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# Gymnastic play as movement-based learning to enhance bodily–kinesthetic intelligence in early childhood

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**Abstract**

**Background:** Bodily–kinesthetic intelligence is an essential component of early childhood development, closely related to children's ability to control body movements, coordinate muscles, and express ideas through physical activity. In early childhood classrooms, stimulation of bodily–kinesthetic intelligence is often limited to routine movement and song activities that do not fully engage children. Movement-based learning, particularly gymnastic play, offers structured physical experiences that integrate balance, strength, coordination, and active engagement. However, empirical evidence examining gymnastic play as a systematic learning intervention in early childhood education remains limited.

**Aims:** This study aims to examine the effect of gymnastic play as a movement-based learning strategy on the improvement of bodily–kinesthetic intelligence in early childhood learners.

**Method:** This study employed a quantitative quasi-experimental design using a posttest-only control group. The participants were children from Group B at TK Harniatun Arrazzaq Bandar Lampung, divided into an experimental group and a control group. The experimental group received gymnastic play activities, while the control group followed conventional movement-based instruction. Data were collected through questionnaires, observations, and documentation, and analyzed using validity and reliability testing, normality and homogeneity tests, and an independent samples t-test.

**Results:** The results show a significant difference in bodily–kinesthetic intelligence between the experimental and control groups. Children who participated in gymnastic play activities achieved higher mean scores and demonstrated better coordination, balance, agility, and movement control compared to those in the control group.

**Conclusion:** Gymnastic play is an effective movement-based learning approach for enhancing bodily–kinesthetic intelligence in early childhood education. Structured and engaging physical activities support children's motor development and active participation in learning.

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## INTRODUCTION

Bodily–kinesthetic intelligence, as proposed by Gardner (1989), is one of the important dimensions of early childhood development related to the ability to control body movements, coordinate large and small muscles, and express ideas and emotions through physical activity. Sunoviani (2020) explains that children with well-developed bodily–kinesthetic intelligence typically demonstrate strong abilities in motor activities, object manipulation, body coordination, and nonverbal communication through movement. These abilities play a crucial role in children's

daily lives, particularly in functional skills such as maintaining balance, performing coordinated movements, and actively participating in activity-based learning.

Tadkiroatun (2017) emphasizes that bodily–kinesthetic intelligence that does not develop optimally may lead to various difficulties, including problems with balance, weak coordination between the eyes and limbs, low muscle strength, and delays in performing basic motor activities. In child development studies, Papalia and Martorell (2021) regard early childhood as a critical period characterized by high plasticity of the motor system. This view is consistent with Hirsh-Pasek et al. (2015), who highlight that appropriate physical stimulation during the golden age has long-term effects on children's motor, cognitive, and social development.

The theory of multiple intelligences positions bodily–kinesthetic intelligence as a fundamental ability that develops through direct movement experiences. In this context, Almeida et al. (2010) view sensorimotor experiences as a means of integrating children's motor, cognitive, and emotional functions. Rohmah (2020) adds that through structured physical activities, all parts of a child's body can develop in accordance with age-related developmental stages. In line with this perspective, research on motor development by Camden et al. (2015) shows that motor skills do not develop spontaneously but require systematically designed stimulation. Barnett et al. (2016) and Robinson et al. (2018) further confirm that the quality of movement experiences contributes significantly to the development of motor competence in early childhood.

Play-based learning approaches are considered relevant strategies for stimulating bodily–kinesthetic intelligence. Gill (2021) conceptualizes play as the primary medium through which children explore their bodily capabilities and their environment. This view is reinforced by Lifter et al. (2022), who emphasize that through play, children naturally construct knowledge about objects, events, and social relationships. Adjei-Boadi et al. (2022) also demonstrate that active play contributes to children's physical, social–emotional development, and overall well-being in a holistic manner. In the context of motor learning, Biino et al. (2025) underscore the importance of enjoyable and meaningful physical activities for young children.

