

**Analysis of Lower Grade Students Gross Motor Ability Using Test of Gross Motor Development-2 (TGMD 2) Instrument**Erika Afriana^{1*}, Martin Sudarmono²¹²Faculty of Sports Sciences, Physical Education, Health and Recreation, Semarang State University, Semarang, Central Java, Indonesia**Keywords**

locomotives; object control; Gross Machine Intelligence (GMQ)

Abstract

Gross motor skills play a fundamental role in supporting children's physical activity participation and long-term health development. However, empirical data on gross motor ability profiles in integrated Islamic primary schools are still limited, especially in terms of distribution analysis based on standard instruments. The study aimed to analyze the locomotor skills, object control skills, and Gross Motor Quasiencies (GMQ) of undergrad students using the Gross Motor Development Test-2 (TGMD-2). The study used a quantitative descriptive design involving 21 students aged 7-10 years who were selected through total sampling. Data was collected using TGMD-2, which consisted of 12 motor skill items. The raw score obtained is converted into standard scores and GMQs based on normative tables. Data analysis includes descriptive statistics and distribution analysis. The results showed that 80.95% of students were categorized as Average and 19.04% as Below Average, with an average GMQ score of 93.71. Despite being within the normative standard, none of the students reached the above-average category, indicating limited optimization of motor skills. This study highlights a distribution-based analytical approach to GMQ in the context of integrated schools, which reveals a tendency to stagnate at the average level. These findings imply the need for structured, progressive, and experiential physical education interventions to improve the development of motor competence.

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INTRODUCTION

Motor ability is one of the fundamental components in children's development which plays an important role in supporting physical activity, health, and participation in daily life (Kelshaw et al., 2022). This ability involves coordinating the body's large muscles used in activities such as running, jumping, throwing, and catching. Research shows that motor competence has a reciprocal relationship with children's physical activity levels, where children with good motor skills tend to be more physically active, and vice versa (Figueroa & An, 2017). Therefore, the development of gross motor skills from elementary school age is very important as a foundation for long-term physical development and health.

Gross motor involves the use of large groups of muscles, both partially and almost all of the limbs, so that they play a role in activities that require overall strength and coordination such as running, jumping, and throwing (Leonardo, 2020; Nurdin et al., 2024). Meanwhile, fine motor is related to movements that use small muscles on specific parts of the body that demand more precision and coordination Specific (Nutr et al., 2024). Activities such as cutting, drawing, coloring, weaving, and pencil sharpening are examples of fine motor skills.

Physical education and sports have a strategic role in developing students' motor skills. Through structured and continuous learning, students can gain diverse movement experiences so that they are able to improve coordination, balance, muscle strength, and movement control. Some previous studies have shown that most elementary school students are in the average category in basic motion skills, both in locomotor aspects and object control (Azrina et al., 2023; Anjani et al., 2024). However, these findings are generally still descriptive and have not described in depth the distribution of motor skills based on developmental categories.

Based on the study of previous research, there are several research gaps that are the basis for this research. First, empirically, there is still limited data on the gross motor ability profile of elementary school students in Indonesia, especially in integrated Islamic-based schools. Second, contextually, integrated Islamic elementary schools (SD IT) have different characteristics of the learning environment, but have not been widely studied in motor research. Third, analytically, most studies still focus on average scores without emphasizing the analysis of the distribution of ability categories based on standard instruments such as the Test of Gross Motor Development-2 (TGMD-2). In fact, the analysis of category distribution can provide a more comprehensive picture of the quality of students' motor development.

To obtain an objective picture of the basic motor movement ability of students, a valid and reliable measurement instrument is needed. One of the widely used instruments is the Test of Gross Motor Development (TGMD-2) developed by Ulrich. The Test of Gross Motor Development-2 (TGMD-2) instrument is one of the standardized measuring instruments and widely used internationally to assess the gross motor ability of children aged 3-10 years. This instrument assesses two main aspects, namely locomotor ability and object control, so that it can provide a comprehensive picture of children's motor development. However, the use of TGMD-2 in the context of the analysis of the distribution of motor skills in integrated Islamic-based elementary schools has not been widely carried out (Ulrich, 2000).

