Comparison of motor competence in rural Indonesian children aged 7-12 yearsMotor competence among rural Indonesian children

aged 7–12 years

Comentado [A2R1]:

Comentado [A3R1]:

Authors

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Abstract

Children in rural areas of Indonesia often face challenges in enhancing their motor competence (MC). Limited access to quality physical education can hinder this development. The primary objective of this study was to compare MC among children aged 7 to 12 years in rural Indonesia using a modified Körperkoordinationstest für Kinder (KTK3+). This cross-sectional study involved 281 children (139 girls and 142 boys children) aged 7 to 12 years in rural Indonesia. A MANOVA for the motor scores showed a significant gender and age effect. For age, the score significantly increased for children 1 year older on all subtests ($p < 0.005$). Thus, for gender, boys scored higher on eye-hand coordination ($p < 0.05$) and moving sideways ($p < 0.05$) when compared to girls. Moreover, a significant difference is also seen in the motor quotient, 2.5% of boys and 2.8% of girls scored "below average". When compared to normative and raw scores, both samples of rural children from 48 years ago scored significant normal scores. The findings of this study indicate an increase in MC with age and highlight that children in rural Indonesia achieve MC scores within the "normal" category, according to the KTK norm. If the government can facilitate talent development in these rural regions, it will represent an important step toward nurturing more talent in Indonesia over the next decade. The government must also pay attention to children in rural, as they have the potential and better movers to develop talent in sports and increase the talent pool.

Con formato: Inglés (Estados Unidos)

Keywords

motor assessment, school-age children, motor skills, rural inequalityearly childhood, game-based, motor coordination, children, rural

Resumen

Los niños de las zonas rurales de Indonesia suelen tener dificultades para mejorar sus habilidades motoras (HM). El acceso limitado a una educación física de calidad puede obstaculizar este desarrollo. El objetivo principal de este estudio fue comparar las HM de niños de entre 7 y 12 años de zonas rurales de Indonesia utilizando una versión modificada del Körperkoordinationstest für Kinder (KTK3+). Este estudio transversal contó con la participación de 281 niños (139 niñas y 142 niños) de entre 7 y 12 años de zonas rurales de Indonesia. Un MANOVA de las puntuaciones motoras mostró un efecto significativo del género y la edad. En cuanto a la edad, la puntuación aumentó significativamente para los niños de 1 año más en todas las subpruebas ($p < 0,005$). Así, en cuanto al género, los niños obtuvieron mejores resultados en coordinación ojo-mano ($p < 0,05$) y en movimientos laterales ($p < 0,05$) en comparación con las niñas. Además, también se observa una diferencia significativa en el cociente motor, ya que el 2,5 % de los niños y el 2,8 % de las niñas obtuvieron una puntuación «por debajo de la media». En comparación con las puntuaciones normativas y brutas, ambas muestras de niños de zonas rurales de hace 48 años obtuvieron puntuaciones normales significativas. Los resultados de este estudio indican un aumento de la CM con la edad y ponen de relieve que los niños de las zonas rurales de Indonesia obtienen puntuaciones de CM dentro de la categoría «normal», según la norma KTK. Si el Gobierno puede facilitar el desarrollo del talento en estas regiones rurales, se dará un paso importante hacia la formación de más talento en Indonesia durante la próxima década. El Gobierno también debe prestar atención a los niños de las zonas rurales, ya que tienen potencial y mejores movimientos para desarrollar el talento en el deporte y aumentar la reserva de talento.

Con formato: Español (España)

Palabras clave

evaluación motora, niños en edad escolar, habilidades motoras, desigualdad rural~~primera infancia, basado en juegos, coordinación motora, niños~~,

Comentado [A4]: Se sugiere: evaluación motora, niños en edad escolar, habilidades motoras, desigualdad rural

