

THE EFFECT OF THE ENDURANCE TRAINING PROGRAM ON THE ANXIETY LEVEL OF ELEMENTARY SCHOOL STUDENTS**Kurniawan Irsyadi¹, Hijrah Maulidiah Afifah²**Universitas Negeri Semarang^{1,2}kurniawanirsyadi01@students.unnes.ac.id**Abstract**

The condition of physical endurance and anxiety levels of elementary school students need attention because they can affect students' physical and psychological health in carrying out daily activities. This study aimed to determine the initial condition of students' physical endurance, describe students' anxiety levels before and after participating in a physical endurance training program, and analyze the effect of the physical endurance training program on the anxiety levels of students at SD Negeri Doropayung 01 Juwana. This research used a quantitative method with a quasi-experimental design of the One Group Pretest-Posttest Design type. The research sample consisted of 34 students selected using purposive sampling technique. Data collection was carried out using a physical endurance test instrument and the Hamilton Anxiety Rating Scale (HARS) questionnaire. The physical endurance training program was implemented through the circuit training method. Data analysis used the paired sample t-test and N-Gain test with the assistance of SPSS version 25. The results showed that the initial condition of students' physical endurance was still in the moderate category and the anxiety level before treatment was dominated by the moderate anxiety category. After participating in the physical endurance training program, students' anxiety levels decreased and most students were categorized as having no anxiety. The paired sample t-test result showed a significance value of $0.000 < 0.05$, indicating a significant effect of the physical endurance training program on students' anxiety levels. The N-Gain test result obtained an average score of 0.4661 categorized as moderate. Therefore, the physical endurance training program was proven to be sufficiently effective in reducing students' anxiety levels.

Keywords: Physical Endurance; Anxiety; Physical Exercise; Circuit Training; Elementary School Students

Submitted : 19th of May 2026Accepted : 19th of July 2026Published : 19th of July 2026

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E-Mail: kurniawanirsyadi01@students.unnes.ac.idDOI <http://dx.doi.org/10.31851/hon.v9i2.21711>

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INTRODUCTION

Anxiety is one of the psychological problems commonly experienced by elementary school children in Indonesia, especially amid increasing academic and social demands. Anxiety can affect children's learning performance and daily social interactions (Haryati et al., 2025). Children who experience anxiety tend to have low learning concentration and become easily fatigued during learning activities

(Liana, 2024). If not properly addressed, anxiety can develop into more serious psychological disorders in later stages of development (Ausie et al., 2025). Therefore, students' anxiety levels are an important concern in elementary education because they influence academic achievement and children's overall quality of life.

The elementary school environment is expected to support students' psychological well-being through balanced learning management and supporting activities. Students with low anxiety levels tend to have better learning motivation and participate more actively in school activities. Widodo et al. (2017) stated that students with high anxiety levels generally experience decreased learning motivation. This condition requires schools not only to focus on cognitive aspects but also to pay attention to factors affecting students' mental health. Thus, understanding factors contributing to students' anxiety becomes an important need in elementary education.

Anxiety is influenced by internal and external factors. Internal factors include physical condition, body endurance, and mental health, while external factors include school environment, academic pressure, and family support (Putri et al., 2025). Siregar (2024) explained that anxiety is influenced by psychological, environmental, and biological factors. Poor physical condition can reduce children's ability to cope with stress (Siby & Kasingku, 2024).

Good physical endurance is known to affect children's mood and stress responses (Gandasari et al., 2024). Physical endurance is the body's ability to perform physical activities without becoming easily fatigued (Nurdin & Ali, 2022). Ma'ruf et al. (2024) found that children who rarely exercise have higher anxiety levels than those who regularly engage in physical activities. In addition, weak physical endurance makes children more vulnerable to fatigue and stress (Widohardhono et al., 2024). Social interaction with peers can also help reduce anxiety (Simanjuntak et al., 2024).

Children with good physical endurance tend to be more resistant to stress and academic pressure. Widohardhono et al. (2024) stated that higher levels of physical

activity are associated with lower academic stress. Nutrition, sleep patterns, and regular physical activity also influence children's endurance. Repeated physical fatigue can trigger stress responses and worsen anxiety (Kasingku & Lotulung, 2024). Therefore, improving physical endurance through exercise and nutrition is an important strategy for managing children's anxiety.

