

Analysis of Gross Motor Skills of Mentally Disabled Children at Dharma Bhakti Abcd Special School Class I-VI Ngempon Semarang Regency

Windha Rosnita¹, Ika Nilawati^{1*} , Aristiyanto¹ , Nur Amin¹ , Nasri¹ , Ina Prihati Nur Islami¹

¹Universitas Ngudi Waluyo

Diponegoro Street No. 186, Semarang Regency, Central Java 50512, Indonesia

*Corresponding Email: ikanilawati@unw.ac.id

ARTICLE INFORMATION

Publication information

Research article

HOW TO CITE

Rosnita, W., Nilawati, I., Arisityanto, A., Amin, N., & Islami, I. P. N. (2025). Analysis of gross motor skills of mentally disabled children at Dharma Bhakti Abcd Special School class I–VI Ngempon Semarang Regency. *Journal of International Conference Proceedings*, 8(1), 544–557.

DOI:

<https://doi.org/10.32535/jicp.v8i1.3931>

Copyright© 2025 owned by Author(s).

Published by JICP



This is an open-access article.

License:

Attribution-Noncommercial-Share Alike
(CC BY-NC-SA)

Received: 26 April 2025

Accepted: 27 May 2025

Published: 28 June 2025

ABSTRACT

Gross motor skills are crucial abilities for daily life that involve the use of large muscles. Children with mental disabilities often face limitations in physical and mental aspects, which can hinder their gross motor development. This study employed a quantitative descriptive design to describe conditions without testing hypotheses. Data were collected through tests of flexibility, coordination, strength, speed, and endurance among students in grades I–VI at Dharma Bhakti Abcd Special School, Ngempon, Semarang Regency. The results showed that both boys and girls achieved a 100% score in the “good” category for flexibility. In coordination, boys were largely in the “less” category (47.1%), while girls achieved 100% in the “good” category. Strength tests indicated both groups were in the “moderate” category (100%). For sprint ability, boys were mostly “moderate” (85.7%), while girls were divided into “good” (40%), “moderate” (40%), and “less” (20%). Endurance results showed both boys and girls in the “less” category (100%). Overall, the findings highlight strong flexibility but challenges in coordination and endurance, providing insights for educators and therapists in designing targeted interventions.

Keywords: Child Development; Extraordinary School; Gross Motor Skills; Mentally Disabled; Physical Education

INTRODUCTION

According to [UNICEF \(2023\)](#), using data from the 2018 RISKESDAS survey, approximately 3.3% of children aged 5–17 in Indonesia are living with disabilities. This proportion is considerably lower than the regional average of around 8% and the global estimate of approximately 10%. Disabilities are characterized by long-term physical, mental, intellectual, or sensory impairments that, in interaction with various barriers, may hinder an individual's ability to participate fully and effectively in society on an equal basis with others ([Ashar et al., 2019](#)). Individuals with intellectual disabilities often face significant challenges in realizing their full potential if they do not have access to proper and equitable education ([Barnard & Henn, 2023](#)). Education for people with disabilities is provided through the national education system, both in the form of inclusive education and special education, including their involvement in the 12-year compulsory education program ([Cho & Park, 2024](#)). In addition to intellectual limitations, they also face barriers in communication, social skills, self-care, health and safety, work ability, participation in the community, and academic achievement. This is what is often of concern to the general public. However, this problem can be overcome by increasing access to quality education, so that people with intellectual disabilities have the provisions to live their daily lives ([Waspijah et al., 2022](#)).

Some people with disabilities are categorized as children who have limitations in intellectual abilities and in terms of cognition, this condition affects growth and development. In the condition of children with intellectual disabilities, they are children with limited conditions in terms of development, which have disorders with mental, emotional, behavioral so that they cannot manage emotions and have difficulty adapting to the social environment of society ([Badriyah & Pasmawati, 2020](#)). Children with intellectual disabilities are children who have differences from normal children in general, this condition can be seen significantly with our naked eyes, because they are children with special needs where this retardation has limitations in terms of mental and physical and can be seen from their psychology ([Özkan & Kale, 2023](#)).

In sports activities, mastery of sports skills cannot be separated from the information received by a person. This information is processed and transformed into a movement response in the field of sports itself, the purpose of the training carried out by students with a teacher is to apply the concepts, principles, and procedures that are being learned into relevant practices in a job that functions as a tool that is useful for improving physiological functions, psychology, and better movement skills ([Winarno, 1995](#)). The problem of poor motor development in children requires the role of an educator in teaching students, at school children are taught about several sports that can develop fine and gross motor functions. Currently, educators or teachers in Special Schools (SLB) are available in sufficient numbers and have good professionalism. This involves educational interventions, therapy, and support provided by health professionals, educators, and their families ([Natadireja, et.al., 2023](#)). In the world of children, the development of gross motor skills is carried out when doing sports or playing that occurs in the school environment, this condition trains children to adjust between their thoughts and movements so that they become a balance that arises from a child's reflex movements ([Tristya & Syafrudin, 2024](#)).

