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Fundamental Motor Skill Competence among Karnataka Children Aged 6–8 Years: Evidence for Physical Literacy and Sustainable Development Goals

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Abstract: This study examined locomotor and ball skill competence in 6–8-year-olds in Karnataka, India, using the Test of Gross Motor Development–Third Edition. Fundamental motor skills (FMS) are essential for physical literacy and lifelong physical activity. A school-based cross-sectional descriptive design was used. In chosen schools, 100 youngsters (50 boys, 50 girls; mean age 6.93 ± 0.74 years) were tested. Six locomotor and seven ball TGMD 3 skills were scored twice per child. Criterion-referenced locomotor, ball skill, and TGMD 3 scores. Performance and gender differences were assessed using descriptive statistics and independent t-tests. Children had intermediate motor skill proficiency, with a mean TGMD 3 score of 60.3 ± 6.62 (range 49-76). Locomotor subscale scores averaged 28.7 ± 4.70 (17-40), whereas ball skill scores averaged 31.6 ± 4.66 (18-44). Sprinting and galloping were better than dribbling and catching. Males outperformed females in ball skills (32.9 ± 4.13 vs 30.9 ± 4.77; $p = 0.027$), but there were no significant differences in locomotor skills. Locomotor strengths and ball skills issues characterise FMS competency in 6–8-year-olds. Gender disparities in object control demand special treatment. Schools should provide systematic skill development, equitable participation, and teacher training to increase motor competence, physical literacy, and lifetime physical activity.

Keywords: TGMD 3 scores; Fundamental Motor Skills; Physical Literacy; Locomotor Skills; Ball Skills; Early Childhood; Motor Development; Locomotor Strength; Gross Motor Development.

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1. Introduction

Childhood motor skills are crucial for lifelong physical activity and health. Physical literacy is the combination of drive, confidence, physical competence, knowledge, and understanding that motivates and empowers lifelong physical exercise, according to Whitehead [23]. In this technique, children's physical activity, health, and psychological development are shaped by basic motor skills (FMS) during the 6- to 8-year-old period. Basic motor abilities include running, hopping, skipping, throwing, catching, kicking, and balance and twisting. These basic movement patterns underpin sports and relaxation. FMS-taught youngsters are more likely to exercise, stay fit, and stay active as adults [1]. Poor motor skills can keep kids from playing, resulting in inactivity, poor fitness, and poor health [5]. Early motor skill development affects several developmental domains, emphasising its relevance. Beyond physical health, FMS proficiency affects cognitive growth, academic success, and social-emotional well-being. Burton et al. [19] found increased self-esteem, peer interactions, and environmental confidence among motor-competent children. These studies show how important motor skill development is for child development. Initial motor skill deficits may last. Exercise makes low-motor skill children nervous, according to Ulrich [21]. Disengagement can cause childhood obesity, CVD, anxiety, and low self-esteem. The "proficiency barrier" suggests that youngsters without mastery of basic motor skills may struggle to adapt to more advanced physical activities, limiting their lifelong active engagement [7].

FMS is important, although most studies are in high-income Western nations. Goodway and Robinson [8] note a scarcity of motor development literature in low- and middle-income countries (LMICs), where socio-economic inequities, cultural differences, and educational systems may hinder motor development. This research mismatch restricts generalizability and emphasises context-specific environmental and socio-cultural studies [10]. India improves motor skills and physical literacy. The socio-economic diversity, urbanisation, and culture of India make it a unique place to study environmental and contextual factors on motor development. Urban children have access to structured sports, playgrounds, and physical education, whereas rural or underprivileged children may lack these opportunities. Cultural gender norms, attitudes toward physical activity, and academic priorities may also affect children's mobility. Regional FMS data in Karnataka is scarce. Urban city studies on motor skill development may not apply to regional settings. Infrastructure, PE teachers, and recreation facilities might alter children's motor skills. Understanding motor skill development in educational and environmental contexts requires localised evaluations. A basic motor skill assessment requires accurate tools. Famous FMS tests for kids include the Ulrich [21] and the Test of Gross Motor Development–Third Edition. Process-oriented locomotor and object-control skill evaluation assesses movement patterns and competency. Although rarely used in non-Western countries such as India, TGMD-3 is reliable and valid across demographics. Cultural, physical activity, and contextual factors can affect performance, requiring careful application and interpretation [11].

Physical literacy improves motor proficiency and readiness for lifelong physical activity in children. Learning physical literacy boosts confidence, motor skills, and exercise motivation. This comprehensive strategy supports modern educational and public health goals of lifetime involvement above performance. Researching FMS proficiency and physical literacy can reveal how early development affects motor psychological and behavioural outcomes. Another key research field is gender differences in motor skill development. Research reveals that girls are better at handling items and moving than guys. Bio, social, and cultural factors, such as practice opportunities, societal expectations, and the availability of sports and exercise, can contribute to inequality. Indian gender norms and cultural expectations may influence participation patterns; boy-girl distinctions in motor skills are essential [12]. Age affects motor skill development. Between 6 and 8, children learn basic motor skills and combine them into more sophisticated movements. In this stage, kids swiftly learn coordination, balance, and neuromuscular control. Motor competency exams in this age range can identify developmental issues and provide focused education. This study impacts public health and education beyond individual development. SDG 3 (Good Health and Well-being) and 4 (Quality Education) support inclusive education and healthy living. Early children's motor skills and physical literacy programs boost health, education, and exercise. These goals may benefit from school physical literacy initiatives. Schools target diverse socioeconomic students and teach fitness and skills. Successful programs need qualified teachers, resources, and culturally relevant curricula.