The relationship between physical endurance and anxiety reflects the close connection between physical health and children's psychological well-being. Children with good physical condition are generally more capable of adapting to daily pressures and stress. In contrast, poor physical fitness can increase stress perception, making children more vulnerable to anxiety (Novianti et al., 2021). When the body is not in optimal condition, emotional responses to pressure become more intense and may trigger anxiety in students (Febri, 2024).

Improving physical endurance can be achieved through systematic and continuous training programs. A physical endurance training program consists of regular physical activities aimed at improving students' fitness and endurance (Supriadi et al., 2025). Regular exercise can increase endorphin production and reduce cortisol levels associated with stress (Aulia et al., 2025). Better physical fitness also supports students' self-confidence and mental resilience (Yulianto et al., 2025). Casman et al. (2022) reported a 17% reduction in anxiety scores among children who participated in regular exercise for at least 30 minutes daily. In contrast, low participation in physical activity is associated with sedentary behavior and emotional problems (Eliawati et al., 2024).

Physical endurance training programs also play a role in improving children's social skills. Through group sports activities, students learn cooperation, communication, and respect for peers. School-based physical activities provide opportunities for students to interact in positive and enjoyable situations (Norok, 2025). Schools that support regular physical exercise also contribute to increasing self-confidence, emotional control, and reducing students' anxiety levels (Kolang

et al., 2025). Therefore, it is important to analyze the relationship between physical activity and students' anxiety levels in elementary schools.

Good physical endurance can reduce anxiety through physiological and psychological mechanisms. Regular training programs can increase endorphin production, which creates feelings of comfort and relaxation (Rahman et al., 2024). In addition, students who regularly engage in physical exercise tend to have better sleep patterns and more stable energy levels (Manalu, Ihsan, et al., 2025). Better physical fitness enables students to face academic demands with improved mental readiness.

Although physical exercise is theoretically believed to reduce anxiety, previous studies have shown inconsistent findings. Oktaviana et al. (2022) found that physical exercise had no significant effect on students' anxiety, while Ayu et al. (2023) reported a significant effect. Gandasari et al. (2024) also stated that there was no relationship between physical activity and students' anxiety. These inconsistent findings indicate a research gap that requires further investigation, particularly regarding structured physical endurance training programs for elementary school students.

METHOD

This study used a quantitative approach with a quasi-experimental research design employing the One Group Pretest-Posttest Design. According to Sugiyono (2019), a quantitative approach is used to examine populations or samples through data collection techniques that are analyzed statistically to test hypotheses. The research was conducted at SD Negeri Doropayung 01 Juwana, Pati Regency, from March to April 2026.

Participants

The population in this study was all students at SD Negeri Doropayung 01 Juwana. The sample consisted of 34 students from grades IV and V selected using purposive sampling. The inclusion criteria were students who were able to participate in physical activity-based training and did not have a medical history that restricted physical exercise. Ethical clearance was obtained through permission

from the school principal, and informed consent was obtained from students' guardians prior to participation.

Intervention Procedure (Circuit Training Program)

The circuit training program was implemented in four sessions. Each session consisted of Warm-up (10 minutes): light jogging, dynamic stretching, and mobility exercises. Main circuit training (4 stations): Station 1: Jumping jack (1 minute, 2 repetitions), Station 2: Plank (1 minute, 2 repetitions), Station 3: Shuttle run 10 meters (back and forth) (1 minute, 2 repetitions), Station 4: Squat (1 minute, 2 repetitions). Students rotated through each station with 30–60 seconds rest between stations. The circuit was repeated twice per session. Cool-down (10 minutes): static stretching and breathing relaxation exercises.

Body endurance questionnaire/instrument

The body endurance instrument consisted of 14 items (P1–P14). Content validity was assessed through expert judgment by a Physical Education lecturer and the instrument was declared feasible to use without revision. Construct validity testing using Pearson correlation showed that all items were valid (Sig. = 0.000). Reliability testing using Cronbach's Alpha produced a value of 0.945, indicating excellent reliability.

Anxiety scale using the Hamilton Anxiety Rating Scale (HARS)

The HARS instrument consisted of 14 indicators with a total of 56 items. The instrument was adapted for elementary school students by simplifying language and adjusting item wording according to children's cognitive development level. Content validity was assessed through expert judgment by a Physical Education lecturer, and the instrument was declared feasible to use without revision. Construct validity testing showed that all items were valid (Sig. = 0.000). Reliability testing using Cronbach's Alpha produced a value of 0.885, indicating good reliability.