Gross motor skills are formed when a child has great coordination skills with his body. Gross motor development is the process of body movements that use large muscles and all parts of the body that are influenced by a child's maturity factor, such as the ability to run, kick, sit, go up and down stairs, jump and walk ([Anggraini & Dwi, 2022](#)). The results of interviews conducted by researchers with the principal of SLB Dharma Bhakti ABCD

Ngempon, Semarang Regency, the author found problems related to motor skills, namely delays in remembering, receiving, and conveying everything. After the author found a problem that occurred in children at SLB Dharma Bhakti ABCD Ngempon, Semarang Regency, the author will conduct a study. The urgency of this research in terms of education is to provide contributions related to certain topics in motor skills and as a measurement of evaluation materials in learning in terms of motor skills for academics, and in the scope of sports itself it is useful for knowing gross motor skills that can help stimulate children, encourage cognitive development, develop skills, optimally in mentally retarded children at SLB Dharma Bhakti Ngempon Semarang Regency, there are several tests used in this study based on the Indonesian Student Fitness Test (TKSI) Mild Mental Retardation Level 1 standards which include flexibility, coordination, power, sprint, and endurance tests. Based on the background above, the author is interested in conducting research with the title "Analysis of Gross Motor Skills of Mentally Disabled Children at the Bharma Bhakti ABCD Special School Classes I - VI Ngempon, Semarang Regency".

LITERATURE REVIEW

Children with Special Needs and Intellectual Disabilities

The World Health Organization (WHO) estimates that 7–10% of children in Indonesia are categorized as children with special needs. Disabilities are long-term conditions involving physical, mental, intellectual, or sensory limitations that hinder full participation in society (Ashar et al., 2019). Children with intellectual disabilities experience significant barriers in communication, social skills, self-care, health and safety, and academic performance (Waspih et al., 2022). Without proper educational access, these children have limited opportunities to develop their potential. Therefore, inclusive and special education programs are essential to support the 12-year compulsory education policy in Indonesia, ensuring equal learning opportunities for children with disabilities.

Intellectual Disabilities and Motor Development

Children with intellectual disabilities often encounter challenges in growth and development, particularly in emotional and behavioral regulation, which affects their ability to adapt socially (Badriyah & Pasmawati, 2020). They are also distinguished from typically developing children by significant physical and psychological limitations (Özkan & Kale, 2023). In the school environment, poor motor development becomes a central issue requiring educational intervention. Motor learning theory emphasizes that mastery of physical skills is closely linked to information processing and the transformation of stimuli into movement responses (Winarno, 1995). Thus, targeted physical education and structured sports activities can enhance both fine and gross motor skills.

The Role of Education and Interventions

Educators and teachers in Special Schools (SLB) play a vital role in supporting children's motor development. Current studies show that professional teaching, combined with therapeutic support and family involvement, significantly contributes to improving motor outcomes (Natadireja et al., 2023). Gross motor skill development is often fostered through play and physical activities in the school environment, which integrate thought processes with body movements and help develop reflex balance (Tristya & Syafrudin, 2024).

Gross Motor Skills and Assessment

Gross motor skills refer to coordinated movements that engage large muscles, including running, climbing stairs, kicking, jumping, and walking (Anggraini & Dwi, 2022). Delays in these skills are frequently observed among children with intellectual disabilities,

leading to difficulties in daily functioning. Measurement of gross motor skills is typically conducted using standardized tests such as the Indonesian Student Fitness Test (Tes Kebugaran Siswa Indonesia/TKSI), which evaluates flexibility, coordination, power, sprint, and endurance (Setiawan et al., 2024). Previous research highlights that while flexibility is often a strength in children with disabilities, coordination and endurance remain areas of significant challenge (Adianto, 2019).

Previous Studies

Empirical studies reinforce the importance of structured interventions in improving motor performance. For example, proprioceptive neuromuscular facilitation has been shown to significantly improve flexibility among children with cerebral palsy (Kruse et al., 2022), while modified ball-bouncing games enhance hand-eye coordination in children with moderate mental disabilities (Dwi et al., 2024). Similarly, group gymnastics has been proven to improve physical fitness in children with mild intellectual disabilities (Kuznetsova et al., 2022). These findings suggest that with proper guidance and training, children with intellectual disabilities can achieve better gross motor outcomes, supporting their cognitive and social development.

Hypotheses Development

Gross motor development in children with intellectual disabilities is influenced by biological, cognitive, and environmental factors. According to Gallahue's theory of motor development, progress in motor abilities depends on the maturity of the nervous system, opportunities for practice, and encouragement from the environment. Children with intellectual disabilities generally show delays in coordination, endurance, and strength due to limited cognitive functioning and insufficient motor stimulation. However, flexibility is often less affected, as it relies more on muscle elasticity and regular movement practice (Anggraini & Dwi, 2022).

Empirical research also shows that structured interventions such as gymnastics, game-based exercises, and proprioceptive training significantly enhance children's gross motor abilities (Kruse et al., 2022; Dwi et al., 2024; Kuznetsova et al., 2022). These findings suggest that different dimensions of gross motor skills—flexibility, coordination, strength, sprint, and endurance—can present distinct performance levels in children with intellectual disabilities. While flexibility and strength tend to be relatively better, coordination, speed, and endurance are more likely to be in the “less” category due to limited practice and absence of specialized physical education programs (Winarno, 1995; Natadireja et al., 2023).