One form of play-based learning with strong potential to develop bodily–kinesthetic intelligence is gymnastic play activities. The Australian Sports Commission (2007) describes gymnastics as a physical activity that involves elements of strength, flexibility, balance, coordination, and agility. Fink et al. (2008) indicates that gymnastics activities not only enhance motor abilities but also support children's social–emotional development and self-confidence. Trajković et al. (2017) emphasizes that children's bodily–kinesthetic potential develops optimally when stimulated through structured and continuous physical training. Empirical support is also provided by Sansone et al. (2019) and Webster et al. (2020), who found that structured physical activities contribute to improvements in motor competence and children's active engagement in learning.

Preliminary findings at TK Harniatun Arrazzaq Bandar Lampung indicate that the bodily–kinesthetic intelligence of children in Group B1 has not yet developed optimally. Based on internal reports from TK Harniatun Arrazzaq, most children were unable to consistently perform balance and coordination movements and showed low participation in gymnastics and movement-based activities. Monotonous and repetitive instructional patterns are suspected to contribute to children's low motivation and engagement in physical activities.

Previous studies have demonstrated the effectiveness of play and physical activities in improving bodily–kinesthetic intelligence among young children, as reported by Anggraini (2015), Yuningsih (2015), Samahati (2019), Hasibuan (2020), and Mayar and Putri (2021). However, a review of the literature indicates that most of these studies focus on general play activities and have not specifically examined the contribution of basic gymnastic movements as a

structured pedagogical intervention. In motor intervention research, Camden et al. (2015) and Robinson et al. (2018) emphasize the importance of systematic movement learning design, while Lenes et al. (2020) and Biino et al. (2025) highlight the potential of creative movement-based learning that has not yet been widely integrated with fundamental gymnastic movements.

Based on these gaps, this study aims to analyze the effect of gymnastic play activities on the improvement of bodily–kinesthetic intelligence in early childhood learners at TK Harniatun Arrazzaq Bandar Lampung. This study is expected to provide empirical contributions by strengthening evidence of the effectiveness of gymnastics as a movement-based learning strategy, theoretical contributions to the development of bodily–kinesthetic intelligence research in early childhood, and practical contributions for teachers and early childhood education administrators in designing physical learning activities that are varied, engaging, and aligned with children's developmental characteristics.

## METHOD

This study employed a quantitative approach using a quasi-experimental method with a Posttest-Only Control Group Design (Sugiyono, 2017). This design was used to examine the effect of a treatment on the dependent variable by comparing posttest outcomes between an experimental group and a control group without administering a pretest. This approach was considered appropriate because it allows researchers to identify the direct impact of the treatment within a naturally formed classroom context.

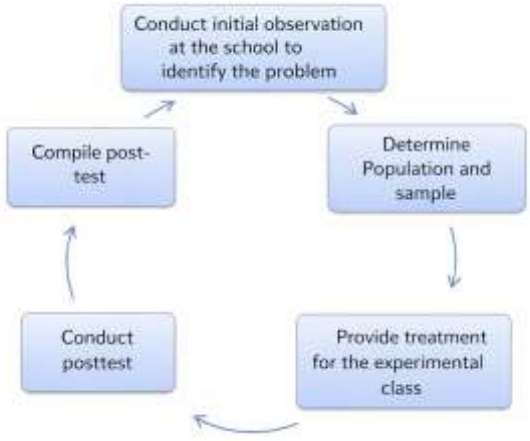


**Figure 1.** Research Flow of the Quasi-Experimental Study with a Posttest-Only Control Group Design

Based on Figure 1, the research procedure began with preliminary observations at the school to identify learning-related problems, followed by the determination of the research population and sample. The next stage involved administering the treatment to the experimental group in the form of gymnastic play activities, while the control group received conventional instruction. After the treatment phase, both groups were given a posttest to measure children's bodily–kinesthetic intelligence. The posttest data were then statistically analyzed to determine the effect of the treatment.

The participants in this study were children from Group B at TK Harniatun Arrazzaq Bandar Lampung, divided into two classes: Class B1 as the experimental group and Class B2 as the control group. The sample was selected using a purposive sampling technique, considering the equivalence of children's ages, classroom conditions, and students' readiness to participate in the

research activities. The study was conducted over a three-week period to ensure that the treatment was implemented consistently and produced measurable effects.