RESULT AND DISCUSSION

Table 1. Descriptive Statistics

Variable	N	Minimum	Maximum	Mean	Std. Deviation
Pretest	34	13.00	29.00	21.0882	4.52848
Posttest	34	7.00	15.00	11.1765	2.11016

The descriptive analysis of anxiety levels showed a decrease in students' scores after the intervention. The mean score decreased from 21.0882 in the pretest to 11.1765 in the posttest. This indicates that students experienced lower anxiety levels after participating in the circuit training program, along with a reduction in score variability.

Result of Normality Test

Table 2. Normality Test Result

Variable	Kolmogorov-Smirnov Sig.	Shapiro-Wilk Sig.
Pretest	0.200	0.102
Posttest	0.200	0.427

The normality test was conducted using Kolmogorov-Smirnov and Shapiro-Wilk tests. The results showed that both pretest and posttest data had significance values greater than 0.05 ($p > 0.05$), indicating that the data were normally distributed. Therefore, the data met the assumption for parametric statistical analysis.

Result of Homogeneity Test

Table 3. Homogeneity Test (Levene's Test)

Based on	Levene Statistic	df1	df2	Sig.
Mean	2.090	1	63	0.153
Median	2.296	1	63	0.135
Median (adj.)	2.296	1	54.735	0.135
Trimmed Mean	2.360	1	63	0.129

The homogeneity test using Levene's Test showed that the significance value based on mean was 0.153, which is greater than 0.05. This indicates that the variance of the data is homogeneous. Thus, the assumption of homogeneity of variance was fulfilled, allowing the use of parametric tests in further analysis.

Results of Students' Physical Endurance Questionnaire at SD Negeri Doropayung 01 Juwana

The results of the students' physical endurance questionnaire were obtained through pretest and posttest measurements after participating in the endurance training program.

Table 4. Results of Students' Physical Endurance Questionnaire

Indicator	Pretest Score	Posttest Score
Cardiovascular endurance	63%	89%
Respiratory endurance	65%	86%
Muscle endurance	64%	86%
Heart rate response	59%	88%
Stamina level	65%	86%

Physical recovery	66%	89%
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The pretest results showed that the physical endurance of students at SD Negeri Doropayung 01 Juwana was still at a moderate level and had not yet reached optimal condition. Cardiovascular endurance obtained a score of 63%, indicating that students still became easily fatigued during physical activities. Sagita et al. (2023) explained that low physical activity can prevent cardiovascular ability from developing optimally. Paroi et al. (2022) also stated that insufficient physical activity may weaken heart muscle performance and reduce oxygen distribution throughout the body.

The respiratory endurance indicator obtained a score of 65%, showing that students' lung capacity and oxygen supply during activities were still relatively moderate. Ardiansyah et al. (2025) explained that respiratory endurance is strongly influenced by regular and continuous physical exercise habits. Regular exercise can improve the ability of the lungs and heart to distribute oxygen efficiently throughout the body. Altmann et al. (2021) explained that cardiorespiratory fitness affects an individual's ability to perform physical activities for longer periods without excessive fatigue.

Muscle endurance obtained a score of 64%, showing that students' muscle strength was still limited. Badaruddin et al. (2024) explained that lack of regular physical exercise can reduce muscles' ability to work continuously for longer periods. Rauzan et al. (2025) also stated that insufficient physical activity may decrease muscle mass and increase body fat accumulation in children. This condition causes students to become more easily fatigued and less able to maintain physical performance during activities.

The lowest pretest result was found in heart rate response with a score of 59%. This condition indicated that students still needed a longer recovery time after physical activity. Regular exercise helps the heart adapt better during physical activity (Patel et al., 2026). Sari et al. (2025) also stated that heart rate response is closely related to physical fitness and exercise habits.

Stamina level obtained a score of 65%, indicating that students were still easily tired during prolonged activities. Prayudho et al. (2026) explained that stamina is closely related to the body's ability to maintain energy during physical activities. Adhelia & Sefrina (2022) further stated that stamina is influenced by healthy lifestyles, nutritional intake, adequate sleep duration, and physical activity patterns.

The physical recovery indicator achieved a score of 66%, indicating that students' recovery after physical activity was still not optimal. This finding shows that some students still required a longer time to restore body energy, normalize heart rate, and reduce fatigue after exercise. Manalu, Nainggolan, et al. (2025) explained that students who rarely engage in physical activities generally have slower recovery processes compared to students who are physically active.