Based on the theoretical framework and previous studies, the following hypothesis is proposed:

H1: There are significant variations in gross motor skills (flexibility, coordination, strength, sprint, and endurance) among children with intellectual disabilities at SLB Dharma Bhakti ABCD Ngempon, Semarang Regency.

RESEARCH METHOD

The study used a quantitative method with a cross-sectional design, this study aims to analyze the gross motor skills of mentally retarded children at the Dharma Bhakti ABCD Ngempon Special School, Semarang Regency. This research was conducted in the yard of the Dharma Bhakti ABCD Ngempon Special School. The population in this study were male and female students aged 6-12 years totaling 27 students. This sample was determined using the total sampling technique. The research instrument used a series

of tests with standards from the TKSI source with tests of flexibility, coordination, power, sprint, endurance. The study used univariate analysis with the SPSS program which includes Descriptive Statistics.

RESULTS

Test instruments covering Flexibility, Coordination, Strength, Sprint, and Endurance

Table 1. Frequency Distribution of Flexibility Test (Durih Test) for Male

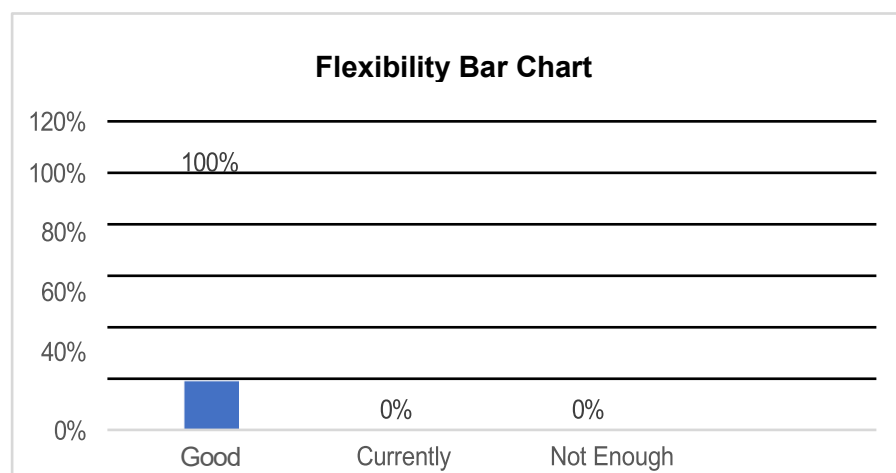
Catagory	Amount (n)	Percentage (%)
Good	7	100%
Currently	-	-
Not Enough	-	-
Total	7	100%

Table 2. Frequency Distribution of Flexibility Test (Durih Test) for Girls

Catagory	Amount (n)	Percentage (%)
Good	5	100%
Currently	-	-
Not Enough	-	-
Total	5	100%

Based on the table above, it can be seen that the results of the flexibility test (Durih test) for girls in the "Good" category were 5, with a percentage of 100%. From the interviews, it was revealed that students of SDLB Tunagrahita Dharma Bhakti, Ngempon, Semarang Regency, practiced gymnastics three times a week and also performed stretching exercises, which helped train their range of motion, especially in early childhood. This finding is in line with [Adiguzel et al. \(2024\)](#), "*The effect of proprioceptive neuromuscular facilitation on functional skills, muscle strength, and trunk control in children with cerebral palsy: A randomized controlled trial*," which reported a significant positive impact of Proprioceptive Neuromuscular Facilitation (PNF) on improving functional skills, muscle strength, and flexibility in children with cerebral palsy.

Figure 1. Flexibility Bar Chart



Based on the figure above, it shows the total of the "Good" category with a percentage of 100%, the "Moderate" category with a percentage of 0%, and the "Poor" category with a percentage of 0%.

Table 3. Frequency Distribution of Coordination Test (Komata Test) for Boys

Catagory	Amount (n)	Percentage (%)
Good	-	
Currently	3	42,9%
Not Enough	4	47,1%
Total	7	100%