Introduction

In recent decades, data showing the classification of impaired motor competence (MC) in children has increased (Brian et al., 2018; Vandorpe et al., 2011). A study conducted in Indonesia indicates that approximately 45% of children have impaired MC (Mardiansyah et al., 2024). In comparison, data on children in Central Europe show that around 20% experience impaired motor development (Vandorpe et al., 2011), and other studies report that the proportion of children facing similar risks exceeds 70% in the United States (De Meester et al., 2018). Therefore, it is important to review the MC that positively impacts a child's development, as MC is a prerequisite for participation and success in sports or recreational activities from childhood through adulthood (Fransen et al., 2014). In the pediatric population, there is considerable variation in MC. Previous research shows that children with developmental coordination disorder (DCD) consistently demonstrate reduced health-related fitness, including lower levels of explosive power, muscular strength, and endurance (Cairney et al., 2017), as well as decreased VO_2 max and impaired cardiorespiratory fitness (Cairney et al., 2011). These findings strengthen the interpretation that poor MC is closely associated with deficits across multiple physical fitness components. ~~Children with low physical fitness (PF) levels tend to perform below the average for their age and/or gender across various PF components and experience a more significant decline in PF over time (Popović et al., 2020).~~ Thus, it is important to understand that children with impaired MC who do not receive prompt intervention will likely struggle to adapt to more complex movements and will continue to lag behind their peers as they grow older (Mardiansyah et al., 2023). This issue also carries the risk of impaired physical fitness extending into adulthood (Stodden et al., 2008). Because it is important to prevent MC disorders from an early age, it is necessary to conduct an early assessment of each child to examine their characteristics.

MC is essential for children's development, particularly during their early years (Giuriato et al., 2021). A good of MC level will enable children to be active in games, sports, and daily activities efficiently and with confidence. A strong foundation for MC from an early age will have a positive impact on a child's lifestyle and physical activity in adulthood (Mardiansyah et al., 2024). The period between 7-12 years old is considered optimal for transitioning from basic to more complex skills, including those related to games, physical activity (PA), and sports (Draghi et al., 2021). Children must actively engage in daily ~~physical activities~~PA to master motor skills, which will positively impact various aspects of their development (Lopes et al., 2013). Beyond health-related outcomes, robust MC has also been associated with improved cognitive abilities and academic performance in children and adolescents. According to Cognitive Load Theory (Sweller, 1988), cognitive processing capacity is limited, and children with proficient motor skills are not required to devote excessive attentional resources or energy to basic movement tasks during classroom activities, enabling greater focus on learning (Pagani & Messier, 2012). Moreover, motor and cognitive functions share common neural pathways in the brain, as demonstrated by functional neuroimaging studies showing activation of the neocerebellum and dorsolateral prefrontal cortex during both motor and cognitive tasks (Diamond, 2000) ~~(Desmond et al., 1995; Diamond, 2000)~~. These findings highlight that developing motor competence may provide dual benefits, supporting both physical health and academic achievement.

~~Therefore, it is essential to identify potential risk factors for MC delay by conducting screenings from an early age (Veldman et al., 2020). Several factors can affect children aged 7 to 12 regarding delays in MC, including individual characteristics (such as weight status) and family factors (including low parental education and lower family socioeconomic status) (Saccani et al., 2013).~~ Therefore, it is essential to screen early for potential risk factors contributing to delays in MC (Veldman et al., 2020). Factors such as weight status, parental education, and socioeconomic constraints have been shown to affect MC development (Saccani et al., 2013). Early intervention is particularly critical, as insufficient MC not only limits participation in physical activity but, according to Cognitive Load Theory, may also increase the attentional demands of basic movement tasks, thereby impacting children's cognitive development and academic performance.

A understanding of the determining factors and correlations of children's ~~motor competencies~~MC positively impacts the optimal development process. Factors influencing this development involve many cultural, environmental, psychosocial, and behavioural constraints affecting MC, ~~physical activity (PA),~~PA, and individual fitness across the lifespan (Hall et al., 2018).

For instance, Research analyzing the relationship between PA and MC has produced inconsistent results. Some studies report that rural children demonstrate higher MC than their urban counterparts

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Se justifica la elección del instrumento (KTK3+).