Motor competency and physical literacy statistics from this study enhance the design and administration of the Indian physical education program [15]. This study impacts policy and implementation. Policymakers use motor skill performance data to identify educational gaps and allocate resources. Teacher training, tailored interventions, and infrastructure may help address low motor competence. Age and gender patterns can help create inclusive programs for all kids. This 6–8-year-old study in Karnataka, India, addresses research questions. Basic motor skills are first examined in kids. Second, gender differences in motor skills are studied. Third, physical literacy and motor skills are tested. Results may inform SDG-aligned physical education programs. These questions enhance motor skills and physical literacy, especially among low-income populations. Physical, cognitive, and socio-emotional child development are also stressed. Educators, governments, researchers, and communities must collaborate to create active and healthy environments for children [16]. Finally, early motor skills are necessary for physical literacy and lifetime activity. FMS is vital, but socio-economic, cultural, and environmental research are needed. Such inquiries are vital in India due to its diverse population and distinct concerns. This study examines children's basic motor skills and physical literacy in Karnataka to inform education, policy, and public health. Promote motor competence and physical literacy in early infancy to generate healthier, more active, and more egalitarian societies, aligning with global sustainable development goals [22].

2. Review of Literature

Physical education, public health, and child development studies early childhood basic motor skills (FMS). The fundamental motor, object control, and stability skills (FMS) that allow children to participate in many physical activities are commonly recognised. These skills foster physical growth and active lifestyles. Physical literacy, according to Whitehead [23], links motor proficiency to motivation, confidence, knowledge, and comprehension for lifetime activity. This approach considers FMS essential to the child's development. According to growing research, children's and teenagers' motor skills are closely linked to physical activity. According to Barnett et al. [2], kids with higher FMS proficiency play more organised sports and engage in moderate-to-vigorous activity. Motor ability predicts future physical activity, underscoring the importance of this link. Stodden et al. [20] developed a developmental model that dynamically links motor skill, perceived competence, physical activity, and health-related fitness. Better motor skills encourage kids to move and flourish. Poor motor skills may lead children to lose confidence, harming development and health and perpetuating disengagement. Health benefits from motor skills. Lubans et al. [9] found strong links between FMS proficiency, cardiorespiratory endurance, muscular strength, and body composition. Motor competence reduces child adiposity, suggesting FMS avoids NCDs. Motor skills impact academic, cognitive, and physical health.

New research shows that exercise and motor skill development improve brain function, attention, and executive functions, which are essential for academic success. These findings stress movement-based early education. Research shows that children with better motor skills have higher self-esteem, social competence, and emotional regulation. Burton et al. [19] say exercise boosts socialisation, teamwork, and interpersonal skills. Poor motor skills can lead to social isolation, low self-esteem, and mental health concerns in youngsters. Due to Ulrich [21] "proficiency barrier," inadequate FMS development can limit children's physical activity and development. Children with motor deficits need early diagnosis and treatment. Researchers have developed standardised tests of child motor skills. The Third Edition Gross Motor Development Test is reliable. Ulrich [21] created TGMD-3 to assess movement patterns, not outcomes. This comprehensive understanding of baby skill development benefits researchers and practitioners. TGMD-3 is trendy in the West but rare in India. Local instrument validation and adaptation may be needed due to cultural differences in movement patterns, play behaviours, and ambient conditions. Many studies show gender disparities in motor capabilities. Girls throw and kick similarly or somewhat better than boys in locomotor and stability skills. Culture and DNA affect these differences. Culture, opportunities, and socialisation affect children's physical activity. As gender differences in motor competence increase with age, Barnett et al. [2] recommend early interventions to reduce skill development disparities.

Understanding these discrepancies is essential for inclusive sports and physical activity programming in India, where gender conventions may limit participation. Motor skill development with age is another popular topic in the literature. Early and middle childhood are critical for motor skill development. Between 6 and 8, children rapidly improve coordination, balance, and neuromuscular control, enabling more complex movements. Research shows that kids learn motor skills with practice and instruction. Children without age-appropriate motor development may struggle with physical activity. Early childhood skill development requires structured physical education and supportive environments. A key literary topic is age-related motor skill development. Early and middle childhood motor skill development is critical. From 6 to 8, children swiftly improve coordination, balance, and neuromuscular control, enabling more complex motions. If kids get enough practice and instruction, motor skills rise with age, research reveals. Undeveloped motor skills may make physical activity difficult for children. This emphasises structured physical education and supportive environments for early childhood skill development. Despite substantial research in high-income countries, the literature on low- and middle-income countries is scarce. Many Western studies limit their applicability. Goodway and Robinson [8] recommended context-specific research that considers cultural, socioeconomic, and environmental aspects. Research on basic motor skills and physical literacy in India is expanding and increasingly urban-focused.

In Karnataka, socio-economic conditions, educational facilities, and cultural traditions might affect children's motor development, making it difficult to understand. Lifelong wellness requires physical literacy in school. School facilities are needed for motor skills PE programs. Curriculum, teacher training, and resources determine program success. Sport-centric models must be replaced with inclusive ones that promote skill development, enjoyment, and lifelong participation. SDG 3 (Good Health and Well-being) and SDG 4 (Quality Education) require inclusive and equitable health and education. Physical education curricula in India vary in their approach to motor skill development. National regulations promote physical activity but lack curricula and trained workers. Policy and practice require evidence-based research. Studies of children's motor skills and physical literacy can inform targeted treatments and curricular changes. The literature emphasises the role of motor skills in children's physical, cognitive, and psychosocial development. Motor ability affects health, quality of life, and physical activity. Because individual, societal, and environmental influences interact, motor development is complicated and requires multidimensional approaches. Limited research in low- and middle-income countries, particularly in India, has proposed localised studies to capture the contextual aspects of motor competence. Research is needed to develop culturally and contextually appropriate physical literacy interventions that support global health and education goals.