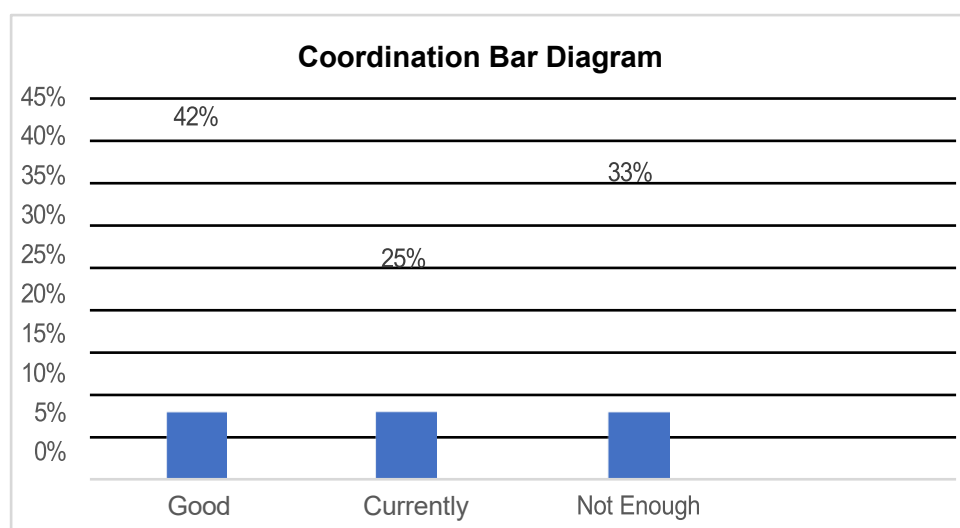
From the table results above, it can be seen that the coordination test (Komata test) for boys in the "Less" category was 4, with a percentage of 47.1%. The presence of this "Less" category at SDLB Tunagrahita Dharma Bhakti, Ngempon, Semarang Regency, is due to the fact that students are not taught basic motor skills such as throwing and catching a ball during sports learning. Other contributing factors include the absence of a physical education teacher at the SDLB, which leads to suboptimal implementation of physical activity. This finding is supported by the research of [Raharjo et al. \(2021\)](#), "Throw and catch the ball games for children with dyskinesia-type cerebral palsy to improve eye-hand coordination movements," which demonstrated significant improvements in eye-hand coordination through modified ball-bouncing games for children with moderate intellectual disabilities at SLB Putra Mandiri Surabaya.

Table 4. Frequency Distribution of Coordination Test (Komata Test) for Girls

Catagory	Amount (n)	Percentage (%)
Good	5	100%
Currently	-	-
Not Enough	-	-
Total	5	100%

Based on the results of the table above, it can be seen that the strength test (Komata test) for the female category was classified as "good," with 5 students achieving a percentage of 100%. In sports learning, students are not taught basic skills such as throwing and catching a ball. Moreover, other factors, such as the absence of a physical education teacher at the SDLB, have caused physical activity programs at the school to be less than optimal. This finding is supported by the study of [Raharjo et al. \(2021\)](#), "Throw and catch the ball games for children with dyskinesia-type cerebral palsy to improve eye-hand coordination movements," which reported significant improvements in eye-hand coordination among children with moderate intellectual disabilities at SLB Putra Mandiri Surabaya through modified ball-bouncing games.

Figure 2. Coordination Bar Diagram



Based on the figure above, the total for the "Less" category is 33%.

Table 5. Frequency Distribution of Strength Test (Doding Test) for Men

Catagory	Amount (n)	Percentage (%)
Good	-	-
Currently	7	100%
Not Enough	-	-
Total	7	100%

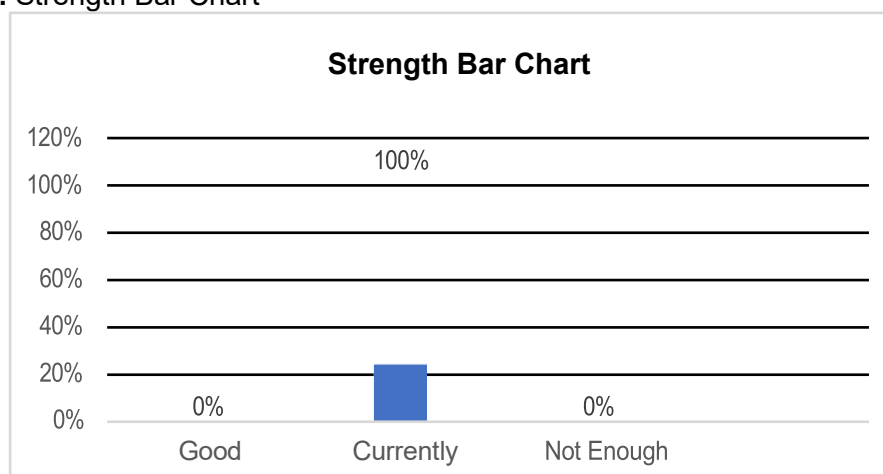
Based on the results of the table above, it can be seen that the results of the male strength test (doding test) in the "Medium" category were 7 with a percentage of 100%. Judging from the results of the research and interviews, the wall pushing test showed quite good outcomes, as the endurance of the students was well maintained due to regular gymnastics activities. According to [Wijayanti et al. \(2024\)](#) in their study *"Cultivating Movement for Students with Special Needs Through Creative Gymnastics to Maintain Physical Fitness,"* creative gymnastics training significantly contributes to improving and sustaining physical fitness in students with special needs.

Table 6. Frequency Distribution of Strength Test (Doding Test) for Women

Catagory	Amount (n)	Percentage (%)
Good	-	-
Currently	5	100%
Not Enough	-	-
Total	5	100%

Based on the results of the table above, it can be seen that the results of the strength test (doding test) for girls in the "Medium" category were 5 with a percentage of 100%. Judging from the results of the research and interviews, the results of the wall pushing test were quite good, as the students demonstrated good endurance due to frequent participation in group gymnastics activities. According to [Wijayanti et al. \(2024\)](#), creative gymnastics can significantly contribute to maintaining and improving the physical fitness of students with special needs, providing structured movement that enhances both endurance and motor skills.

