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GROSS MOTOR SKILLS OF CHILDREN AGED 5–6 YEARS TRANSITIONING FROM EARLY CHILDHOOD EDUCATION TO ELEMENTARY SCHOOL IN KARANGANYAR, INDONESIA

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Abstract

The transition from early childhood education to primary school requires children to adapt to a more structured learning environment, and gross motor skills are one part of this readiness. Aim: This descriptive study aimed to describe the gross motor skill profile of 5–6-year-old children before entering elementary school in Karanganyar Regency, Indonesia, by aspect. Method: A quantitative descriptive design was used with 63 children aged 5–6 years from two early childhood education institutions (TK Angkasa, n = 31; TK Adzikru, n = 32). Five aspects (balance, strength, agility, coordination, and flexibility) were assessed by direct observation using a motor development assessment form, with items scored on a 1–5 scale. Results: Mean percentages of maximum score were 80.6% for balance (SD 16.9), 86.6% for strength (SD 9.5), 88.6% for agility (SD 14.7), 82.7% for coordination (SD 13.3), and 85.9% for flexibility (SD 11.3). Balance had the lowest mean and the widest spread, and 57.1% of children reached the maximum score on the single agility item, suggesting a ceiling effect. Conclusion: Within the limits of a non-standardized instrument and a single regency, balance and coordination had the lowest mean percentages of maximum scores. These descriptive profiles should be confirmed with standardized measures and larger samples.

Keywords: Gross motor skills; School readiness; Early childhood; Descriptive study

INTRODUCTION

The transition from early childhood education (PAUD) to elementary school (SD) is a critical stage in a child's life. Children must adapt to a more structured learning environment, higher academic expectations, and more complex social demands (Lestari, 2023; Mardiani et al., 2024). Success in this transition depends on overall readiness, including physical development (Davies et al., 2016). Physical readiness is practical as well as developmental:

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gross motor skills support active movement, participation in play-based learning, and the movement tasks that children meet at school.(Arifah et al., 2023; Dimyati, 2022).

Recent studies have strengthened the link between motor skills and readiness. A systematic review of school readiness among vulnerable children treated the motor/physical domain as a component of readiness, but only four of the eight included studies measured it (Garon-Carrier et al., 2024). Fine motor skills predicted school readiness in preschoolers (Karimi et al., 2025), and motor skill profiles were related to cognitive and non-cognitive outcomes in first grade (Kamphorst et al., 2021). Motor skills, both gross and fine, are generally positively associated with academic achievement, although associations with some academic outcomes are inconsistent (Wang & Wang, 2024). The present study focuses on gross motor performance and does not assess fine motor skills, so these studies frame the motor domain rather than the measures used here.

In Indonesia, gross motor skills and school readiness have mostly been described separately, although a few studies have reported gross motor levels of children aged 5–6 years. Azzahra et al. (2024) described the gross motor skills of 137 children aged 5–6 years in Islamic-based kindergartens in Samarinda, using a teacher-completed questionnaire of 17 indicators, and reported that most children were still in the early developing category. Agustina (Agustina, 2016)described the gross motor levels of 81 group B children aged 5–6 years in Kulon Progo, Yogyakarta, using an observation checklist, and reported results by activity grouped into five elements: flexibility, balance, agility, coordination, and strength. Stephani et al. (2019) described gross and fine motor development in four- and five-year-old children in a Moslem kindergarten. School readiness has been examined with the Nijmeegse Schoolbekwaamheid Test in Malang (Fajariyah, 2022) and in Makassar (Agussalim & Rasyid, 2025), where motor was one of ten domains but its results were not reported separately. Sensorimotor maturity has also been linked conceptually to school readiness (Yuris et al., 2025), and a systematic review of gross motor physical activity in early childhood did not report motor profiles of children (Faizah & Alim, 2024)