The results of initial observations conducted at SD IT PSA Nurul Amal showed that there was a variation in basic movement skills in lower-class students. Some students have shown good locomotor skills and object control, but there are still students who have not developed optimally. This condition shows the need to carry out systematic and standardized measurements in order to obtain accurate empirical data as a basis for planning more effective and needs-based physical education learning. Based on this description, this study aims to analyze the locomotor movement ability, object control ability of students in grades I-III SD IT PSA Nurul Amal using the Test of Gross Motor Development-2 (TGMD-2) instrument as a measurement tool that has been tested for validity and reliability in assessing the development of basic movement of elementary school age children.

The novelty in this study lies in the use of a distribution-based analysis approach of the Gross Motor Quotient (GMQ) category, not just the average score, in the context of integrated Islamic elementary schools which are still rarely studied. In addition, this study provides an interpretation of students' motor development based on the international norm of TGMD-2 so that it can make a scientific contribution to the development of motor ability evaluation and

become the basis for the preparation of a more structured and effective physical education learning program.

METHODS

This study uses a quantitative approach with a descriptive method that aims to systematically and objectively describe the level of gross motor ability of students without giving specific treatment to the research subject. This approach was chosen to obtain a profile description of locomotor maneuverability, object control, and Gross Motor Quotient (GMQ) based on measurement results using standard instruments. This approach was used to obtain an overview of students' basic locomotor and object control skills based on the results of measurements in this study using the Test of Gross Motor Development-2 (TGMD-2) instrument which includes six types of locomotor skill tests and six types of object control skill tests.

The subjects in this study were 21 students in grades I-III SD IT PSA Nurul Amal aged 7-10 years. The sampling technique uses total sampling, which is the entire population is used as a research sample because the population is relatively small. This research has obtained permission from the school and the consent of parents/guardians of students before the implementation of data collection.

Table 1. Research Sample

Classes	Number of Students in Each Class
I	4
II	8
III	8
Number of students	21

The instrument used in this study is the Test of Gross Motor Development (TGMD-2), which is a measuring tool designed to assess gross motor skills in children aged 3-10 years. The instrument includes six types of locomotor skill tests as well as six types of control object skill tests (Ulrich, 2000).

Table 2. TGMD-2 Instrument

Locomotive	Object Control
Run	Hitting stationary balls
Running fast	Dribbling Station
Jump	Catch
Jump	Kicks
Horizontal Jump	Throw Over
Shear	Cunning Role

The TGMD-2 is a standard instrument that focuses on the process, uses reference criteria and norms as a reference, and is designed to assess gross motor skills in children aged 3 to 10 years (Aye et al., 2017). In addition, this instrument has been applied by international researchers, including in Myanmar and Japan, as reported in the study (A & K, 2018). This is strengthened by the opinion of Bakhtiar (2014) who states that TGMD-2 has advantages in three aspects of validity, namely content validity, predictive validity of criteria, and validity of constructs or concept identification.

The TGMD-2 instrument contains 12 forms of gross motor skills tests that are grouped into two main aspects, namely locomotor skills and manipulative skills (object control). The assessment system in the Test of Gross Motor Development-2 is carried out by giving a score of 1 if the participant is able to display movements according to the set criteria and a score of 0 if the movements do not meet the criteria. Each child gets two chances on each test item; If both attempts are done correctly, then the maximum score for each criterion is 2.

Each test item has several scoring indicators. The locomotor subtest consists of six types of movement, namely run (four criteria), gallop (four criteria), hop (five criteria), leap (three criteria), horizontal jump (four criteria), and slide (four criteria). Meanwhile, the object control

subtest includes striking a stationary ball (five criteria), stationary dribble (four criteria), catch (three criteria), kick (four criteria), overhand throw (four criteria), and underhand roll (four criteria). Based on all of these criteria, the raw score that participants can get is in the range of 0 to 48.