Figure 3. Strength Bar Chart



Based on the image above, it shows the total of the "Good" category with a percentage of 0%, the "Moderate" category with a percentage of 100%, and the "Poor" category with a percentage of 0%.

Table 7. Frequency Distribution of Boys' Speed Test (Folding Test)

Catagory	Amount (n)	Percentage (%)
Good	-	-
Currently	6	85,7%
Not Enough	1	14,3%
Total	7	100%

Based on the results above, there is 1 male student in the "Less" category with a percentage of 14.3%. Judging from the findings on students of SDLB Tunagrahita Dharma Bhakti Ngempon Semarang Regency, they have different levels of muscular ability to react quickly. This condition occurs because students are not taught sprint practice in sports learning, and other factors such as the absence of a sports teacher at the SDLB also contribute, resulting in less optimal physical activity. Consequently, this limitation is influenced by the intensity of training and participation in PJOK learning. According to [Ferreira et al. \(2019\)](#), physical exercise has been shown to effectively reduce stereotyped behaviors in children with autism spectrum disorders, highlighting the importance of structured physical activities in supporting the development of children with special needs.

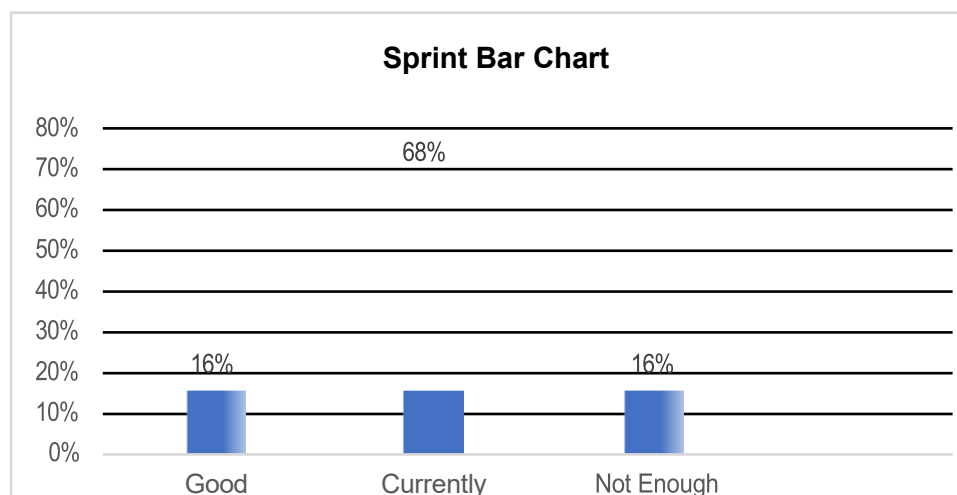
Table 8. Frequency Distribution of Speed Test (Folding Test) for Girls

Catagory	Amount (n)	Percentage (%)
Good	2	40%
Currently	2	40%
Not Enough	1	20%
Total	5	100%

Based on the results above, there is 1 male student in the "Less" category with a percentage of 20%. The study conducted on students of SDLB Tunagrahita Dharma Bhakti Ngempon, Semarang Regency, shows that they have different levels of muscular ability to react quickly. This variation is strongly influenced by the intensity of training and

participation in PJOK learning. According to Ferreira et al. (2019), physical exercise has been proven effective in reducing stereotyped behaviors in children with autism spectrum disorders, emphasizing the importance of structured physical activities to support the physical and functional development of children with special needs.

Figure 4. Sprint Bar Chart



Based on the image above, it shows the total of the "Good" category with a percentage of 16%, the "Medium" category with a percentage of 68%, and the "Poor" category with a percentage of 16%.

Table 9. Frequency Distribution of Endurance Test (Lalingku Test) for Boys

Catagory	Amount (n)	Percentage (%)
Good	-	-
Currently	-	-
Not Enough	5	100%
Total	5	100%

Based on the results of the table above, it can be seen that the results of the "Good" category in the temple endurance test were 5 with a percentage of 100%. In sports learning, students are not specifically taught endurance, and there are other factors, such as the absence of a sports teacher at the SDLB, which causes physical activity at the SLB to be less than optimal. According to Tse, Pang, and Lee (2018), appropriate physical exercise interventions can significantly reduce stereotypic behavior in children with autism spectrum disorders, suggesting that structured endurance-based activities could provide similar benefits for children with special needs.