(Adriyani et al., 2022; Mardiansyah et al., 2023), while others indicate the opposite (Ujević et al., 2013). However, caution is warranted when comparing studies from different regions of the world, as the concept of rurality varies substantially depending on each country's development index and socioeconomic conditions. Both Adriyani et al. (2022) and Mardiansyah et al. (2023) attribute the advantage observed in rural children partly to unstructured activities afforded by wide-open spaces, which facilitate the practice and refinement of motor skills. In contrast, ~~(Peña~~ Reyes et al. ~~(~~-2003) highlight that urban–rural differences in growth may also be influenced by improvements in public health, nutrition, and general living standards commonly associated with urbanization. These factors may mediate the ~~[illegible]~~ This difference may be attributed to factors such as social support and the influence of teaching methods. Therefore, it is very important to create policies for the equalization of professional teachers to support children's development. Efforts to promote equitable professional development for physical education (PE) teachers should target both urban and rural areas. Research indicates that teacher professional development programs in Indonesia exhibit lower effectiveness in rural settings compared to urban ones (Soebari & Aldridge, 2016). Moreover, early childhood educators in rural schools often have limited access to information on modern physical literacy practices (Friskawati, 2022). These disparities are compounded by broader challenges, such as inadequate training infrastructure, limited access to technology and professional development opportunities, and constrained budgets at the local level (Sutomo & Siregar, 2022). In addition, the PE teachers in elementary schools involved in this study also faced the same problems. development (in sports and other areas). Most research on children's MC has come from high-income countries, and there is a need to investigate the assessment quality of children's motor coordination across cultures, environments and contexts (Lopes et al., 2021). The absence of universally available standards and data for assessing children's motor coordination limits cross-country comparisons. For example, Salami et al. (2023) examined the factor structure and measurement invariance of the Körperkoordinations Test für Kinder (KTK) among Iranian children aged 5–14 years and highlighted that motor coordination assessments may not operate equivalently across populations. Their findings suggest that cultural and contextual differences can affect test performance and interpretation, underscoring the need for harmonized reference values or standardized protocols to enable valid [illegible] children, a population that has received limited scholarly attention. The findings provide comparative data for similar studies in developing regions and contribute to a more comprehensive understanding of childhood motor development in diverse socio-cultural contexts."

~~This equalization of professional teachers should be implemented not only in urban areas but also in rural areas that are in great need. In Indonesia, rural areas are often less prioritized regarding physical education teacher development. Many physical education teachers lag behind in developing and implementing learning in primary schools.~~ However, the elementary school age is critical for optimizing children's development (in sports and other areas). Most research on children's MC has come from high-income countries, and there is a need to investigate the assessment quality of children's motor coordination across cultures, environments and contexts (Lopes et al., 2021). The absence of universally available standards and data for assessing children's motor coordination limits cross-country comparisons. For example, Salami et al. (2023) examined the factor structure and measurement invariance of the Körperkoordinations Test für Kinder (KTK) among Iranian children aged 5–14 years and highlighted that motor coordination assessments may not operate equivalently across populations. Their findings suggest that cultural and contextual differences can affect test performance and interpretation, underscoring the need for harmonized reference values or standardized protocols to enable valid international comparisons. Addressing this gap, ~~The absence of universally available standards and data for measuring children's motor coordination limits international comparisons (Salami et al., 2023).~~ the present study examines~~This study addresses a research gap by examining~~ MC in rural Indonesian children, a population that has received limited scholarly attention. The findings provide comparative data for similar studies in developing regions and contribute to a more comprehensive understanding of childhood motor development in diverse socio-cultural contexts."

In addition, developing an MC promotion program for children is essential for total and comprehensive motor development. As can be seen, future research should investigate the longitudinal sustainability and impact of MC interventions on children in Indonesia's rural and urban areas. This will

provide valuable insights into how innovative MC intervention programs can be effectively implemented in schools, homes, and communities.

This research aims to compare MC among children aged 7-12 years in rural areas of Indonesia. We hypothesize that children who are one year older perform better in each subtest, and that boys are favored over girls. In addition, cultural influences can affect MC differences between the genders. Children living in rural areas in Indonesia can obtain better MC scores than children in urban areas. We use the Körperkoordinationstest für Kinder (KTK3+) (de Niet et al., 2021) to profile motor competence levels in children. The KTK3+ test is very suitable for educational settings to assess children's MC which is valid and reliable

Method

Participants

This study employed a cross-sectional design, dData were collected in West Sumatra Province (Indonesia). A total of 281 children (139 girls and 142 boys) aged 7 to 12 years took part in the study. The selected schools are located in districts classified as rural by {The Central Bureau of Statistics of Indonesia (BPS) ~~(BPS), 2020~~}based on low population density, predominant agricultural land use, and limited infrastructure development. The selected schools are located in communities where economic activities are primarily agriculture-based, with fewer transportation and public facilities compared to urban centers. These features align with international definitions of rural areas, which emphasize lower demographic density, expansive open spaces, and dependence on primary-sector activities rather than dense, diversified urban economies. This clarification is important for readers from outside Indonesia to contextualize the findings and assess their generalizability to other settings. The study received approval from the University Ethics Committee and the Educational Office for Elementary Schools. All participants and their guardians provided written informed consent prior to data collection.