To our knowledge, a descriptive profile of gross motor performance across five aspects has not been reported for children in Karanganyar. Gross motor skills of group B children in this regency have been examined in an intervention study (Febriana, 2017), but it did not frame its findings in terms of the transition from early childhood education to elementary school. The closest descriptive study was conducted in a different regency and reported results by activity rather than as a normalized profile for each aspect. The other studies reviewed used teacher questionnaires, combined fine motor items, addressed other age groups or regions, or did not break readiness down by motor domain (Agustina, 2016). This claim rests on a limited search of Garuda and Google Scholar-indexed journals and should be treated as provisional. Without a local baseline framed around the transition, educators cannot easily tell which aspects are weakest in a given group.

The problem addressed in this study is, therefore, the lack of a descriptive picture of gross motor performance among children entering elementary school in Karanganyar. Although teachers already stimulate children's gross motor skills through ice-breaking activities, art learning centers, and physical exercise (olah tubuh), a descriptive picture of how children perform across the five gross motor aspects at this transition point has not been available in Karanganyar.

To address this problem, a quantitative descriptive study was conducted with 63 children aged 5–6 years in two early childhood education institutions. Five aspects were assessed

through direct observation using a motor development assessment form. Balance (walking forward, backward, between places, and in a zigzag pattern), strength (jumping on both feet, hopping on one foot, and gripping an object), agility (imitating movements demonstrated by the teacher), coordination (raising one arm while moving one leg sideways, and throwing and catching a ball), and flexibility (twisting the body and performing movements following counts or directions) are operationalized as the tasks in the assessment form. Results are reported as the percentage of the maximum score for each aspect, so that aspects with different numbers of items can be compared on the same scale.

Two bodies of knowledge frame the study. First, Presidential Regulation No. 60 of 2013 on holistic-integrative early childhood development remains in force and states that early childhood education aims to prepare children holistically for primary education. Second, Ministry of Basic and Secondary Education Regulation No. 10 of 2025 on graduation competency standards for early childhood, primary, and secondary education identifies gross and fine motor skills as sub-elements of physical-motor development (Art. 5), and only the gross motor sub-elements were scored in this study. School readiness is multidimensional (Garon-Carrier et al., 2024), so motor performance is treated as one component of readiness rather than a complete measure of it.

The aim of this study is to describe the gross motor skill profile of 5–6-year-old children in Karanganyar Regency across five aspects before they enter elementary school, and to describe the distribution of scores within each aspect. The novelty of this study lies in describing the gross motor profile of children at the PAUD–SD transition in Karanganyar, with each aspect reported as a normalized percentage of its maximum score. Agustina (2016) reported a comparable activity profile in a different regency; this study differs in its local setting, transition framing, and aspect-level normalization.

The study is expected to identify which motor aspects are relatively stronger and weaker in this sample. The results are intended as a local baseline for educators and parents planning movement activities during the transition period, and as a reference for future studies that test structured movement programs or use standardized measures. The study does not test causal effects or predict school success.

METHODOLOGY

This study used a quantitative descriptive design. The design aimed to describe the distribution of motor performance across aspects in one population, without testing hypotheses or examining causal relationships between variables (Creswell, 2012; Sugiyono, 2017).

The study was conducted in Karanganyar Regency, Central Java, Indonesia, from February to March 2025. Participants were 63 children aged 5–6 years from two early childhood education institutions in Karanganyar Regency: TK Angkasa and TK Adzikru. Institutions were selected using purposive sampling, based on established cooperation with the research team and the institutions' attention to preparing children for the transition from kindergarten to elementary school (Sugiyono, 2017). All children in the class B groups at both institutions were assessed (a total sample of eligible children). Participants were aged 5–6 years according to the class B enrolment criteria of both institutions. Individual birth dates were not available, so the mean age and standard deviation are not reported. Of the 63 children, 33 were boys, and 30 were girls. TK Angkasa included 31 children, and TK Adzikru included 32 children.