The TGMD-2 instrument has good content validity, construct validity, and predictive validity and has been widely used in international research. To maintain the reliability of the data in this study, the following procedures were carried out: 1. Each test item was carried out twice in an experiment, 2. The assessment refers to the TGMD-2 standard guidelines, 3. The consistency of the assessment was maintained during the data collection process. The main variables in this study are: 1. Locomotor motion ability, 2. Object control ability, 3. Gross Motor Quotient (GMQ). The control variables include: 1. Age of students (7-10 years), 2. Learning environment (same school), 3. Physical education learning exposure. Data collection was carried out through direct measurement using TGMD-2. Each student performs 12 types of movement skills according to the instrument, with two attempts for each skill. The assessment is carried out based on predetermined performance criteria.

The data obtained was analyzed through several stages as follows: 1. The calculation of the raw score was obtained from the sum of the scores of each criterion in two experiments. 2. Conversion of the standard score

of the raw score is converted into a standard score for locomotor subtest and object control based on the TGMD-2 norm **table 3**. Calculation of the Gross Motor Quotient (GMQ) of the standard score of the two subtests is summed and converted into GMQ values. 4. Descriptive statistical analysis includes mean values, standard deviations, minimum values, and maximums. 4. Analysis of the distribution of data categories is classified into capability categories based on TGMD-2 norms. 5. Percentage calculation Using formulas.

Table 3. Norma Sums of Standart Scores To Precentile and Quontiens.

Rough Motor Quantil	Descriptive Ranking
>130	Highly Superior
121-130	Superior
111-120	On top of Averagr
90-110	Average
80-89	Below average
70-79	Poor
<70	Very Bad

The instrument used in this study is the Test of Gross Motor Development-2 (TGMD-2). The data obtained was then analyzed using descriptive statistical techniques and percentage analysis with the following formula:

$$P = \frac{f}{n} \times 100\%$$

Remarks

f : the frequency to be searched

n : number of frequencies

P : Percentage number

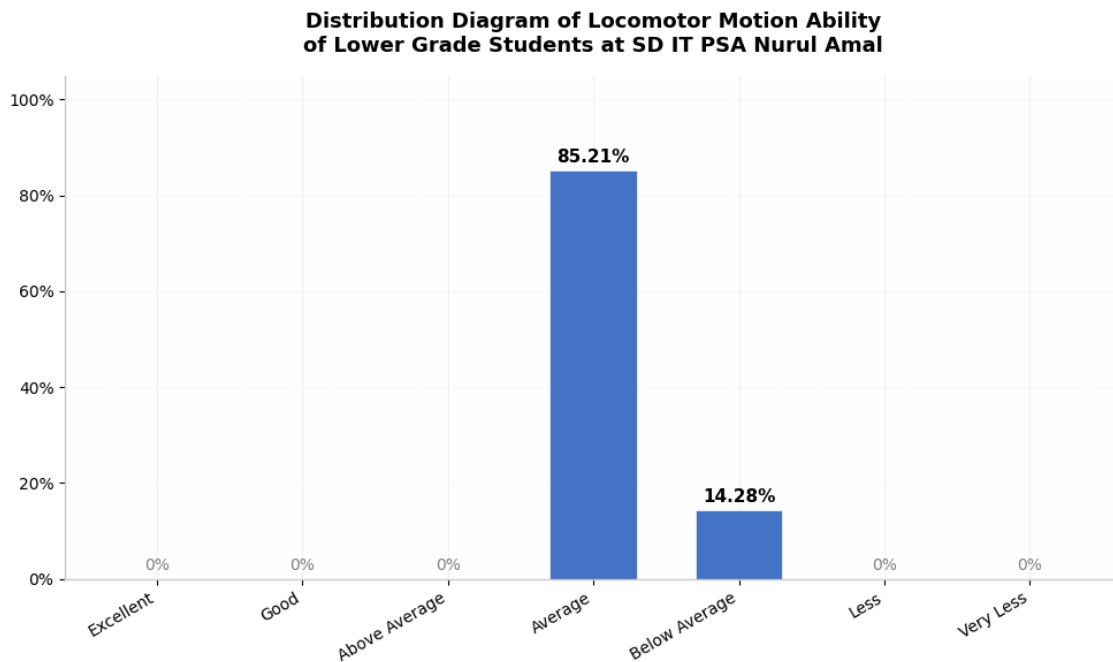
RESULTS AND DISCUSSION

The results of the study were obtained through the measurement of students' gross motor skills using the Test of Gross Motor Development-2 (TGMD-2) instrument, which includes locomotor skills, object control, and Gross Motor Quotient (GMQ).

Locomotor Motion Ability**Table 4.** Distribution of Locomotor Movement Ability Level for Lower Class Students of SD IT PSA Nurul Amal

Standard Score	Frequency	Introduce yourself	Categories
17-20	0	0%	Excellent
15-16	0	0%	Good
13-14	0	0%	Above Average
8-12	18	85,71%	Avarage
7-6	3	14,28%	Below Average
4-5	0	0%	Less
1-3	0	0%	Very Less
Quantity	21	100%	-

Referring to **Table 4**, the results of the analysis of locomotor movement skills of lower grade students of SD IT PSA Nurul Amal on 21 students showed that as many as 18 (eighteen) students were in the average category with a score range of 8-12 which was 85.71%. Meanwhile, 3 (three) students were included in the below-average category with a score between 6-7 which was 14.28%. There are no students who fall into the category of less or less once. In addition, there are no students who reach the above-average, good, or excellent categories.

**Figure 1.** Locomotor Motion Diagram of Lower Grade Students of SD IT PSA Nurul Amal.

Based on the diagram in **Figure 1**, the results of the analysis of locomotor movement skills of the lower class students of SD IT PSA PSA Nurul Amal show that the highest percentage is in the average category, which is 85.21%. Furthermore, the category below the average has a percentage of 14.28%. As for the categories of very good, good, above average, less, and less there were no students who obtained a score in that range, so that each category showed a percentage of 0%.

Table 5. Results of Descriptive Analysis of Locomotor Movement Ability of Lower Class Students of SD IT PSA Nurul Amal

Components	Average	Minimum Score	Maximum Score	Standard Deviation	Categories
Locomotor Motion	9	6	12	1.447	Average

Based on **Table 5**, the results of the descriptive analysis on the locomotor movement component of the lower class students of SD IT PSA Nurul Amal showed that the average score obtained was 9.00, with the lowest score of 6 and the highest score of 12, as well as the standard deviation of 1.447. This shows that the variation in ability between students is relatively low and tends to be concentrated at moderate ability levels.

The results of this study are in line with the findings Azrina et al. (2023) which states that most elementary school students are in the average category in basic movement skills. This shows that motor development at the age of 7-10 years is still in the phase of strengthening fundamental movement patterns. However, the absence of students in the above-average category indicates the need to increase the variety and intensity of movement stimulation in physical education learning so that locomotor skills can develop more optimally. These results show that the students' locomotor movement ability is at a functional level, but not optimal. The absence of students who reach the above-average category indicates that the stimulation of movement provided has not been able to encourage development to a higher level.

Theoretically, children's motor development is not only influenced by age factors, but also by the quality of movement experience obtained through learning activities (Stodden et al., 2012). The lack of variety of physical activity and the lack of challenges in physical education learning can cause students' abilities to tend to stagnate in the average category. These findings indicate the need to increase the variety and intensity of locomotor movement exercises in learning so that students can achieve a more optimal level of development.