The posttest results showed improvements in all physical endurance indicators after students participated in the endurance training program. Cardiovascular endurance increased from 63% to 89%, respiratory endurance from 65% to 86%, muscle endurance from 64% to 86%, heart rate response from 59% to 88%, stamina from 65% to 86%, and physical recovery from 66% to 89%. These improvements indicate that the endurance training program positively affected students' physical fitness, body adaptation, and recovery abilities. Students became more capable of participating in physical activities without quickly experiencing fatigue after regularly following the structured exercise program.

Based on the pretest and posttest results, it can be concluded that the endurance training program improved the physical endurance of students at SD Negeri Doropayung 01 Juwana. Improvements were observed in cardiovascular endurance, respiratory endurance, muscle endurance, heart rate response, stamina, and physical recovery. The results indicate that regular and structured physical activity can help students become fitter, more energetic, and physically stronger in carrying out daily activities.

Results of Students' Anxiety Level Questionnaire at SD Negeri Doropayung 01 Juwana

Students' anxiety levels were measured before and after participating in the endurance training program using an anxiety questionnaire. The results are presented in the following tables.

Table 5. Pretest Results of Students' Anxiety Levels

Score	Category	Frequency	Percentage
<14	No anxiety	1	3%
14–20	Mild anxiety	15	44%
21–27	Moderate anxiety	16	47%
28–41	Severe anxiety	2	6%
42–56	Very severe anxiety	0	0%
Total		34	100%

Based on Table 5, most students were categorized as experiencing moderate anxiety (47%) before participating in the endurance training program. Students in this category often felt nervous, worried, and tense during school activities and social interactions. Setiawan & Musslifah (2023) explained that environmental and cognitive factors can trigger anxiety in students. Mizan & Uce (2025) also stated that difficulties in emotional control may increase anxiety levels in children.

Mild anxiety was experienced by 44% of students. This condition was generally characterized by feelings of restlessness and worry in certain situations. Mild anxiety usually makes individuals more alert to their surroundings (Afriany, 2025). Dayanti & Aristawati (2026) also stated that social environments and negative thinking patterns can contribute to mild anxiety. Severe anxiety was still experienced by 6% of students. Students in this category tended to panic easily, had difficulty concentrating, and showed excessive fear. Maindoka (2026) explained that unpleasant experiences can trigger anxiety responses in individuals. Hikmah & Mufqi (2025) also stated that severe anxiety can cause excessive fear and emotional instability.

Table 6. Posttest Results of Students' Anxiety Levels

Score	Category	Frequency	Percentage
<14	No anxiety	29	85%
14–20	Mild anxiety	5	15%
21–27	Moderate anxiety	0	0%
28–41	Severe anxiety	0	0%
42–56	Very severe anxiety	0	0%
Total		34	100%

The posttest results showed that the percentage of students with no anxiety increased significantly to 85%. Physical activity helps reduce psychological tension and creates relaxation (Wibowo et al., 2025). Ayu et al. (2023) also stated that regular physical exercise can improve emotional control and psychological well-being through the release of neurotransmitters such as serotonin.

The percentage of mild anxiety decreased to 15%, while moderate and severe anxiety categories were no longer found. Rahman et al. (2024) explained that regular physical exercise helps individuals become more relaxed and capable of controlling anxiety. These findings indicate that the endurance training program helped students become calmer, more confident, and emotionally stable.

Based on the pretest and posttest results, it can be concluded that students' anxiety levels improved after participating in the endurance training program. Before the program, most students experienced moderate anxiety and some experienced severe anxiety. After the program, the majority of students were categorized as having no anxiety, while moderate and severe anxiety categories disappeared entirely. These findings indicate that structured physical exercise contributed positively to improving students' emotional conditions and reducing anxiety levels.

Students' Anxiety Levels Before and After Participating in the Endurance Training Program

The analysis of the effect of the endurance training program on students' anxiety levels was conducted using the paired sample t-test and N-Gain test. The paired sample t-test was used to determine whether there was a significant difference in anxiety levels before and after treatment, while the N-Gain test was used to determine the effectiveness level of the program.

Table 7. Paired Sample T-Test Results

Paired Samples Test	Mean	Std. Deviation	Std. Error Mean	t	df	Sig. (2-tailed)	Cohen's d
Pretest – Posttest	9.97059	2.87608	0.49324	20.214	33	0.000	3.47

Based on Table 7, the significance value (Sig. 2-tailed) was 0.000, which was lower than 0.05. This result indicates that the endurance training program had a

significant effect on reducing students' anxiety levels at SD Negeri Doropayung 01 Juwana. Rahman et al. (2024) explained that physical activity stimulates endorphin production, which helps reduce stress responses and promotes relaxation. Aulia et al. (2025) also stated that regular exercise reduces cortisol levels associated with stress and anxiety.