Motor performance was assessed with a motor development assessment form. The five aspects and the tasks used to assess them are summarized in Table 1. The aspects are operationalized as tasks on the assessment form, consistent with the constructs measured in children of this age (Reeves et al., 1999). The current graduation competency standard, Ministry of Basic and Secondary Education Regulation No. 10 of 2025, identifies gross and fine motor skills as sub-elements of physical-motor development, and only the gross motor sub-elements were scored in this study.

Table 1. Motor aspects, assessed tasks, and scoring structure

Aspect	Assessed tasks (as recorded on the assessment form)	Number of items	Maximum score
Balance	Walking forward and backward without losing balance; moving between places without falling; walking in a zigzag pattern	4	20
Strength	Jumping in place on both feet without falling; hopping on one foot three times; holding an object with both hands	3	15
Agility	Imitating physical movements demonstrated by the teacher	1	5
Coordination	Raising one arm while moving one leg sideways at the same time; throwing and catching a ball	2	10
Flexibility	Twisting the body without losing balance; performing movements following counts or directions	2	10

Each aspect comprised [n] 5 items, and each item was scored on a [skala skor, misalnya 0–X] 1-5. The maximum score was [n] 5 for balance, [n] 5 for strength, [n] 5 for agility, [n] 5 for coordination, and [n] 5 for flexibility.

The assessment form was developed from the five aspects described above and the gross motor sub-elements of Regulation No. 10 of 2025. Only five aspects were scored, all of which relate to gross motor and physical performance: balance, strength, agility, coordination, and flexibility. Fine motor and tactile sub-elements were not scored because of time constraints. The coordination task combined catching a ball, which standardized ball-skill tests have been described as capturing gross visual–motor coordination in children aged 6–10 years (Smits-Engelsman et al., 2022), with transferring an object from one hand to the other. The second element is a manipulative task closer to fine motor skills, and this mixed content is noted as a limitation. The second element is a manipulative task closer to fine motor skills, and this overlap is noted as a limitation.

Content validity was checked by one early childhood education expert. Reliability data were not available for this study. The instrument was not standardized against a published motor test such as TGMD-3, MABC-2, or BOT-2.

The children in this study were a different cohort from those in a separate study on song-and-movement activities conducted at TK Angkasa in 2025. Data were collected by trained

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assessors through direct observation of each child performing the assessed tasks, and scores were recorded on the motor development assessment form.

Data were edited, coded, tabulated, and analyzed using SPSS. Data from both institutions were analyzed together as a single sample. This is because the study aimed to describe the motor profile of the children, and institution was not an analytic variable in this descriptive study. No inferential comparison between institutions was performed. Descriptive statistics were calculated for each aspect: mean, standard deviation, minimum, maximum, and mean as a percentage of the maximum score. Because the number of items and the maximum score differ across aspects, aspect scores were compared using percentages of the maximum score rather than raw means. Readiness categories were not used because no validated cut-off for gross motor readiness at this age is available.

Both institutions granted permission for the study, provided time for data collection, and assisted with access to the required data. Verbal informed consent was obtained from the parents of all participating children. Before each assessment, teachers asked the children whether they were willing to take part, and the children gave their assent. Children could decline without consequence, and none did. The university did not require ethics committee review. Teachers accompanied the research team during the assessments to help keep the children safe and comfortable. The research team had previously conducted internships and community service activities at both institutions, and the assessment tasks are routine classroom activities.

RESULTS AND DISCUSSION

A. RESULTS

1. Motor aspect performance

A total of 63 children were assessed: 31 from TK Angkasa and 32 from TK Adzikru. All children had complete scores for every item.