Measurements

The MC test is administered by trained assessors who have received specific courses before collecting data. For all tests, children perform without footwear. The tests are conducted both in a sports hall and outdoors. All participants are required to complete the four KTK3+ tests correctly, and it is confirmed that all participants are in good health.

Motor Competence

MC was evaluated using four subtests from the modified "KörperKoordinations Test für Kinder (KTK3+)" (de Niet et al., 2021), (1) Balance Beam (BB): Participants walk backward along beams of varying widths (6 cm, 4.5 cm, and 3 cm) (ICC= 0.80); (2) Jumping Sideways (JS): Participants perform two-legged sideways jumps on a wooden bar for two 15-second intervals, with the total number of jumps from both trials recorded (ICC= 0.95); (3) Moving Sideways (MS): Participants move sideways across a wooden platform for two 20-second intervals, with the total number of movements recorded across both trials (ICC= 0.84); (4) Eye-Hand Coordination (EHC): Each child stands in front of a line 1 meter from the wall, the participant throws the ball against the wall with one hand (right) then catches it with the opposite hand (left), and repeats the same thing for 30 seconds with two repetitions (ICC= 0.87).

Data Analysis

IBM SPSS version 27 was utilized for the statistical analysis, with a p-value of ≤ 0.05 regarded as statistically significant in all evaluations. The first analysis evaluated differences in MC by gender and age category, using motor quotient (MQ) as the primary outcome variable. Group comparisons were performed to identify whether MQ scores varied significantly between boys and girls and among different age groups. ~~The first analysis examined differences by category (gender, age) and motor quotient.~~ The second analysis assessed the main effects on the MANOVA value for motor competence (MC) measurements based on gender and age. The magnitude of the differences was determined using partial eta squared (ηp^2), with values of 0.01 (small), 0.06 (medium), and 0.14 (large). Last, we

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Comentado [A7]: Se menciona la aprobación pero es importante detallar sí hubo consentimiento informado por parte de todos las actores del estudio.

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Comentado [A8]: Se menciona la aprobación pero es importante detallar sí hubo consentimiento informado por parte de todos las actores del estudio.

Comentado [A9]: Falta especificar con mayor claridad el tipo de diseño. Adicional, sería conveniente ampliar sobre el proceso de validación local del instrumento.

categorize (impaired, poor, normal, good, high) and compare the distribution of rural children on all KTK3+ subtests through motor quotient.

Results

Raw Score Differences by age and gender

In table 1, we report the raw mean and standard deviation for KTK3+ subtests, which are also analyzed using the motor quotient. Meanwhile, table 2 explains the main effects and interaction effects through analysis by age and gender.

A significant main effect were found for gender (Wilks' $\lambda = 0.92$; $F = 6.07$; $p = 0.000$; partial $\eta 2 = 0.084$) and age (Wilks' $\lambda = 0.52$; $F = 9.57$; $p = 0.000$; partial $\eta 2 = 0.150$). However, follow-up ANCOVA could confirm the age effect for KTK3+ subtests. Further, boys had better on MS ($F(1, 269) = 17.80$, $p < 0.05$, $\eta p^2 = 0.062$) and EHC ($F(1, 269) = 15.04$, $p < 0.05$, $\eta p^2 = 0{,}053$) compared to their girls counterparts. No significant gender differences were found in balance beam and jumping sideways ($p > 0.05$). Finally, significant differences were observed in each subtest, with older children outperforming their one-year younger peers (all $p < 0.005$)