3. Methodology

3.1. Study Design

A school-based cross-sectional descriptive study was conducted to assess fundamental motor skill competency among 6–8-year-olds in Karnataka, India. The study employed TGMD-3 to measure locomotor and ball skills as indices of motor competence, interpreting them through a physical literacy framework and in relation to the SDGs (Figure 1).

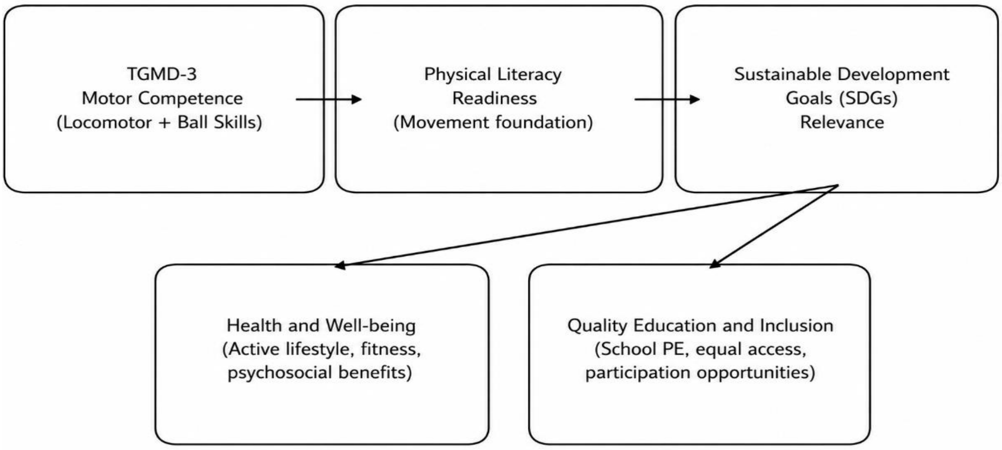

Figure 1: Conceptual framework linking motor competence, physical literacy and SDG relevance

3.2. Study Setting

Some Karnataka schools collected data. If available, assessments were conducted in the playground or a multipurpose hall during school hours. The testing spaces were designed for safe mobility, minimal distraction, and sufficient distance for locomotor and ball-skill exercises.

3.3. Participants

About 100 children, 6–8-year-old boys and girls, participated in the study. Early elementary school is a sensitive developmental stage for fundamental movement learning, and this stage is often addressed in physical literacy and school-based physical education programs.

3.4. Inclusion Criteria

Children aged 6–8 who were medically suitable for movement-based assessment and enrolled in the designated schools were included in the research. Participation was restricted to children with signed parental agreement and child assent.

3.5. Exclusion Criteria

Children were excluded from the trial if they had a neurological, orthopaedic, or medical condition affecting motor function. This recent injury impeded normal mobility or was missing on the TGMD-3 assessment day.

3.6. Sampling Method

School-based sampling was used. Subjects were recruited from specified schools, depending on availability and consent after institutional approval. Subgroup comparisons of fundamental motor skill ability were conducted between boys and girls.

3.7. Instrument: Test of Gross Motor Development–Third Edition (TGMD-3)

This study used Ulrich [21] Test of Gross Motor Development–Third Edition to test basic motor abilities. The widely used, standardised, and process-oriented TGMD-3 tests gross motor skills in 3–10-year-olds. Psychometric properties, such as reliability and validity, make it a strong tool for early childhood motor skills. TGMD-3 emphasises movement execution rather than distance or speed, unlike product-oriented appraisals. Performance-based skill evaluation is comprehensive in the process-oriented approach. Breaking each skill down into behavioural components helps examiners assess a child's movement patterns. This strategy helps in understanding development and designing motor competency treatments. The TGMD-3 measures locomotor and ball skills. Locomotor subtests measure the child's coordination and body movement through running, galloping, hopping, skipping, horizontal jumping, and sliding. Normal movement and more complex physical activities require these talents.