Data collection instruments included questionnaires, observation sheets, and documentation. The questionnaire was used to measure children's bodily–kinesthetic intelligence based on predetermined indicators, while observations were conducted to obtain supporting data related to children's engagement and the learning process during the activities. Documentation served as supplementary data in the form of activity records and visual evidence collected throughout the research implementation.

Data analysis was carried out through several stages, including validity testing using Product Moment correlation and reliability testing using Cronbach's Alpha coefficient to ensure instrument quality. Prerequisite analyses included a normality test using the Kolmogorov–Smirnov method and a homogeneity test using Levene's test. Hypothesis testing was conducted using an Independent Samples t-test with a significance level of less than 0.05. All data analyses were performed using SPSS version 26 for Windows.

## RESULT AND DISCUSSION

The results of this study were obtained through the use of a questionnaire designed in accordance with indicators of children's bodily–kinesthetic intelligence. This instrument was used to identify the effect of gymnastic play activities on children's bodily–kinesthetic intelligence at TK Harniatun Arrazzaq Bandar Lampung. A summary of the descriptive statistical results is presented in Figure 2.

**Statistics**

| | | KelasEksperimen | KelasKontrol |
|---|---|---|---|
| N | Valid | 14 | 20 |
| | Missing | 6 | 0 |
| Mean | | 75,71 | 48,85 |
| Std. Error of Mean | | ,737 | ,979 |
| Median | | 75,00 | 47,50 |
| Mode | | 74[a] | 47 |
| Std. Deviation | | 2,758 | 4,380 |
| Variance | | 7,604 | 19,187 |
| Range | | 8 | 13 |
| Minimum | | 72 | 43 |
| Maximum | | 80 | 56 |
| Sum | | 1060 | 977 |

a. Multiple modes exist. The smallest value is shown

**Figure 2.** Descriptive Statistics of Experimental and Control Groups

Descriptive statistical analysis revealed differences in bodily–kinesthetic intelligence achievement between the experimental group and the control group. The mean score of the experimental group reached 75.71, whereas the control group obtained a mean score of 48.85, resulting in a difference of 26.86 points. This difference was also reflected in the median values, with the experimental group achieving a median score of 75.00 and the control group 47.50, indicating a difference of 27.5 points. A similar pattern was observed in the mode values, which were 74 for the experimental group and 47 for the control group. In addition, the standard deviation of the experimental group (2.758) was lower than that of the control group (4.380), indicating that the data distribution in the experimental group was more homogeneous and concentrated.

Based on these results, it can be concluded that children in the experimental group who participated in gymnastic play activities demonstrated better bodily–kinesthetic intelligence than children in the control group who followed conventional movement-and-song learning. Categorically, the achievement of the experimental group was classified as competent, whereas the control group remained in the fairly competent category.

The next stage of analysis involved testing the assumption of data normality to ensure the appropriateness of inferential statistical analysis. The normality test was conducted using the Liliefors test with the assistance of SPSS version 26 for Windows. Data were considered normally distributed if the significance value in the Kolmogorov–Smirnov test exceeded 0.05. The results of the normality test are presented in Figure 3.

**Tests of Normality**

| | | Kolmogorov-Smirnov[a] | | | Shapiro-Wilk | | |
|---|---|---|---|---|---|---|---|
| | Kelas | Statistic | df | Sig. | Statistic | df | Sig. |
| Hasil | Kelas Eksperimen | ,174 | 14 | ,200* | ,886 | 14 | ,071 |
| | Kelas Kontrol | ,177 | 20 | ,101 | ,908 | 20 | ,057 |

*. This is a lower bound of the true significance.
a. Lilliefors Significance Correction

**Figure 3.** Normality Test Results of Experimental and Control Groups

The normality test results showed that the significance value for the experimental group was 0.200, while that for the control group was 0.101. Both values exceeded the 0.05 significance threshold, indicating that the bodily–kinesthetic intelligence scores of both groups were normally distributed.