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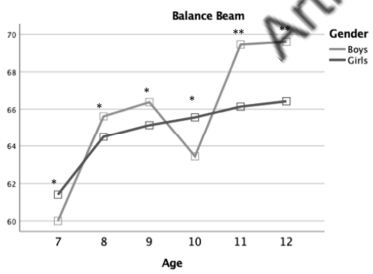
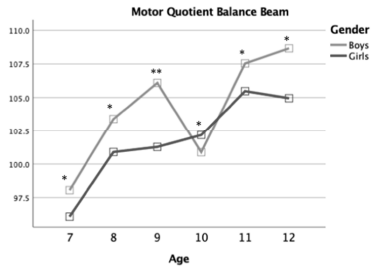
Table 1. Raw KTK3+ (means and standard deviations) and motor quotient

Variable	7 years (n = 42)	8 years (n = 41)	9 years (n = 39)	10 years (n = 21)	11 years (n = 40)	12 years (n = 39)
Motor Quotient						
BB	97.1 (16.5)	102.1 (10.8)	103.6 (13.2)	101.5 (12.9)	106.6 (6.8)	106.9 (8.3)
JS	94.6 (9.8)	98.9 (16.4)	99.9 (11.5)	108.3 (10.3)	110.0 (7.0)	115.3 (8.0)
MS	94.6 (10.3)	96.6 (18.3)	101.7 (9.2)	102.5 (9.4)	108.0 (13.5)	106.8 (11.1)
EHC	83.0 (8.7)	92.2 (16.6)	93.9 (12.1)	103.0 (15.3)	106.2 (10.2)	112.4 (12.5)
Raw Scores						
BB	60.72 (10.8)	65.04 (10.1)	65.74 (9.1)	64.50 (9.3)	68.00 (6.4)	68.09 (6.5)
JS	49.70 (8.8)	55.83 (14.1)	55.47 (9.7)	63.24 (9.5)	64.87 (7.2)	69.70 (8.1)
MS	38.77 (5.7)	40.33 (11.6)	43.09 (5.0)	43.60 (5.6)	46.53 (7.3)	45.93 (7.1)
EHC	4.49 (4.3)	9.28 (9.0)	10.12 (6.1)	14.58 (7.8)	16.34 (5.3)	19.61 (6.5)





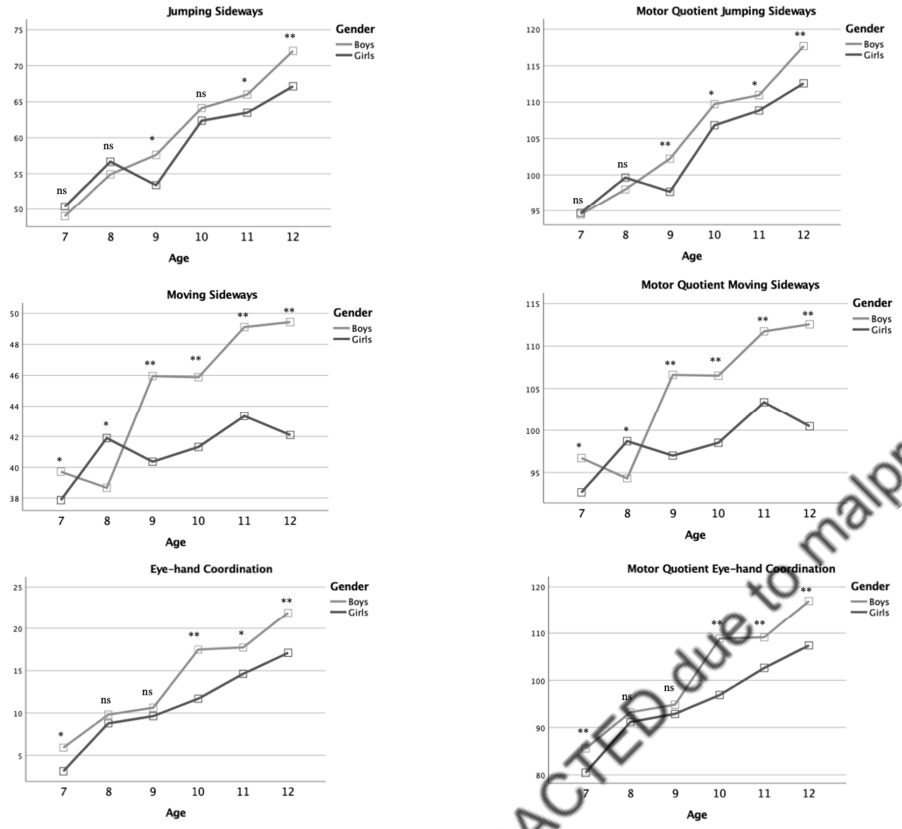


Figure 1. Comparison of KTK3+ and motor quotient by gender (**P<0.001; *P<0.05; NS, not significant)