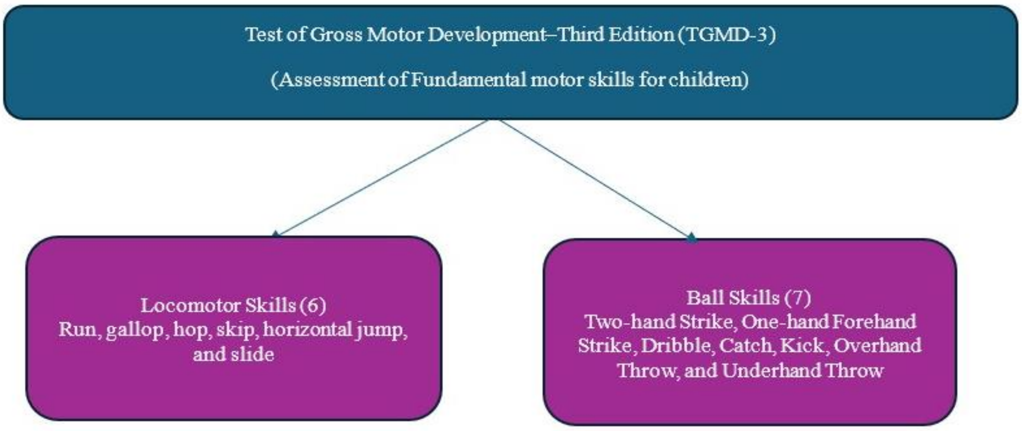

Figure 2: TGMD-3 structure

The ball skills subtest covers two-hand and one-hand forehand strikes, dribbling, catching, kicking, and overhand and underhand throws. These tasks need higher hand-eye coordination, timing, and perceptual-motor integration for children to manipulate objects. Three to five performance criteria assess TGMD-3 competencies. The examiner tests each component twice. If the criterion is met, the score is “1”; otherwise, “0”. Summarising all criteria yields a raw score for each skill, which is combined to produce locomotor, ball, and gross motor subtest scores. This scoring method measures a child's motor skills and allows meaningful comparisons across individuals and groups. The TGMD-3 structure, including its two subtests and the skills they assess, is shown in Figure 2. A benefit of TGMD-3 is its applicability across varied demographics. Developed and standardised in the West, it has been widely used in international research to assess motor competence in children from different cultures. When interpreting results, cultural practices, environmental opportunities, and physical activity should be considered.

3.8. TGMD-3 Includes Two Domains

- **Locomotive Skills:** Run, gallop, hop, skip, horizontal jump, and slide.
- **Ball Skills:** Two-hand Strike, One-hand Forehand Strike, Dribble, Catch, Kick, Overhand Throw, and Underhand Throw.

4. Test Administration Procedure

The present study examined basic motor skills using Ulrich [21] Test of Gross Motor Development–Third Edition (TGMD-3). Assessing young children whose performance may be affected by environmental and instructional factors requires standardised testing to ensure data reliability, validity, and consistency. The TGMD-3's process-oriented evaluation paradigm prioritises movement pattern quality over result for early childhood motor competence assessment. Before administering each ability, the examiner explained and demonstrated it in an age-appropriate manner. Kids needed this level to comprehend each skill's movement and performance criteria. Through visual modelling, children acquire motor skills from demonstrations. Watching each task performed correctly helped participants repeat the movement pattern. Clarity came from simple words and empathy. Children had some informal practice after the demonstration. Practice allowed participants to learn the exercise without evaluation. Motor skill evaluation recommends spontaneous practice to alleviate anxiety and enhance accuracy.

It ensures that recorded trials reflect the child's motor ability rather than their immediate reaction to a new task. Each youngster was given adequate time to learn and practice the skill because they learn at varying speeds and require varying levels of preparation. Participants completed two formal trials for each TGMD-3 skill and were assessed on performance. Multiple trials capture consistent performance patterns and reduce the influence of random errors or concentration gaps, making the assessment more reliable. TGMD-3 manual behavioural components were monitored and assessed in each experiment to ensure subject impartiality and standardisation—individual evaluations-controlled testing. Peer observation and competitiveness could hinder children's performance; hence, individual testing was necessary. Each child was examined independently so the examiner could focus, score accurately, and create a supportive environment for the best performance. Short rests improved skill assessment.

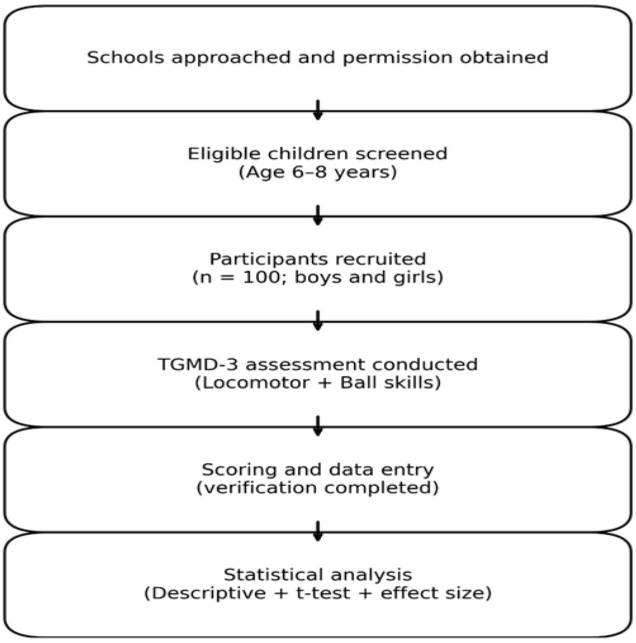

Figure 3: Participant recruitment and assessment flow diagram

These intervals were significant because fatigue decreases motor function, especially in young newborns with poor endurance. Adequate recovery time ensured that each skill was performed under equivalent physical conditions, thereby improving the validity of the results. In Figure 3, the participant flow diagram shows how the assessment was adapted to TGMD-3 and young children's development. Clear instructions, demonstrations, practice, multiple trials, individual assessment, and rest periods made the evaluation thorough and child-friendly.

4.1. Scoring Procedure

Ulrich [21] developed a standardised, process-oriented scoring method for the Test of Gross Motor Development–Third Edition (TGMD-3) to evaluate children's movement execution. Performance rather than outcome is used to examine basic motor skills more completely and gradually. Grading is objective, rigorous, and sensitive to performance fluctuations, making it useful for study and training. The TGMD-3 fundamental motor skills include performance standards. According to developmental sequences, these skills are essential for movement. Running may require the flight phase, arm-leg synchronisation, and foot placement. The examiner thoroughly monitors each child's performance to verify compliance. Scores are “1” if the youngster meets a performance criterion, “0” otherwise. Dichotomous scoring lowers evaluation subjectivity. Also discovered are movement components that need development. Using multiple criteria, the TGMD-3 provides precise insights into children's motor skill development. Children get two official trials for each talent after practice and display. Individual performance criteria are averaged over trials.