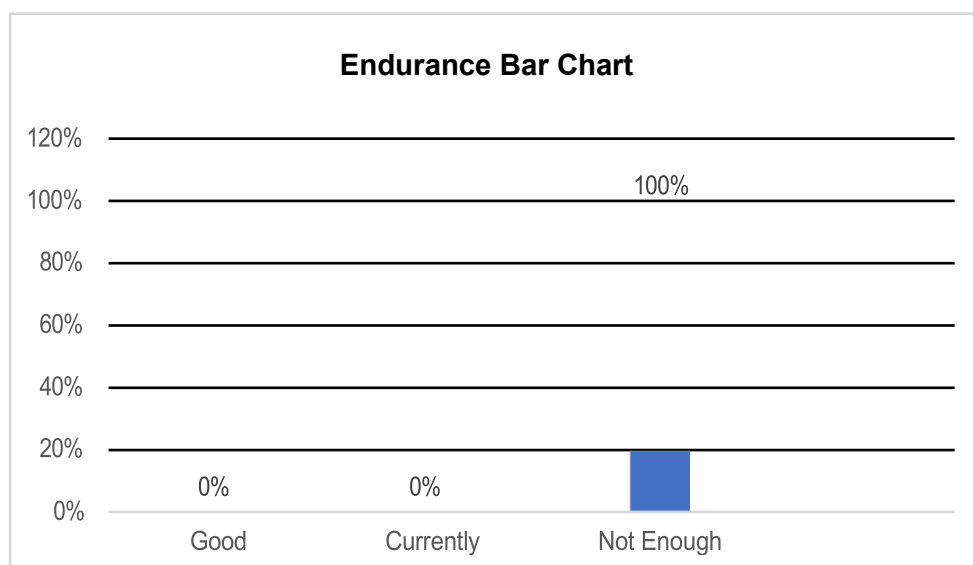
Table 10. Frequency Distribution of Endurance Test (Lalingku Test) for Girls

Catagory	Amount (n)	Percentage (%)
Good	-	-
Currently	-	-
Not Enough	5	100%
Total	5	100%

Based on the results of the table above, it can be seen that the results of the strength test (komata test) for the female category in the "Good" classification amounted to 5 with a percentage of 100%. In sports learning, students are not specifically taught endurance,

and there are other contributing factors, such as the absence of a sports teacher at the SDLB, which causes physical activity at the SLB to be less than optimal. According to [Tse, Pang, and Lee \(2018\)](#), appropriate physical exercise interventions can effectively reduce stereotypic behaviors in children with autism spectrum disorders, highlighting the importance of structured physical training to optimize physical development and overall well-being in children with special needs.

Figure 5. Endurance Bar Chart



Based on the image above, it shows the total of the "Good" category with a percentage of 0%, the "Medium" category with a percentage of 0%, and the "Poor" category with a percentage of 100%.

DISCUSSION

The findings of this study provide important insights into the gross motor skills of children with intellectual disabilities at SLB Dharma Bhakti ABCD Ngempon, Semarang Regency. Using the Indonesian Student Fitness Test (TKSI) as a benchmark, the research revealed distinct variations in performance across five tested domains: flexibility, coordination, strength, sprint, and endurance.

Flexibility

The results show that both male and female students achieved 100% in the "good" category for flexibility. This indicates that children with intellectual disabilities still retain adequate muscle elasticity and joint mobility. Flexibility is less dependent on complex cognitive functions and more influenced by daily activities such as stretching or gymnastics, which the school conducts three times a week. This finding is consistent with [Adiguzel et al. \(2024\)](#), who demonstrated that proprioceptive neuromuscular facilitation training significantly improved flexibility in children with cerebral palsy. Therefore, flexibility can be considered a strength among students with intellectual disabilities when supported by regular physical activity.

Coordination

In contrast, coordination presented significant challenges. While all girls scored in the "good" category, 47.1% of boys fell into the "less" category, with only 42.9% achieving moderate performance. These results reflect limited opportunities for activities involving

throwing, catching, and other ball-related exercises, as there is no dedicated sports teacher in the school. Previous research by [Raharjo et al. \(2021\)](#) confirmed that modifications in ball-bouncing games could improve hand-eye coordination in children with moderate intellectual disabilities. Thus, the lack of specialized physical education support in this context directly impacts coordination outcomes.

Strength

For strength, both boys and girls fell into the “moderate” category (100%). Strength training typically requires consistent resistance-based activities, which were not systematically provided in the school setting. However, group gymnastics contributed to maintaining a moderate level of muscular endurance. [Wijayanti et al. \(2024\)](#) similarly found that gymnastics training improved physical fitness in children with mild intellectual disabilities. This suggests that while the current interventions are beneficial, more structured and intensive strength training is necessary to elevate performance to the “good” category.

Sprint Ability

Sprint results indicate that boys were predominantly in the “moderate” category (85.7%), with a minority in the “less” category (14.3%). Girls, however, showed more variation, with 40% categorized as “good,” 40% as “moderate,” and 20% as “less.” This variation highlights differences in individual muscle reaction speeds and exposure to sprint training. According to [Winarno \(1995\)](#), the ability to respond quickly in sports is a function of both neuromuscular development and practice intensity. The absence of targeted sprint exercises in the curriculum may explain the uneven outcomes among students.

Endurance

Endurance proved to be the weakest area, with both boys and girls scoring 100% in the “less” category. Endurance requires sustained aerobic activity and consistent physical training, which were limited in the school due to a lack of structured sports programs and the absence of a physical education specialist. This result aligns with [Ferreira et al. \(2019\)](#), who emphasized that physical exercise interventions are necessary to improve stamina and reduce behavioral issues among children with special needs. The findings underline the urgent need for endurance-focused interventions in the curriculum.