Motor Quotients of Boys and Girls

The results of the MANOVA analysis for the total KTK3+ in the motor quotient show that boys are better ($F = 6.74$; $p < 0.001$; partial $\eta 2 = 0.092$) compared to girls. The description of the motor ~~intelligence~~ quotients assessment is as follows: 1) A score of 70 or below indicates impaired MC; 2) A score between 71 and 85 indicates poor MC; 3) A score between 86 and 115 indicates normal MC; 4) A score between 116 and 130 indicates good MC; and 5) A score greater than 131 indicates high MC (Vandorpe et al., 2011).

Further, children aged 10-12 years performed better than children aged below, increasing as they became older ($F = 9.94$; $p < 0.001$; partial $\eta 2 = 0.155$). As a result, girls get higher normal scores than boys when compared with Kiphard and Schilling's motor quotient norms, but boys get more good scores than girls (see figure 1). Furthermore, the MQ score for older children and boys is significantly better across all KTK3+ subtests ($p < 0,005$). The single-factor analysis outcome also evidenced that boys performed scored significantly high on JS and EHC ($p < 0.001$).

Table 2. Interaction and main effects on KTK3+ by age and gender.

Variables	$F_{AGE\ x\ GENDER}$	ηp^2	F_{AGE}	ηp^2	F_{GENDER}	ηp^2
Balance Beam	0.75*	0.014	3.93**	0.068	0.69*	0.003
Jumping Sideways	0.90*	0.017	24.12***	0.310	2.05*	0.008
Moving Sideways	3.56**	0.062	7.69***	0.125	17.80***	0.062
Eye Hand Coordination	1.05*	0.019	29.68***	0.356	15.04***	0.053

*p > 0.05, **p < 0.05, ***p < 0.001

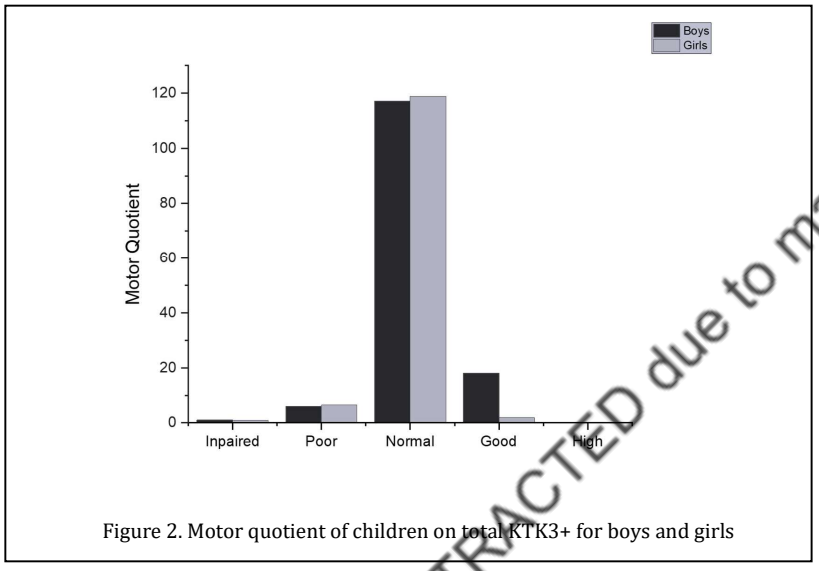


Figure 2. Motor quotient of children on total KTK3+ for boys and girls

Discussion

The importance of being aware of the level of MC in childhood, which can affect the physical and mental well-being of children and even throughout life. The level of MC that children possess is essential for mastering the basic skills of sports in the future. This cross-sectional study aims to compare MC in children based on age (7-12 years) and gender (male and female) in rural areas using the KTK3+.