Adjusting for attention, motivation, and task familiarity improves evaluation reliability. Multiple efforts ensure consistency. To calculate skill scores, add all performance criteria from both trials. Locomotor and ball skills (object control skills) subtest scores are calculated from individual skill scores. Locomotor subtest scores are based on total locomotion, while ball skills scores rely on object control. Gross motor competence is measured by adding the locomotor and ball skills subtest scores to the TGMD-3 score. Higher scores indicate better performance and motor skills. Our scoring style allows for more skill analysis and subtest and total-score evaluation. Hierarchical scoring identifies motor skill strengths and deficits for focused improvement. TGMD-3 scores children's motor skills thoroughly and accurately. A formal scoring system and process-oriented evaluation ensure accurate assessment of motor development in children. It is useful for physical education, child development research, and practice.

4.2. Quality Control and Data Verification

To increase data quality, scoring sheets were verified immediately after testing for completeness. To avoid transcribing mistakes, all scores were validated during data entry. Data gathering followed standardised instructions and testing circumstances to guarantee participant homogeneity.

4.3. Statistical Analysis

All statistical analyses were conducted in Jamovi (2.6.22). Mean, standard deviation, and percentage described locomotor, ball, and total TGMD-3 scores. Researchers confirmed data normality before inferential analysis. To assess gender differences in fundamental motor skill competency, an independent-samples t-test was used to compare boys' and girls' TGMD-3 locomotor, ball, and overall scores. To evaluate differences, researchers set the statistical significance level at $p < 0.05$ and calculated effect sizes (Cohen's d) of 0.20, 0.50, and 0.80.

4.4. Ethical Considerations

Before data gathering, school officials gave permission. Before evaluation, parents/guardians provided written informed consent, and children provided assent. Study participants were kept secure, and their data were kept confidential throughout all examinations.

5. Results

The mean age was 6.93 ± 0.74 years, with 45% (n=45) aged 7 years, 31% (n=31) aged 6 years, and 24% (n=24) aged 8 years. Among early primary school children, boys had a somewhat higher mean age (7.02 ± 0.71 years) than females (6.84 ± 0.77 years), indicating a balanced age distribution (Table 1).

Table 1: Participant characteristics (n = 100)

Characteristic	Total (N = 100)	Boys (n = 50)	Girls (n = 50)
Age (years), Mean ± SD	6.93 ± 0.74	7.02 ± 0.71	6.84 ± 0.77
Age 6 years, n (%)	31 (31%)	12 (24%)	19 (38%)
Age 7 years, n (%)	45 (45%)	25 (50%)	20 (40%)
Age 8 years, n (%)	24 (24%)	13 (26%)	11 (22%)

The children demonstrated modest competence in basic motor skills, scoring 60.3 ± 6.62 (range: 49-76) out of 104 available points. Locomotor subscale scores averaged 28.7 ± 4.70 (range: 17–40; max 48), and ball skills subscale scores averaged 31.6 ± 4.66 (range: 18–44; max 56; Table 2).

Table 2: TGMD-3 subscale and total scores

TGMD-3 Component	Possible Score Range	Mean ± SD	Minimum	Maximum
Locomotor subscale score (6 skills)	0 – 48	28.7 ± 4.70	17	40
Ball skills subscale score (7 skills)	0 – 56	31.6 ± 4.66	18	44
Total TGMD-3 score (13 skills)	0 – 104	60.3 ± 6.62	49	76

Within locomotor skills (max 8 per skill), running and galloping scored highest (both 5.01 ± 1.56 and 1.73, respectively), followed by horizontal jumping (4.84 ± 1.92), sliding (4.64 ± 1.72), skipping (4.39 ± 2.15), and hopping (4.33 ± 1.86; Table 3).

Table 3: Skill-wise score ranges

TGMD-3 Skill	Domain	Score Range	Mean ± SD
Run	Locomotor	0–8	5.01 ± 1.56
Gallop	Locomotor	0–8	5.01 ± 1.73
Hop	Locomotor	0–8	4.33 ± 1.86
Skip	Locomotor	0–8	4.39 ± 2.15
Horizontal Jump	Locomotor	0–8	4.84 ± 1.92
Slide	Locomotor	0–8	4.64 ± 1.72
Two-hand strike	Ball skills	0–10	6.30 ± 2.17
One-handed forehand strike	Ball skills	0–8	4.73 ± 1.61
One-handed stationary dribble	Ball skills	0–6	3.44 ± 1.68
Two-hand catch	Ball skills	0–6	3.52 ± 1.73
Kick a stationary ball	Ball skills	0–8	4.93 ± 1.82
Overhand throw	Ball skills	0–8	4.07 ± 2.20
Underhand throw	Ball skills	0–8	4.51 ± 1.83

Ball skills showed greater variability, with two-hand striking highest (6.30 ± 2.17; max 10), then kicking (4.93 ± 1.82), underhand throwing (4.51 ± 1.83), one-hand forehand striking (4.73 ± 1.61), overhand throwing (4.07 ± 2.20), two-hand catching (3.52 ± 1.73; max 6), and one-hand stationary dribbling lowest (3.44 ± 1.68; max 6) (Figure 4).