In addition, the magnitude of the effect was confirmed by the effect size analysis using Cohen's d , which showed a very large effect ($d = 3.47$). This indicates that the endurance training program had a strong practical impact on reducing students' anxiety levels. The very large effect size can be explained by the consistent decrease in anxiety scores across almost all students after the intervention, along with relatively low variability in score changes, which reflects a uniform response to the circuit training program. This suggests that the structured physical activity was highly effective in supporting emotional regulation and reducing anxiety symptoms among elementary school students.

The t -value of 20.214 further indicated a substantial difference between anxiety levels before and after the treatment, strengthening the evidence that the intervention had a strong and consistent impact. The endurance training program also improved students' physical fitness, making them less easily fatigued during daily activities. Liana (2024) explained that anxious students generally experience fatigue and difficulty concentrating during learning activities. Siby & Kasingku (2024) also stated that poor physical conditions reduce children's ability to cope with stress, while Novianti et al. (2021) further explained that children with better physical conditions tend to have stronger adaptability to stress and pressure.

Regular physical activity additionally contributed to improving sleep quality and maintaining students' energy stability. Manalu et al. (2025) explained that students who regularly participate in physical exercise tend to have better sleep quality and more stable energy levels. Widohardhono et al. (2024) also stated that increased physical activity is associated with lower academic stress levels. Norok (2025) explained that group physical activities help improve children's

communication skills and social interactions. Komang et al. (2025) also stated that positive sports environments can improve students' self-confidence and emotional control.

Table 8. N-Gain Test Results

N	Minimum	Maximum	Mean	Std. Deviation
34	0.35	0.58	0.4661	0.06217

Based on Table 8, the average N-Gain score was 0.4661, which falls within the moderate category according to Hake (1999) in Wahab et al. (2021). This finding indicates that the endurance training program had a moderate level of effectiveness in reducing students' anxiety levels. Although the paired sample t-test showed a statistically significant difference between pretest and posttest results ($p < 0.05$), the moderate N-Gain value suggests that the level of improvement was not yet optimal in terms of normalized effectiveness gain.

This condition can be explained by several factors. Anxiety is a complex psychological condition that is influenced by multiple aspects such as psychological state, environmental conditions, and biological factors (Siregar, 2024). Putri et al. (2025) also stated that academic pressure, social support, and physical conditions affect students' anxiety levels. Therefore, variations in students' emotional adaptation and external environment may affect the extent of improvement achieved, resulting in a moderate rather than high N-Gain score.

In addition, differences in individual responses to physical training may also contribute to the moderate effectiveness level. Not all students adapt at the same speed to structured physical activity, especially within a relatively short intervention period consisting of only four training sessions. Eliawati et al. (2024) stated that low physical activity participation is associated with emotional instability in children, while Gandasari et al. (2024) explain that good physical endurance can improve mood and stress responses in children. These findings indicate that although the endurance training program was effective in reducing anxiety, its impact may still require a longer duration or more intensive intervention to achieve a higher level of effectiveness.

CONCLUSION

Based on the results of this study, the physical endurance of students at SD Negeri Doropayung 01 Juwana before participating in the endurance training program was still not optimal, as shown by the moderate scores in cardiovascular endurance, respiratory endurance, muscle endurance, heart rate response, stamina, and physical recovery. After participating in the program, all indicators of physical endurance improved. In addition, students' anxiety levels before the program were mostly categorized as moderate and mild anxiety, while after participating in the program, most students were categorized as having no anxiety and no students remained in the moderate or severe anxiety categories. The paired sample t-test results showed that the endurance training program had a significant effect on reducing students' anxiety levels. Furthermore, the N-Gain test results indicated that the program had moderate effectiveness in reducing anxiety. These findings indicate that regular and structured physical exercise can improve students' physical endurance while also supporting their emotional stability and psychological well-being.

Based on these findings, schools are recommended to implement endurance training programs as regular activities to support students' physical and mental health. Teachers are expected to encourage students to participate actively in physical exercise, while students should maintain regular physical activity habits both at school and at home. Future researchers are also encouraged to conduct similar studies with larger samples and longer implementation periods to obtain broader research findings.

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