Table 2 presents descriptive statistics for each aspect. The mean percentage of maximum score was highest for agility (88.6%, SD 14.7; range 3–5 of 5) and lowest for balance (80.6%, SD 16.9; range 10–20 of 20). The remaining aspects fell between these values: strength (86.6%), flexibility (85.9%), and coordination (82.7%). The difference between the highest and lowest aspects was 8.0 percentage points. Raw means were not compared across aspects because the number of items and maximum scores differ among them

Table 2. Descriptive statistics of gross motor performance by aspect (N = 63)

Motor aspect	Items	Max score	Mean % of max	SD (%)	Raw mean (SD)	Min–max (raw)
Balance	4	20	80.6	16.9	16.11 (3.38)	10–20
Strength	3	15	86.6	9.5	12.98 (1.42)	10–15
Agility	1	5	88.6	14.7	4.43 (0.73)	3–5
Coordination	2	10	82.7	13.3	8.27 (1.33)	6–10
Flexibility	2	10	85.9	11.3	8.59 (1.13)	5–10

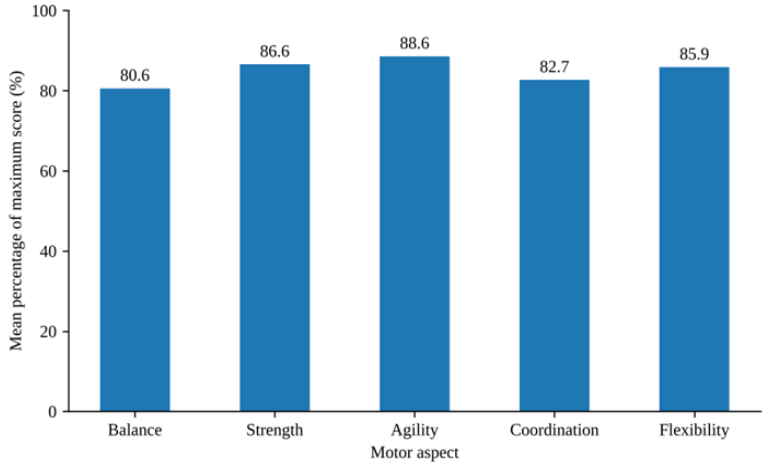
Note. Mean % of max = mean score ÷ maximum score × 100. SD (%) = SD ÷ maximum score × 100. Raw mean and SD are shown for reference. Strength was based on the three items described in the Methods.

Scores varied within each aspect, as shown by the standard deviations and ranges in Table 2. The proportion of children who reached the maximum score was 57.1% for agility,

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25.4% for balance, 23.8% for coordination, 23.8% for flexibility, and 14.3% for strength. Figure 1 displays the mean percentage of the maximum score for each aspect.

Figure 1. Mean percentage of maximum score by motor aspect (N = 63).



2. Comparison between institutions

Table 3 shows the mean percentage of maximum score for each aspect in each institution. In TK Angkasa (n = 31), balance was the lowest aspect (71.5%) and flexibility the highest (85.5%). In TK Adzikru (n = 32), flexibility was the lowest aspect (86.3%) and agility the highest (93.1%). These comparisons are descriptive, and no inferential tests were performed.

Table 3. Mean percentage of maximum score by aspect and institution

Motor aspect	TK Angkasa (n = 31), mean % (SD)	TK Adzikru (n = 32), mean % (SD)
Balance	71.45 (17.52)	89.38 (10.53)
Strength	83.23 (7.86)	89.79 (9.87)
Agility	83.87 (16.67)	93.13 (10.91)
Coordination	77.10 (11.31)	88.13 (13.06)
Flexibility	85.48 (10.91)	86.25 (11.85)

3. Sex

Of the 63 children, 33 were boys and 30 were girls. Table 4 shows the mean percentage of maximum score by sex. Boys had higher mean percentages for balance and strength, whereas girls had higher mean percentages for agility, coordination, and flexibility, with small differences for coordination and flexibility. These comparisons are descriptive only.