Object Control Motion Analysis

Table 6. Distribution of Object Control Movement Ability Level for Lower Class Students of SD IT PSA Nurul Amal

Standard Score	Frequency	Introduce yourself	Categories
17-20	0	0%	Excellent
15-16	0	0%	Good
13-14	0	0%	Above Average
8-12	18	80,95%	Avarage
7-6	3	19,04%	Below Average
4-5	0	0%	Less
1-3	0	0%	Very Less
Quantity	21	100%	-

Based on **Table 6**, the results of the Object Control movement skill assessment of 21 students in the lower class of SD IT PSA Nurul Amal showed that as many as 18 students (80.95%), were in the average category with a score range of 8-12. Meanwhile, 3 students (19.04%) were included in the below-average category with scores between 6-7. There are no students who fall into the category of less or less once. No students were found who reached the category above average, good, or excellent.

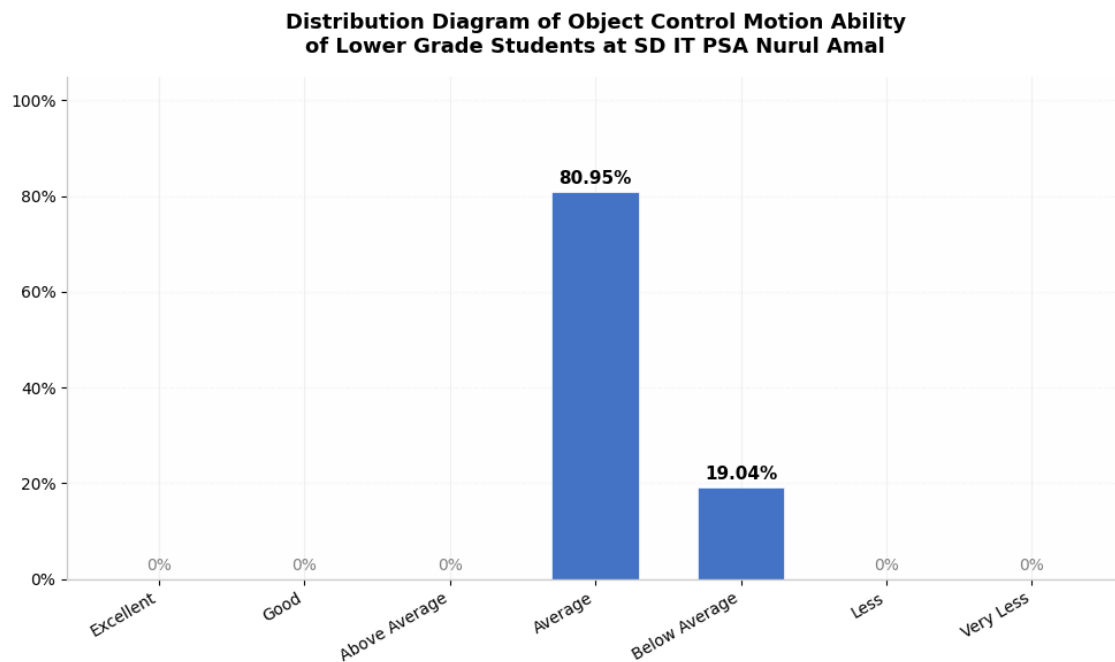


Figure 2. Motion Diagram of Object Control of Lower Class Students of Elementary School IT PSA Nurul Amal.

Based on **Figure 2**, the results of the analysis of object control movement skills of students in the lower grades of SD IT PSA PSA Nurul Amal show that the highest percentage is in the average category, which is 80.95%, in the category below the average has a percentage of 19.04%. Meanwhile, in the categories of very good, good, above average, less, and less there are no students who get a score in that range, so that each category shows a percentage of 0%.