Subsequently, a homogeneity of variance test was conducted to determine whether the variances of the experimental and control groups were equivalent. This test employed Levene's Statistic using SPSS version 26 for Windows, with the criterion that data are considered homogeneous if the significance value exceeds 0.05. The results of the homogeneity test are presented in Figure 4.

**Test of Homogeneity of Variances**

| | | Levene Statistic | df1 | df2 | Sig. |
|---|---|---|---|---|---|
| Hasil | Based on Mean | 4,940 | 1 | 32 | ,033 |
| | Based on Median | 2,737 | 1 | 32 | ,108 |
| | Based on Median and with adjusted df | 2,737 | 1 | 27,931 | ,109 |
| | Based on trimmed mean | 4,769 | 1 | 32 | ,036 |

**Figure 4.** Homogeneity of Variances Test Results

Based on Levene's test results, a significance value of 0.033 was obtained, indicating that the variance between the two groups met the requirements for hypothesis testing.

Hypothesis testing was conducted using an Independent Samples t-test with the assistance of SPSS version 26 for Windows to determine the effect of gymnastic play activities on children's bodily–kinesthetic intelligence. The decision-making criterion was set at a significance level of 0.05, whereby the alternative hypothesis is accepted if the significance value is less than 0.05. The results of the hypothesis testing are presented in Figure 5.

**Independent Samples Test**

| | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | 95% Confidence Interval of the Difference | |
| | | F | Sig. | t | df | Sig. (2-tailed) | Mean Difference | Std. Error Difference | Lower | Upper |
| Hasil | Equal variances assumed | 4,940 | ,033 | 20,259 | 32 | ,000 | 26,864 | 1,326 | 24,163 | 29,565 |
| | Equal variances not assumed | | | 21,916 | 31,737 | ,000 | 26,864 | 1,226 | 24,367 | 29,362 |

**Figure 5.** Independent Samples t-Test Results

The results of the Independent Samples t-test showed a significance value (2-tailed) of 0.000. This value was below the 0.05 significance level, leading to the rejection of the null hypothesis and acceptance of the alternative hypothesis.

Thus, gymnastic play activities were proven to have a significant effect on the bodily–kinesthetic intelligence of children at TK Harniatun Arrazzaq Bandar Lampung.

This study aimed to examine the effect of gymnastic play activities on the bodily–kinesthetic intelligence of early childhood learners. The results indicate that children who participated in gymnastic-based learning exhibited higher levels of bodily–kinesthetic intelligence compared to those who engaged in conventional learning. These findings are consistent with the view of Mursid (2015), who stated that children's bodily–kinesthetic intelligence can be developed through structured physical activities such as games, dance, and sports. Gymnastic activities, as a form of early childhood physical exercise, provide movement stimulation involving body coordination, balance, flexibility, and muscle strength, making them highly relevant for the development of bodily–kinesthetic intelligence.

The findings of this study also reinforce those of Trajković et al. (2017), who reported that systematic implementation of gymnastics can enhance various aspects of bodily–kinesthetic intelligence, including flexibility, balance, and agility. In this study, the sequence of gymnastic activities was designed to train these aspects through activities such as jumping one meter, jumping to a height of forty centimeters, bouncing a ball while walking, running in a zigzag pattern, and performing front support. These activities provided children with opportunities to coordinate whole-body movements while developing motor control in a playful and enjoyable context.

During the treatment process, the activity of jumping one meter through the *frogs and lily pads* game functioned to train agility and body coordination. The activity of jumping to a height of forty centimeters through the *target relay* trained leg muscle strength and body balance, as evidenced by improvements in children's ability to land using both feet in the *motor bike* position. For the indicator of bouncing a ball while walking, most children demonstrated good mastery of hand–foot coordination. The *stone bridge trees* activity involving zigzag running also showed improvements in children's agility when navigating obstacles. Meanwhile, in the *front support* activity, several children still demonstrated moderate ability, particularly in hand–foot coordination and arm muscle strength.

These outcomes indicate that most indicators of bodily–kinesthetic intelligence, such as jumping one meter, landing in the *motor bike* position, bouncing a ball, and zigzag running, were mastered well by the children. However, some children remained in the fairly competent category for the front support indicator. This condition suggests that although gymnastic activities are effective in improving bodily–kinesthetic intelligence overall, individual achievement levels are still influenced by personal and environmental factors.