Overall Discussion

Overall, the study confirms that children with intellectual disabilities show varied gross motor performance. Flexibility and strength appear relatively well-preserved, while coordination, sprint, and especially endurance are areas requiring significant attention. These outcomes can be explained through motor development theories, such as Gallahue’s framework, which emphasizes the importance of maturity, practice, and environmental support in achieving motor competence. Limited opportunities for structured training in schools contribute to disparities across different gross motor domains.

The practical implication of these findings is that educators, therapists, and policymakers should design targeted interventions that focus on improving coordination and endurance while maintaining the strengths already demonstrated in flexibility and strength. Collaborative efforts between schools, health professionals, and families are essential to ensure that children with intellectual disabilities can achieve better physical, cognitive, and social development through enhanced gross motor skills.

CONCLUSION

This study analyzed the gross motor skills of children with intellectual disabilities at SLB Dharma Bhakti ABCD Ngempon, Semarang Regency, using the Indonesian Student Fitness Test (TKSI) standards. The findings revealed varied performance across the five domains assessed. Both male and female students demonstrated strong results in flexibility, with 100% categorized as “good.” Coordination showed a disparity, where nearly half of the boys were in the “less” category, while all girls achieved the “good” category. Strength for both boys and girls was consistently in the “moderate” category, indicating adequate muscular ability but limited progression to higher levels. Sprint ability varied, with boys predominantly in the “moderate” category and girls spread across “good,” “moderate,” and “less.” Endurance emerged as the weakest aspect, as all students fell into the “less” category.

Overall, the results highlight that flexibility and, to some extent, strength remain as relative strengths for children with intellectual disabilities, whereas coordination, sprint, and particularly endurance require greater educational and therapeutic attention. These findings underscore the importance of structured physical education programs, targeted interventions, and professional support to enhance the overall motor development of children with intellectual disabilities.

ACKNOWLEDGMENT

The authors gratefully acknowledge the contributions of informants, colleagues, and all individuals who supported this research through their insights and engagement. Their involvement greatly enriched the quality and depth of this study.

DECLARATION OF CONFLICTING INTERESTS

The authors have declared no potential conflicts of interest concerning the study, authorship, and/or publication of this article.

REFERENCES

- Adianto, R. (2019). *Tingkat kemampuan motorik kasar anak tunagrahita di SLB Bakti Putra Ngawis Kabupaten Gunungkidul* (Skripsi, Universitas Negeri Yogyakarta). Universitas Negeri Yogyakarta.
- Adiguzel, H., Kirmaci, Z. I. K., Gogremis, M., Kirmaci, Y. S., Dilber, C., & Berktaş, D. T. (2024). The effect of proprioceptive neuromuscular facilitation on functional skills, muscle strength, and trunk control in children with cerebral palsy: A randomized controlled trial. *Early Human Development*, 192, 106010. <https://doi.org/10.1016/j.earlhumdev.2024.106010>
- Anggraini, M. P., & Dwi, D. (2022). *Perkembangan fisik motorik kasar anak usia dini*. CV Kreator Cerdas Indonesia.
- Ashar, D., Ashila, B. I., Pramesa, G. N., Saadah, N., & Ayatullah, R. K. (2019). *Panduan penanganan perkara penyandang disabilitas berhadapan dengan hukum* (T. Y. S. Putri & M. J. Yulianto, Eds.). Masyarakat Pemantau Peradilan Indonesia Fakultas Hukum Universitas Indonesia (MaPPI FHUI).
- Badriyah, L., & Pasmawati, H. (2020). *Problematika pada anak berkebutuhan khusus: Sebagai panduan bagi pendampingan ABK*. Rumah Literasi Publishing.
- Barnard, R. W., & Henn, R. H. (2023). Overcoming learning obstacles: Strategies for supporting students with diverse needs. *Open Access Library Journal*, 10(8), 1–14. <https://doi.org/10.4236/oalib.1110509>
- Cho, S., & Park, J. (2024). Inclusive education in Japan and its role in international cooperation: Analysis of a project for children with disabilities in Mongolia. *Asia*