Table 7. Results of Descriptive Analysis of Object Control Movement Ability of Lower Grade Students of SD IT PSA Nurul Amal

Components	Average	Minimum Score	Maximum Score	Standard Deviation	Categories
Locomotor Motion	8.80	6	12	1.621	Average

Based on **Table 7**, a descriptive analysis on the object control motion component of students in the lower grades of SD IT PSA PSA Nurul Amal showed that the average score obtained by students was 8.80, with the lowest score recorded at 6 and the highest score of 12. The standard deviation value is 1.621. The percentage of students in the below-average category indicates that manipulative skills tend to be more complex and relatively more difficult to master than locomotor skills.

This is in line with Stodden et al. (2012) which states that motor competence has a reciprocal relationship with physical activity participation. Students with limited practical experience tend to exhibit lower object control abilities. Therefore, more varied and repetitive practice opportunities are needed in physical education learning to improve students' manipulative skills. The object control ability shows a comparatively lower level compared to the locomotor ability. This is because manipulative skills require more complex coordination, such as eye-hand coordination, timing, and movement precision.

Analytically, this condition suggests that students have limitations in movement experiences that involve the use of objects, such as ball games or other manipulative activities.

According to Stodden et al. (2012), motor skills have a reciprocal relationship with physical activity, so lack of practical experience will have a direct impact on the low ability to control objects. Thus, a more game-based approach to learning and repetitive practice is needed to improve students' manipulative skills.

Gross motor

Table 8. Results of Gross Motor Skills Class 1, II and III SD IT PSA Nurul Amal

Standard Score	Frequency	Introduce yourself	Categories
>130	0	0%	Excellent
121-130	0	0%	Good
111-120	0	0%	Above Average
90-110	17	80,95%	Avarage
80-89	4	19,04%	Below Average
70-79	0	0%	Less
<70	0	0%	Very Less
Quantity	21	100%	-

Based on **Table 8**, the distribution of the frequency of gross motor skills of lower grade students of SD IT PSA Nurul Amal shows that as many as 17 (seventeen) students are in the average category with a score range of 90-110, which is 80.95%. In addition, there are 4 (four) students who are included in the below-average category with a score range of 80-89 which is 19.04%. Meanwhile, no students were found in the category of less or less once.

Gross Motor Diagram of Lower Grade Students at SD IT PSA Nurul Amal

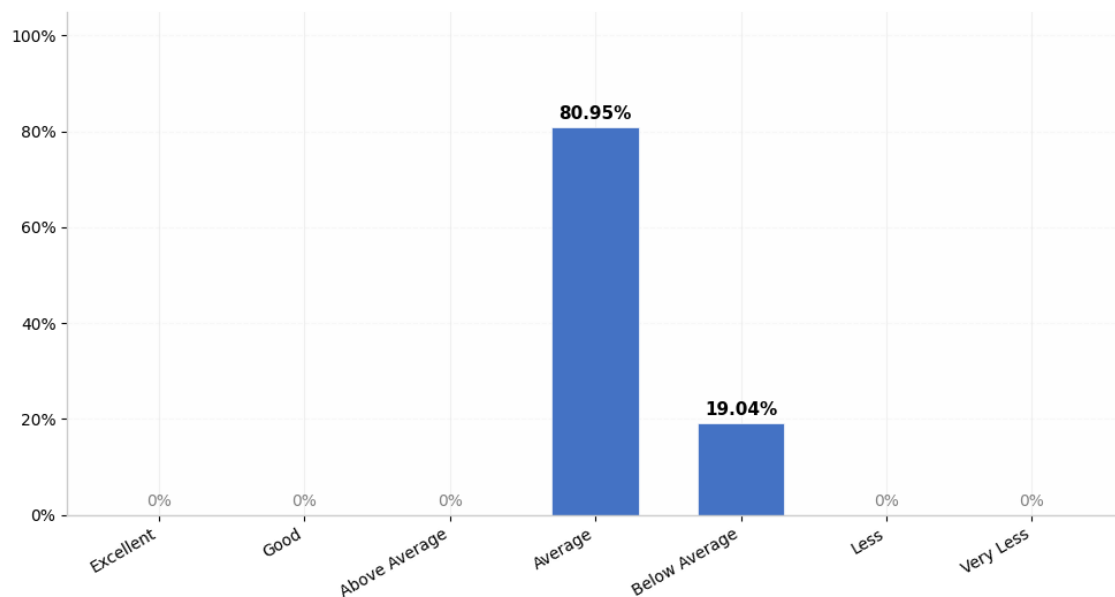


Figure 3. Gross Motor Diagram of Grade 1, II and III Students of SD IT Nurul Amal