Observations during the activities revealed that parental involvement also influenced children's performance in participating in gymnastic activities. Some children were observed frequently approaching their parents during the sessions, while verbal and nonverbal support

from parents remained relatively limited. This condition caused some children to lose focus and perform the gymnastic movement sequences less optimally. These findings are consistent with the view of Sri Widiyati (2008), who stated that children's bodily–kinesthetic intelligence is influenced by internal factors such as genetics and intelligence, as well as external factors including parenting style, environmental stimulation, and nutritional intake.

Environmental stimulation, both at school and at home, plays a crucial role in supporting the development of children's bodily–kinesthetic intelligence. Lubis (2020) emphasized that the home environment makes a significant contribution by providing stimulation that strengthens children's motivation and engagement in physical activities. In the context of this study, limited stimulation from the family environment, particularly insufficient parental support during activities, was one factor influencing variations in children's bodily–kinesthetic achievement. Therefore, collaboration between teachers and parents is essential in creating a conducive learning environment for children's motor development.

In addition to its impact on bodily–kinesthetic intelligence, the implementation of gymnastic activities also demonstrated positive contributions to children's social–emotional development. Children appeared more confident and willing to try various movements, even though some were initially hesitant. This finding supports the view of Suyati and Margono (2000), who stated that gymnastic activities can foster children's self-confidence and courage through challenging yet enjoyable movement experiences.

Other findings indicated that children were enthusiastic and enjoyed each stage of the gymnastic play activities. They demonstrated joy, perseverance, and enthusiasm to continue trying when encountering difficulties in performing certain movements. Margono (2009) noted that the immediate goals of gymnastic activities include not only improving physical skills but also fostering joy, courage, and the development of positive attitudes toward physical activity. Thus, gymnastic activities in this study functioned not only as a means of enhancing bodily–kinesthetic intelligence but also as a learning medium that supports children's holistic social–emotional development.

Overall, this discussion confirms that the results of the study are aligned with the theoretical framework and empirical findings presented in the introduction. Gymnastic activities, as a form of play- and movement-based learning, have been shown to provide structured, enjoyable, and meaningful motor stimulation for young children. These findings further strengthen the position of gymnastics as an effective alternative pedagogical strategy for enhancing bodily–kinesthetic intelligence in early childhood education settings.

## CONCLUSIONS

This study concludes that gymnastic play activities have a significant effect on improving the bodily–kinesthetic intelligence of early childhood learners at TK Harniatun Arrazzaq Bandar Lampung. These findings are consistent with the research objective, which was to analyze the impact of movement-based learning through gymnastics on children's bodily–kinesthetic intelligence. The implementation of gymnastic activities, including jumping a distance of one meter, jumping to a height of forty centimeters, and running in a zigzag pattern, was proven to enhance children's flexibility, leg muscle strength, and agility in an integrated manner. These results indicate that gymnastics can function as an effective and enjoyable learning strategy for stimulating bodily–kinesthetic intelligence through structured and meaningful movement experiences.

The implications of this study highlight that gymnastic play activities can serve as an alternative motor learning approach in early childhood education to optimally support the

development of children's bodily–kinesthetic intelligence, while also encouraging active engagement, courage, and self-confidence. However, this study is limited by the relatively small number of participants and the research context being confined to a single educational institution, which requires cautious generalization of the findings. Therefore, future research is recommended to involve larger samples, more diverse institutional contexts, and to examine long-term effects as well as the integration of gymnastics with other domains of child development in order to obtain a more comprehensive understanding.

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## AUTHOR CONTRIBUTION STATEMENT

NT contributed to research conceptualization, data collection, and implementation of gymnastic play activities. SI contributed to research design, statistical data analysis, interpretation of results, and manuscript revision. Both authors approved the final version of the manuscript.

## CONFLICTS OF INTEREST

The authors declare that the study was conducted in collaboration with the participating school for educational purposes only. No financial incentives, commercial interests, or personal relationships influenced the research design, data analysis, or interpretation of the findings.

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