- Pacific Education Review*, 25(1), 229–242. <https://doi.org/10.1007/s12564-023-09923-4>
- Dwi, G. D. G., Maliki, O., Widiyatmoko, F. A., Hudah, M., & Yuliawan, D. (2024). Improvement of manipulative skills of 6-year-old children through "Si buyung" gymnastics. *Jurnal SPORTIF: Jurnal Penelitian Pembelajaran*, 10(1), 47–57. https://doi.org/10.29407/js_unpgri.v10i1.21420
- Ferreira, J. P., Ghiarone, T., Cabral Junior, C. R., Furtado, G. E., Moreira Carvalho, H., Machado-Rodrigues, A. M., & Andrade Toscano, C. V. (2019). Effects of physical exercise on the stereotyped behavior of children with autism spectrum disorders. *Medicina*, 55(10), 685. <https://doi.org/10.3390/medicina55100685>
- Kruse, A., Habersack, A., Jaspers, R. T., Schrapf, N., Weide, G., Svehlik, M., & Tilp, M. (2022). Acute effects of static and proprioceptive neuromuscular facilitation stretching of the plantar flexors on ankle range of motion and muscle-tendon behavior in children with spastic cerebral palsy—a randomized clinical trial. *International Journal of Environmental Research and Public Health*, 19(18), 11599. <https://doi.org/10.3390/ijerph191811599>
- Kuznetsova, L., Trachuk, S., Semenenko, V., Kholodova, O., Podosinova, L., Brychuk, M., ... Kedrych, H. (2022). Effect of movement games on physical fitness of children with intellectual disabilities. *Physical Education Theory and Methodology*, 22(2), 158–165. <https://doi.org/10.17309/tmf.2022.2.02>
- Natadireja, U., Qomariyah, S., Babullah, R., & Rizki, N. J. (2023). Kontribusi SLB dalam memenuhi kebutuhan wajib belajar anak berkebutuhan khusus di SLB Budi Nurani Kota Sukabumi. *Bersatu: Jurnal Pendidikan Bhinneka Tunggal Ika*, 1(5), 134-143. <https://doi.org/10.51903/bersatu.v1i5.334>
- Özkan, Z., & Kale, R. (2023). Investigation of the effects of physical education activities on motor skills and quality of life in children with intellectual disability. *International Journal of Developmental Disabilities*, 69(4), 578–592. <https://doi.org/10.1080/20473869.2021.1978267>
- Raharjo, S., Wibowo, A., Andiana, O., Pelana, R., Susiono, R., Antoni, R., & Amalia, E. F. (2021). Throw and catch the ball games for children with dyskinesia-type cerebral palsy to improve eye-hand coordination movements. *Journal of Physical Education and Sport*, 21(Suppl. 4), 2419–2424. <https://doi.org/10.7752/jpes.2021.s4325>
- Setiawan, I., Wijayanti, D. G. S., Annas, M., & Pujiyanto, A. (2024). Pengaruh permainan lempar tangkap bola terhadap koordinasi mata, tangan, dan kaki siswa tunagrahita. *Indonesian Journal for Physical Education and Sport*, 5(2), 565–573. <https://doi.org/10.15294/inapes.v5i2.7200>
- Tristya, I., & Syafrudin, U. (2024). Analisis perkembangan fisik motorik anak usia 5–6 tahun dalam kecanggihan teknologi gadget di lingkungan masyarakat. *DZURRIYAT: Jurnal Pendidikan Islam Anak Usia Dini*, 2(1), 17–22. <https://doi.org/10.61104/jd.v2i1.99>
- Tse, C. A., Pang, C. L., & Lee, P. H. (2018). Choosing an appropriate physical exercise to reduce stereotypic behavior in children with autism spectrum disorders: A non-randomized crossover study. *Journal of Autism and Developmental Disorders*, 48(5), 1666–1672. <https://doi.org/10.1007/s10803-017-3419-3>
- UNICEF. (2023). *Key issues for children with disabilities in Indonesia* [Discussion paper]. UNICEF Indonesia.
- Waspih, W., Arifin, R., Putri, N. M., Safarin, M. H. A. F., & Putri, D. D. P. (2022). Student edited law journals: Strengthening the creativity of law students in a challenging era. *Journal of Creativity Student*, 7(2), 133–154. <https://doi.org/10.15294/jcs.v7i2.38493>
- Wijayanti, D. G. S., Yuwono, C., Rizqanada, A., Berlianti, D., Tadita, A. D., Pamungkas, D. B. A., & Ngatinah, N. (2024). Cultivating movement for students with special

needs through creative gymnastics to maintain physical fitness. *Jurnal Abdimas*, 28(2), 168–171. <https://doi.org/10.15294/s9jwqk77>
Winarno, M. E. (1995). *Belajar Motorik*. Malang: Departemen Pendidikan dan Kebudayaan.

ABOUT THE AUTHOR(S)

1st Author

Ika Nilawati is a lecturer at the Department of Sport Science, Faculty of Health, Universitas Ngudi Waluyo. Her research interests focus on sport science and athlete development. She can be contacted at ikanilawati@unw.ac.id. ORCID iD: 0009-0006-4601-1479.

2nd Author

Aristiyanto is a faculty member at the Department of Sport Science, Faculty of Health, Universitas Ngudi Waluyo. His academic work emphasizes sport education and coaching studies. He can be reached at aristiyanto@unw.ac.id. ORCID iD: 0000-0002-2808-5005.

3rd Author

Nur Amin is affiliated with the Department of Sport Science, Faculty of Health, Universitas Ngudi Waluyo. His scholarly contributions are in the field of physical education and sports training. Correspondence can be sent to nuramin@unw.ac.id. ORCID iD: 0000-0001-8124-6157.

4th Author

Nasri is a lecturer at the Department of Sport Science, Faculty of Health, Universitas Ngudi Waluyo. His research focuses on sports performance and physical conditioning. He can be contacted via nasri@unw.ac.id. ORCID iD: 0000-0002-2127-2107.