Table 4. Mean percentage of maximum score by aspect and sex

Motor aspect	Boys (n = 33), mean % (SD)	Girls (n = 30), mean % (SD)
Balance	82.42 (18.25)	78.50 (15.32)
Strength	88.69 (9.20)	84.22 (9.34)
Agility	87.27 (17.19)	90.00 (11.45)
Coordination	82.42 (13.93)	83.00 (12.91)
Flexibility	85.45 (11.75)	86.33 (10.98)

B. DISCUSSION

Sex differences were described only descriptively. Boys had higher mean percentages in balance and strength, whereas girls had higher mean percentages in agility, coordination, and flexibility, with small differences in coordination and flexibility. The study did not test whether these differences are statistically meaningful, and the subgroups of 33 boys and 30 girls are too small to support firm conclusions about sex. A systematic review and meta-analysis of children aged 3–6 years reported that boys were more proficient in total fundamental motor skills and in object control, with the object-control difference increasing with age, while the locomotor difference was near-significant and trended toward girls (Zheng et al., 2022). The present pattern only partly matches this. Boys scored higher on balance and strength than on ball skills, and girls scored slightly higher on the coordination aspect, which included a ball throw-and-catch item. Because the coordination aspect mixed a ball skill with a limb-coordination item, and age was not recorded for individual children, these results cannot be used to test the meta-analytic pattern. The sex differences observed here are best read as a feature of this sample rather than a general difference between boys and girls.

The present profile differs from the intervention studies in Indonesia, which reported gross motor gains after structured play (Kuswanto et al., 2023; Poniati et al., 2024), because this study did not test an intervention. Instead, it provides a descriptive baseline. From the perspective of motor competence, performance during the transition period is part of the foundation for later physical activity (Stodden et al., 2008), and lower-value aspects may warrant attention in planning movement activities.

The results suggest that educators could focus on balance and coordination in daily movement activities. The study cannot show that such activities improve these aspects or that they affect later school outcomes. Future studies should test structured movement programs with standardized measures and follow the same children into first grade (Kamphorst et al., 2021).

Motor skills have been associated with school-related outcomes in other studies. Karimi et al. (2025) reported that fine motor skills predicted school readiness in preschoolers, and Kamphorst et al. (2021) found that motor skill profiles were related to first-grade outcomes. These studies used different measures and designs, so they support the plausibility of the motor domain as part of school readiness rather than confirming the profiles reported here.

This study has several limitations. The sample came from two institutions in one regency, purposively selected rather than randomly, so the results may not generalize to other early childhood education settings. The assessment instrument was not standardized, and reliability data were not available, so the consistency of scoring could not be quantified. The instrument was developed for this study and has not been compared with a standardized motor test. Observers may have been biased, and the study did not include fine motor or tactile measures, which were not assessed because of time constraints. The coordination aspect combined a limb-coordination item with a ball throw-and-catch item, and the classification of ball skills as gross visual–motor coordination was based on a study of older children (6–10 years), so this aspect should be interpreted with caution. The agility aspect was represented by a single imitation item, which limits the construct validity of this aspect. The aspect labels follow the grouping of items on the assessment form, and some items may capture related abilities rather than the named aspect alone. Because the design was cross-sectional, the study cannot describe developmental change, and the profiles were not linked to school outcomes. Differences between the two institutions were described but not tested statistically. Age was not recorded for individual children, so age-related differences in motor performance could not be examined.

CONCLUSION

This descriptive study provides a gross motor profile of 5–6-year-old children at the transition from early childhood education to primary school in Karanganyar Regency. Performance varied across the five aspects, with balance and agility showing the lowest and highest percentages of the maximum score. These profiles offer a baseline for educators and parents planning movement activities during the transition period.

The findings describe this sample only. They do not show that an intervention model is effective or that the profiles predict school success. Future studies should use standardized tests, larger and more diverse samples, and longitudinal designs that follow children into the first grade of elementary school. Experimental studies are needed to test whether structured play-based activities improve the aspects identified as weaker in this sample.

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