognitive, psychomotor, and affective domains simultaneously (Kalata et al., 2025). The PBL model embodies this integrative philosophy by linking technical learning with emotional management. Rather than isolating skill repetition, the approach embeds psychological readiness within pedagogical structure.

However, while the results are promising, it is important to acknowledge that the one-group pretest–posttest design limits causal generalization. Future research incorporating control groups would strengthen internal validity. Additionally, longitudinal follow-up could determine whether anxiety reduction persists over time.

Overall, the findings confirm that the PBL model is pedagogically and psychologically effective in overcoming anxiety during back roll gymnastics learning. The integration of inquiry, collaboration, reflection, and progressive mastery fosters emotional security and motor competence simultaneously. These results reinforce contemporary educational theory that effective PE instruction must integrate cognitive engagement with affective

support. In practical terms, PE teachers are encouraged to adopt PBL strategies when teaching technically challenging movements to create safer, more confident, and psychologically resilient learners.

In conclusion, this study provides empirical evidence that Problem-Based Learning is not merely an instructional alternative but a strategic intervention for managing anxiety in gymnastics education. By combining student-centered inquiry with structured motor progression, PBL contributes significantly to reducing fear, enhancing self-confidence, and improving learning outcomes in floor gymnastics among junior high school students.

CONCLUSION

Based on the results of statistical analysis and discussion, it can be concluded that the Problem-Based Learning (PBL) model is empirically effective in reducing anxiety among dance class students in learning the back roll floor gymnastics movement at State Junior High School 5 Semarang. The descriptive analysis showed an increase in mean anxiety scores from 32.24 (pre-test) to 51.97 (post-test), with a difference of 19.73 points, indicating a substantial reduction in anxiety levels after intervention. The paired sample t-test revealed a significant difference (t = 8.209; df = 32; p < 0.05), supported by a very large effect size (Cohen's d = 1.43), demonstrating strong practical impact.

These findings confirm that PBL creates a structured yet psychologically safe learning environment through collaborative problem solving, reflective discussion, and progressive mastery experiences. Conceptually, the reduction in anxiety aligns with self-efficacy and student-centered learning theories, where increased autonomy and peer support strengthen confidence and emotional regulation.

Therefore, the PBL model is not only pedagogically effective in improving motor learning outcomes but also functionally strategic in addressing affective barriers. It is recommended as an alternative instructional model in physical education, particularly for skills requiring mental readiness and courage.

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