Based on **Figure 3**, the results of the analysis of gross motor skills (Gross Motor Quotient) of the lower grade students of SD IT PSA Nurul Amal show that the highest percentage is found in the average category, which is 80.95%. Furthermore, the below-average category has a percentage of 19.04%. As for the categories of very good, good, above average, less, and less there are no students who get a score in this range, so that each category shows a percentage of 0%.

Table 9. Results of Descriptive Analysis of Gross Motor Ability of Students in Grades I, II, III SD IT PSA Nurul Amal

Components	Average	Minimum Score	Maximum Score	Standard Deviation	Categories
Locomotor Motion	93.71	82	103	5.993	Average

Based on **Table 9**, the results of the descriptive analysis of gross motor skills of lower grade students of SD IT PSA Nurul Amal showed that the average score obtained was 93.71, with the lowest score of 82 and the highest score of 103. The standard deviation was recorded at 5.993. Although the average value of GMQ is in the average category, this achievement has not shown the advantages of optimal movement competence. If not balanced with a more progressive and structured learning program, students' motor skills have the potential to stagnate at an average level. Therefore, structured game-based interventions, active learning approaches, and increased frequency of physical activity need to be implemented in an ongoing manner to encourage the improvement of students' gross motor competence.

Although students' GMQ scores were in the average category, distribution analysis showed that no students reached the above-average category. This indicates a tendency to stagnate motor development.

These findings suggest that the "average" category does not necessarily reflect optimal developmental conditions, but can rather indicate that students' abilities have not been developed to their full potential. Theoretically, optimal motor development requires varied, progressive, and continuous experience of movement. In the absence of adequate stimulation, students tend to persist at a level of ability (Azrina et al., 2023). Therefore, these results confirm the importance of more structured learning interventions to encourage the improvement of motor abilities to a higher level.

Overall, the results showed that most students were in the average category, both in the aspects of locomotor, object control, and GMQ. However, the absence of students in the above-average category indicates a limitation in optimizing motor development. These findings reinforce the results of previous studies that stated that without structured interventions, children's motor development tends to stagnate at the basic level (Stodden et al. (2012); Azrina et al. (2023). The main contribution of this study lies in the use of distribution analysis that is able to reveal the hidden conditions behind the average score, namely the tendency to stagnate students' motor skills.

CONCLUSION

This study shows that the gross motor ability of the lower class of Nurul Amal Elementary School students is generally in the average category based on the Test of Gross Motor Development-2 (TGMD-2) norm. The same was also found in the aspects of locomotor motion and object control, which were mostly in the average category, with a small percentage of students still in the below-average category. However, distribution analysis showed that no students reached the above-average category, indicating a tendency for stagnation in the development of motor skills. These findings suggest that the "average" category does not necessarily reflect optimal developmental conditions, but can rather be an indicator that students' abilities have not developed to their full potential.

The scientific contribution of this research lies in the use of the Gross Motor Quotient (GMQ) distribution analysis approach which is able to reveal the conditions of motor development more comprehensively, especially in the context of integrated Islamic schools which are still rarely studied. Theoretically, the results of this study confirm that motor development is not only influenced by age factors, but also by the quality of movement experience and learning environment. Therefore, a more structured, varied, and progressive physical education learning is needed to improve students' motor skills.

For further research, it is recommended to use experimental designs to test the effectiveness of learning interventions, as well as conduct longitudinal studies to look at students' motor development in a sustainable manner.

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