Overall, girls were found to our result in poorer KTK3+ performances than boys. Specifically, boys scored higher in each subtest (BB, JS, MS, EHC). In this study, there is a significant increase in MC with age, as children in the older age group scored significantly better compared to those in the 1-year younger peers. In line with the results Coppens et al (2021) and Moreira et al (2019), MC increased and gave positive relationships between age and MC in each age group during elementary school. On the other hand, these data may indicate a difference in maturity between boys and girls in primary school, so it is rather difficult to compare children in primary school by gender. However, it should be compared only with children of the same age and gender.

According to DeWolfe et al (2020) and Walhain, Van Gorp et al (2016), boys do more PA than girls and spend more time playing outside. This habit is the most important factor in enhancing PA and MC. Positive correlations between habits and PA suggest that habits play a significant role in promoting PA (Feil et al., 2021). Particularly given the habit of rural children engaging in more PA than urban children (Loucaides, 2004) ~~(Loucaides, 2004)~~. In fact, this circumstance becomes a crucial factor in selecting future athletes. Although rural settings are sometimes assumed to promote higher physical

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activity (PA) than urban settings (Loucaides et al., 2004), evidence suggests that the relationship is more nuanced. Loucaides and colleagues reported seasonal variations in PA, with urban children being more active during winter and rural children more active during summer, shaped by contextual affordances such as safer outdoor spaces in rural schools and greater access to exercise equipment and organized transport in urban areas. Furthermore, {Bell et al. (2016) found that athletes from suburban schools began their primary sport earlier, trained more months per year, participated in more competitions, and were more likely to be highly specialized than rural athletes. These findings highlight that geographic context influences opportunities and developmental pathways rather than serving as a simple predictor of athletic potential.

Currently, in Indonesia, sports policymakers pay little attention to children living in rural. In contrast, if a more comprehensive study is conducted, it may be able to report that children in the rural are much more capable in many sports.

In terms of motor quotient tasks, On average, boys have better grades than girls. However, girls get more "normal scores" than boys using the German standardization sample from 1974. This is also in line with research of Kokštejn (2017), girls aged 3 and 4 have better total scores on fine motor skills and balance than boys. However, this study only applies to children aged 3 and 4 years. The study also explained that there was no difference in the ability of children aged six and over (Adriyani et al., 2019). The result of this study indicate that girls score 1% higher than boys on the MQ of the KTK3+. However, an analysis of the raw KTK3+ data reveals that boys outperform girls at every age, except for 8-year olds in JS and MS. Boys averaged 1% higher scores than girls on the BB, MS, JS, and EHC. In addition, it has been argued that evaluating MC can assess several aspects of physical fitness, such as speed, strength, endurance, and flexibility.

Furthermore, the findings of this research indicate that boys are fitter than girls. This explains why girls score lower on every test item because every MC test item is also influenced by physical fitness. This is aligned with the result Luz et al (2017), which describes the relationship between children's MC and physical fitness. The study showed a significant relationship between MC and health-related fitness (HRF) regardless of age or gender. However, this study's results differ from those of Luz et al. (2017). This study also indicates that there are differences between gender and age in the ability to MC, although these differences are not substantial (see Table 2). This shows that children's habits have changed, mainly due to the effects of technology. The use of technology in children increases the risk of obesity and other deadly disorders (Alotaibi et al., 2020). Thus, children with a screen time habit are at a higher risk for depression, attention issues, behavior, and academic achievement and have fewer opportunities to engage and socialize (Alotaibi et al., 2020). However, technology has become an enormous difficulty for parents in the modern era. Parents must be able to regulate their children's time when using technology (Rosen et al., 2014). Frequent use of technology can negatively impact children's physical activity and fitness. According to scientific guidelines, children should not spend more than two hours per day in front of a screen (such as watching television or using mobile phones), and children under the age of two should not be exposed to screen time, as recommended by the American Academy of Pediatrics (Committee on Public Education, 2001).

Early childhood is a critical period for developing fundamental motor skills, which serve as the foundation for more complex motor development (Hardy et al., 2010). During this stage, children have an optimal opportunity to build MC, which significantly impacts their physical, social, emotional, and cognitive abilities (Mardiansyah et al., 2023). Appropriate stimulation through physical activities and play can have long-term effects on overall child development (Mardiansyah, Bakhtiar, & Syafruddin, 2024).