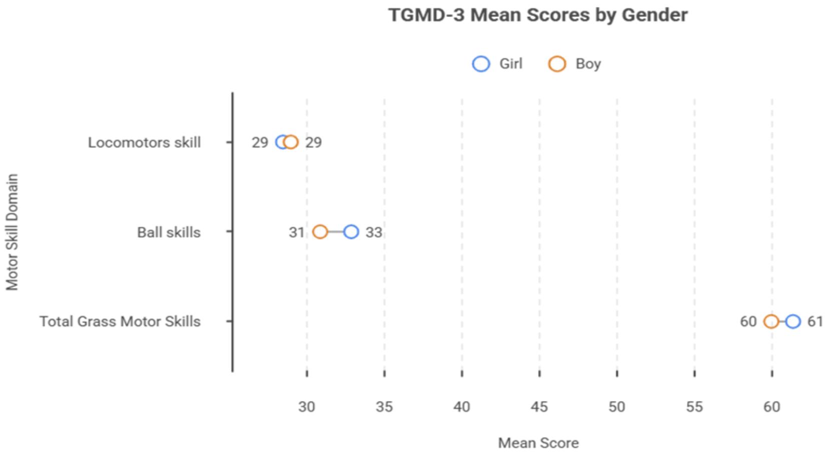

Figure 4: Gender-based comparison of TGMD-3 motor skill domain mean scores

Locomotor abilities (p = 0.551) and overall TGMD-3 score (p = 0.234) did not differ by gender. Ball abilities were significantly different between boys and females (p = 0.027). Boys scored higher. A moderate effect size (d = 0.45) for ball skills indicated gender-related variation in object-control ability (Table 4).
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Table 4: Gender differences in TGMD-3 scores

TGMD-3 Component	Boys Mean ± SD	Girls Mean ± SD	t	p	Cohen's d
Locomotor score	28.5 ± 4.53	29 ± 4.83	-0.598	0.551	-0.12
Ball skills score	32.9 ± 4.13	30.9 ± 4.77	2.241	0.027	0.448
Total TGMD-3 score	61.4 ± 6.06	60 ± 5.95	1.198	0.234	0.24

5.1. Discussion and Findings

In Karnataka, India, 6–8-year-olds were tested for FMS using the Test of Gross Motor Development–Third Edition. The investigation revealed moderate motor skills, with a mean TGMD-3 score of 60.3 ± 6.62. Subscale analysis suggested modest competency in locomotor (28.7 ± 4.70) and ball skills (31.6 ± 4.66), indicating that children in this age group are consolidating rather than mastering basic motor patterns. According to Ulrich [21], early primary school students rarely have advanced motor skills. Robinson et al. [18] found that practice and environment shape FMS proficiency in middle childhood. This study demonstrated low motor competence, consistent with the global literature showing that many children do not attain ideal FMS proficiency early on. Lubans et al. [9] revealed that children from diverse groups often have poor motor abilities, which may limit their physical activity. Early school-structured treatments increase motor development. The findings show that children may not learn the skills needed for regular exercise without focused guidance. Running and galloping were better developed than hopping and skipping when skill-specific performance was examined. Goodway et al. [6] found that simpler locomotor skills develop earlier than rhythmic and bilateral coordination. Advanced neuromuscular control and interlimb synchronisation require more experience for skipping and hopping. Thus, this data supports the phased development of motor skills and meets theoretical assumptions. Loromotor skills outperformed object control skills, agreeing with Ulrich [21] TGMD-3 normative patterns.

This study found that children have poor object-handling skills, notably hand-eye coordination, such as dribbling and catching. Logan et al. [14] found that object control is more complex and requires perceptual-motor integration. Robinson et al. [18] noted that these skills require practice and environmental exposure, which may not be available in all socioeconomic contexts. Indian conditions may have hindered the development of ball skills in this study. Without sports facilities, structured PE, and practice, object control may be delayed. These findings support Cattuzzo et al. [4]. Goodway and Robinson [8] found an environmental constraint effect on motor ability. Specialised equipment or instruction can affect the motor skill development of low- and middle-income individuals. Males outperformed females in ball skills (32.9 ± 4.13 vs 30.9 ± 4.77; p = 0.027), but the difference was not significant in locomotor skills or total TGMD-3 scores. This supports previous findings that gender differences in object control outweigh locomotion. Men enhance ball abilities by moving more, say Barnett et al. [3]. Lubans et al. [9] found that boys outperform girls in object control throughout ages. Environmental and societal factors contribute to gender disparities. Boys are encouraged to play ball-handling sports in many countries, including India, but girls may face social restrictions. Okely et al. [17] found that boys outperformed girls in community-based object-handling tasks, suggesting that these differences endure across cultures. Researchers found gender-sensitive programs that enhance abilities equally. Small gender differences in locomotor ability support the idea that biological development overrides social effects.

Lloyd et al. [13] found no gender differences in locomotor skills among 5–9-year-olds, supporting the idea that play and movement naturally develop them. Goodway et al. [6] say locomotor skills are innate and require little training. Health and physical literacy are affected by moderate motor skills. Exercise and health depend on motor skills. Stodden et al. [20] link motor skill, exercise, and health-related fitness in their developmental model. Improved motor abilities may lead to greater activity and improved behaviour in youngsters. Low motor competency levels in this study suggest that many youngsters may not be ready to participate fully in physical activity, thereby limiting its health benefits. Barnett et al. [1] say motor competence increases cardiovascular fitness, body composition, and exercise. This study found that kids had poor object control, which may hinder their participation in and enjoyment of sports. Focused ball skill training promotes gender equality and inclusion. Primary school PE should systematically build motor skills. FMS interventions have been shown to improve motor skills and physical activity. Logan et al. [14] found that systematic motor skill interventions improve early childhood movement proficiency. These treatments work best in schools because they give structured education and practice. Developing motor skills in schools promotes global policy, especially the UN Sustainable Development Goals. Good Health and Well-being and Quality Education are SDGs that encourage inclusive and equitable health and education.

Early motor competence promotes active lives and complete development. Whitehead [23] says physical literacy demands transdisciplinary approaches. Findings notwithstanding, this study has drawbacks. Cross-sectional research makes causal conclusions about skill development. Physical exercise and the health implications of motor skill development need long-term study. Western-based TGMD-3 normative data are accurate and widely utilised. Culture and environment may affect performance, raising doubts about whether Indian pupils adopt these ideas. Need context-specific criteria and local validation studies. Socioeconomic position, play space availability, and extracurricular engagement may affect results. Future research should examine how this affects motor performance. Quality insights into children's attitudes toward physical activity may help explain motor development. This study found that 6–8-year-old children in Karnataka exhibit intermediate motor skills, with locomotor skills exceeding object control. Gender differences in ball skills require different approaches for fair development. These findings emphasise early, systematic, inclusive motor skill development, as previously found. Determinants of motor competence and their effects on physical literacy and health require longitudinal, contextual research.

6. Conclusion

This study examines the influence of contextual constraints on the development of basic motor skills (FMS) in 6–8-year-old children in Karnataka, India. Locomotor skills outperform object control and ball skills in children. According to motor development theories, basic locomotor skills develop during play, but object-handling skills require more structured practice and guidance. Many kids are not ready for sustained, confident physical activity, as shown by their average performance. The difference between locomotor and ball skills is important, as many structured sports and hobbies require object control. Children may have trouble with hand-eye coordination, timing, and perceptual-motor integration due to poor ball skills. Participating in a variety of activities increases confidence, motivation, and lifelong physical activity. The gender differences in this study underscore the need for expertise in motor development. Ball skills were substantially better for boys than girls, but locomotor and motor competence were not. This complements prior findings that socio-cultural and practice opportunities increase gender differences in motor performance. No gender differences in locomotor skills suggest they are more generally acquired and less dependent on external influences. In contrast, object-control skills are influenced by environmental exposure, societal expectations, and involvement patterns. These results underscore the relevance of early motor skill and physical literacy development. Motor competence throughout this developmental stage predicts future health habits and outcomes as well as physical capacity. Good motor skills help kids exercise, stay healthy, and fit. In contrast, children with poor motor skills may be less active, less self-confident, and less healthy. This study supports the idea that environmental factors affect motor development.

Changes in physical education, play areas, and organised exercise may explain why Karnataka kids have mediocre motor skills. Academic priorities and bad infrastructure may hamper motor skill development and movement-based learning. Resource and opportunity disparity may hurt low- and middle-income countries. Findings impact school-based physical literacy. Lifelong physical literacy comprises confidence, motivation, and knowledge of exercise. The study found moderate motor competency, suggesting many kids lack physical literacy. A more structured physical education approach that stresses skill development, cognition, and emotion is suggested. The UN SDGs and global development initiatives make this study essential. Physical literacy and motor competence promote active living and reduce the risk of non-communicable diseases, advancing SDG 3.

Movement-based solutions enhance learning and development, supporting SDG 4 (Quality Education). Early childhood motor competency research improves global health and education. The study includes pros and cons. The cross-sectional approach makes it harder to assess motor skill development and causal linkages. Western values may render TGMD-3 culturally challenging. These limitations suggest that future research should use longitudinal designs, culturally appropriate evaluation instruments, and contextual variables. Intermediate ball, locomotor, and object-control skills vary by gender among 6–8-year-old children in Karnataka. Thus, early intervention, regular physical education, and inclusive behaviours increase motor development. These regions boost physical literacy, activity, and child development.

6.1. Recommendations

Based on this study, recommendations are provided to improve children's core motor abilities and physical literacy. These principles promote collaboration between educators, policymakers, academics, and the community to close gaps. Fundamental motor skill (FMS) interventions must be planned and developmentally suitable for early primary school physical education. Physical education should emphasise mobility, object handling, and stability, not sports. Modern physical literacy programs emphasise lifelong movement. This study found that children struggle more with ball skills than locomotor skills, stressing the need for specialised intervention. Teachers must utilise controlled, gradual activities for throwing, catching, and dribbling that require sophisticated coordination, timing, and perceptual-motor integration. Physical education improves kids' hand-eye coordination, rhythm, and object manipulation. Kids are motivated by skill-based assignments in fun learning situations. Children's confidence and self-efficacy increase with the accomplishment of motor skills, encouraging activity. Well-designed FMS activities boost fitness, health, and motor abilities. Physical education must be methodical and skill-based. Instead of early sport specialisation, focusing on core movement skills can build inclusive and supportive environments that encourage holistic development and lifetime physical activity. School PE programs must be purposeful, inclusive, and context-sensitive to address gender disparities in motor competency. Boys and girls must participate equally in object control, where prejudices are most visible. This requires aggressively confronting gender norms that may deter girls from ball-handling and object-manipulation sports.