An important finding of the age and gender group analysis was the identified difference in MC. Boys and girls should have developed FMS and MC early because will help children prepare to become athletes in the future (Goodway et al., 2017). Boys and girls should develop FMS and MC early in life, as these skills not only prepare children for potential sport participation but, more importantly, lay the foundation for lifelong engagement in physical activity and healthy lifestyles (Goodway et al., 2017). Goodway and colleagues emphasize that youth sport should adopt a public health and youth development approach, aiming to provide all children, regardless of skill level, with the competencies, knowledge, and attitudes needed to participate regularly in physical activity throughout childhood and into adulthood. To develop FMS, kindergarten and ~~physical education~~PE teachers should understand and improve children's ~~motor competence~~MC. ~~The Indonesian government should make it a priority to equate and link the kindergarten curriculum and the physical education~~PE ~~curriculum of elementary~~

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Comentado [A11]: Como punto a favor, se discute adecuadamente la relación entre edad, género y competencia motora.
Sin embargo, se deben evitar generalizaciones no sustentadas a toda la población.
Faltan propuestas de intervención educativa o líneas para futuras investigaciones.
Sería positivo incluir una discusión más crítica sobre las limitaciones metodológicas.

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~~schools~~. The Indonesian government should prioritize aligning curriculum objectives for motor development in kindergarten with the PE curriculum in elementary school. In Indonesia, early childhood education emphasizes general developmental milestones, such as gross and fine motor activities, but often lacks systematic play-based approaches to movement learning. In contrast, elementary school PE implements a more structured curriculum focusing on FMS, introductory sports, and fitness concepts (Kementerian Pendidikan dan Kebudayaan, 2021). This misalignment may disadvantage children in rural areas, where limited access to qualified teachers, adequate facilities, and continuous motor development programs can further hinder their educational opportunities.

This is evident from a recent study indicating that many elementary school students have poor motor skills (Bakhtiar 2014; Bakhtiar et al. 2015; Famelia et al. 2018; Goodway et al. 2017; Syafruddin, Bakhtiar, and Famelia 2020). In addition, this finding also indicates that children's MC in rural areas are within the "normal" category (see Figure 2). This suggests that the MC characteristics of rural children are very suitable for special attention from the Indonesian government to foster long-term sports development. The lack of sports development in rural areas of Indonesia can be attributed to the limited government attention. If the government can facilitate talent development in these rural regions, it will represent a significant step toward nurturing more talent in Indonesia over the next decade.

A limitation of this study is that it only assesses MC in children from rural areas. As the sample is drawn from a small rural region in West Sumatra Province, the results may not be representative of all rural children in Indonesia. Based on our findings, implementing structured physical activity programs in rural schools may help improve motor competence among children. These programs could emphasize fundamental motor skill development through age-appropriate games and athletics. Future research should evaluate the effectiveness of such interventions using longitudinal or experimental designs to establish causal relationships and inform sustainable educational strategies. ~~Thus, this cross-sectional study could not explain the links between MC and other variables, such as FMS or PA. Further research needs to link or assess the characteristics of children's MC and PA in rural areas with a larger and more diverse sample.~~ Importantly, this is a novel study in Indonesia that uses the modified edition of KTK3+, which can assess the MC of children who are better movers and may be prepared to become elite athletes in the future.

Conclusions

This study shows that MC children aged 7 to 12 years differ significantly in rural Indonesia. Alarmingly, approximately 2.5% of boys and 2.8% of girls scored “below average” in MC. The results also indicate that, in terms of daily activity habits, girls in rural areas exhibit very low levels of daily physical activity. Another key finding is that the general motor quotient score for rural children shows favorable results, with the average score categorized as “normal” for children in rural Indonesia. Girls perform slightly better than boys on average. However, when comparing the raw data, boys outperform girls in all KTK3+ subtests. While our findings suggest the possibility of age-related improvements in MC, additional validation through longitudinal studies in Indonesia is required in various rural areas. KTK3+ is a reference tool for assessing MC in children, and we recommend its use in educational settings in Indonesia. This research can serve as a pilot study and a reference for future studies. Additionally, the government should prioritize special attention to children in rural areas to ensure that child development is evenly distributed across regions.

Author Contributions

Conflict of interest

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Comentado [A12]: Algunas referencias no están completamente ajustadas a APA 7 (faltan DOI o cursivas en nombres de revistas).

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