All schoolchildren, regardless of gender, should try a variety of movement activities. Teachers use inclusive pedagogy to promote equitable practice, constructive feedback, and skill growth. Give each child enough time, encouragement, and aid to enhance motor skills using diverse instructional approaches. Collaboration and non-competition lessen performance anxiety and increase student belonging. Positive reinforcement and female role models boost girls' fitness and confidence. Equal and inclusive learning environments can reduce the gender gap in motor competence, support balanced skill development, and boost physical literacy for all students. Motor skill programs need continual teacher training and professional development to increase evaluation, instruction, and student involvement. Teachers must reliably measure motor proficiency, provide developmentally appropriate therapies, and establish inclusive, motivating learning environments. Study evidence-based motor development and physical literacy to teach skills outside standard methods. Quality physical education requires understanding how children learn, develop, and respond to teaching. Ulrich [21] Test of Gross Motor Development–Third Edition provides a systematic testing approach. These tools let teachers assess kids' motor skills, identify issues, and track progress. Such assessments help educators target aid and adapt treatments for needy youngsters. Professional development should also stress pleasant, student-centred learning environments. Confident teachers can help youngsters develop physical literacy, motor skills, and a lifelong habit of physical activity. Child motor development needs early detection and intervention. Teachers identify children at risk of developmental delays using motor competency exams.

The third edition of the Ulrich [21] Test of Gross Motor Growth (TGMD-3) tracks skill growth and gaps. After diagnosis, targeted interventions enhance coordination, balance, and object control. Inactivity, social isolation, and low self-esteem can be averted with early intervention. Regularly failing movement exercises may make kids lose interest in exercise, which is harmful. Thus, timely support boosts mental and motor skills. Schools must monitor, appraise, and provide tailored aid. Teacher-physical educator collaboration should provide inclusive programs for challenging youngsters with various learning requirements. Children of all abilities can acquire motor skills in a caring environment. Early diagnosis and intervention improve motor skills, confidence, and involvement, maximising the child's potential. Active participation by families and communities outside of school improves motor skills. Motor competence improves with structured physical education and frequent active play at home and in the community. Balls, cycling, jogging, and informal games are fun ways for kids to practice their movement skills. Thus, parents must understand the long-term benefits of physical activity for their children's cognitive, emotional, and physical development. Encourage active lifestyles, reduce sedentary behaviour, and create supportive conditions to improve children's motor skills. Local sports groups, leisure programs, and safe play areas encourage kids to exercise. Platforms encourage confidence, skill development, and socialising.

Family, school, and community collaboration is needed to provide a healthy and supportive environment for children. School awareness programs and community partnerships can engage parents. Integrated efforts allow children to practice motor skills in different situations, promoting physical literacy, active lives, and well-being. National and regional education policies must promote children's physical literacy. This demands intentional inclusion of physical activity and motor skill development in the curriculum, not a bonus. Governments should offer safe playgrounds, sports facilities, and mobility gadgets. Recruiting and training qualified physical education instructors to run structured, developmentally appropriate programs to improve core motor skills and physical literacy is also important. Schools should promote physical education to help students develop physically, cognitively, and socio-emotionally. Policy should prioritise inclusive and effective physical education for all students, regardless of socioeconomic background or geography. Integrating global initiatives such as the UN Sustainable Development Goals helps strengthen national educational policy. SDG 3 (Good Health and Well-being) and SDG 4 (Quality Education) promote active living and inclusive education. Physical literacy in school policy and sufficient funding can help governments develop sustainable systems that promote lifelong health and well-being. This method improves public health, education, and individual growth, making societies healthier and more active. Additionally, a longitudinal study is needed to understand motor skill development and its long-term impacts on health, well-being, and physical activity. Cross-sectional studies provide glimpses but do not show how motor skills develop or how early competence affects later behaviours.

To understand how early fundamental motor abilities affect physical activity, fitness, and health in adolescence and adulthood, longitudinal studies can follow children across development. Such evidence is needed to establish causal links and intervention windows. Also, a longitudinal study can evaluate the long-term effectiveness of motor competence rehabilitation programs. It assesses whether motor skill gains are preserved and lead to increased exercise and decreased health risks. By tracking how different groups respond to treatments, such research can identify and address gender, socioeconomic, and resource disparities. This understanding is essential for inclusive programming for diverse populations. Longitudinal studies can explain motor development by including environmental, cultural, and psychological factors. By offering robust, evidence-based insights, longitudinal research can guide policy, education, and targeted programs to increase physical literacy and lifetime physical activity. Culturally relevant motor skill development studies must include regional socio-economic, environmental, and cultural factors. Western literature and conventional tests may misrepresent children's lives, activities, and environmental constraints. Thus, adopting, validating, or designing locally relevant assessment methodologies may improve the accuracy, reliability, and contextual relevance of motor skill ratings. Tools should evaluate lifestyle, play behaviour, and resource availability that affect children's practice of movement skills.

Consider socioeconomic status, play facilities, and structured physical education programs in relation to motor development. Resource-limited children may have less structured practice, while urban children may have space limits despite more scheduled activities. Culture affects children's physical activity, which may hinder motor skill development. Understanding these elements helps academics and practitioners create inclusive, context-sensitive solutions. Cultural, environmental, and socio-economic studies may resonate with locals. This method improves motor competence, physical literacy, and child development research and intervention design. Last, include motor development into cognitive, socio-emotional, and physical learning. Brain development, emotional regulation, and social interaction are affected by movement. Movement-based learning improves motor skills, academics, attention, and well-being. Movement, problem-solving, rhythm, and coordination activate memory, executive function, and learning pathways. Exercise increases teamwork, communication, self-esteem, and resilience. Maintaining these benefits requires an exercise-friendly culture. Schools, families, and communities should promote mobility. Children's health and behaviour can be affected by an inclusive, and holistic culture. Movement can make kids happy, accomplished, and social, forming lifelong positive views of physical activity. Integrating cognitive, emotional, and physical elements into motor development improves immediate outcomes and lays the foundation for lifelong health, learning, and well-being.

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