Jurnal Sains Sukan dan Pendidikan Jasmani Vol 14, Issue 2, 2025, (139-152)
ISSN: 2232-1918 / eISSN: 2600-9323
https://ejournal.upsi.edu.my/journal/JSSPJ

GROUNDWORK FOR DANCE-BASED INTERVENTION TO ENHANCE GROSS MOTOR SKILLS IN CHILDREN WITH DOWN SYNDROME: A MALAYSIAN SETTING

Mak Foong Ming[1,3]; Mumtaz Begum P.V Aboo Backer[1]*; Vina Tan Phei Sean[2]

[1]School of the Arts, Universiti Sains Malaysia
[2]School of Health Sciences, Universiti Sains Malaysia
[3]Faculty of Music and Performing Arts, Universiti Pendidikan Sultan Idris, Malaysia

*Corresponding author: mumzie@usm.my

Received:09 October 2025; **Revised:** 10 November 2025; **Accepted:** 21 December 2025; **Published:** 29 December 2025

To cite this article (APA): Mak, F. M., Aboo Backer, M. B.., & Tan, V. P. S. (2025). Groundwork for Dance-based Intervention to Enhance Gross Motor Skills in Children with Down Syndrome: A Malaysian Setting. *Jurnal Sains Sukan & Pendidikan Jasmani*, *14*(2), 139-152.https://doi.org/10.37134/jsspj.vol14.2.10.2025

To link to this article: https://doi.org/10.37134/jsspj.vol14.2.10.2025

ABSTRACT

Children with Down syndrome often face delays in gross motor development, which can restrict daily activities. Despite the recognised benefits of dance for physical and mental well-being, research on dance-based interventions customised for Malaysian children with Down syndrome remains limited. This study aimed to lay a foundation for future interventions by examining current gross motor skills and pinpointing key design considerations. A scoping review, which included eight selected articles, and interviews with six experts were conducted, and the data were analysed thematically. Six considerations were identified concerning locomotor skills, object control skills, single-leg balance, torso strength and flexibility, progression of complex movements, and gender-neutral application. Contemporary dance, focusing on Cunningham's techniques, was identified as an effective approach, with other dance forms following, each with necessary adaptations to enhance gross motor development.

Keywords: Contemporary Dance, Down syndrome, gross motor skills, and children.

INTRODUCTION

Global estimates show that about one in every 800 children is born with Down syndrome (Ali, 2023; Kamrujjaman, 2019; Saljoughian, 2023). In Malaysia, its prevalence exceeds estimations by the World Health Organisation (Cosma et al., 2017), with nearly 40,000 individuals currently identified (Bernama, 2021; Md Said, 2023). As one of the major public health issues, Down syndrome places burdens on families and society (Chen et al., 2022), highlighting the need for timely and adequate support. Recognising these challenges, the Malaysian Ministry of Education (MOE) has recently expressed openness to proposals for updating the curriculum for students with disabilities, particularly those with Down syndrome, to improve their post-graduation competitiveness (Asrol, 2023).

Gross motor skill development should be included in the proposal because limitations in these skills can impair performance on complex motor tasks (Barros et al., 2020), impact daily activities, and influence overall development (Lestari & Ratnaningsih, 2016; Phytanza et al., 2021). In general, people with Down syndrome often struggle to develop motor skills comparable to their typically developing peers (Quinzi et al., 2022) due to structural differences in the brain (Jain et al., 2021; Mann et al., 2023; Shodrina et al., 2025). Strengthening these skills early can better equip children for future activities and align with the MOE's objectives to enhance post-graduation competitiveness.

Dance has emerged as a promising intervention for children. Like other physical activities, it can enhance engagement, physical fitness, and motor function (Lee & Kuan, 2021). Dance is suitable for all ages and functions both as therapy and art, improving flexibility, strength, coordination, and speed (Cosma et al., 2017; Snyder, 2018). Interventions incorporating movement-based programmes, such as kinetic music, have also been shown to promote motor learning (Mazeed, 2023). Additionally, research has examined the effects of dance-based interventions on walking, gait, postural control, range of motion (Duarte Machado et al., 2024) and balance (Aleksander-Szymanowicz et al., 2025; Maïano et al., 2019; Vieira Lourenço et al., 2021).

Although previous studies have reported positive outcomes, research on the essential components for designing dance-based interventions tailored to Malaysian children with Down syndrome, especially those aimed at improving gross motor skills, remains scarce. Identifying these core elements is vital for determining which motor domains require enhancement and for informing the development of dance-based programmes that are developmentally appropriate, effective, and culturally relevant. At present, clear guidance for designing such dance-based interventions in the Malaysian context remains limited.

To address this gap, the present study examines the current gross motor skill levels of Malaysian children with Down syndrome and outlines key considerations for creating effective, appropriate, and culturally relevant dance-based interventions. The findings aim to offer practical guidance for educators, therapists, and researchers in supporting gross motor development and overall well-being in this population, while also aligning with the Ministry of Education's goal of fostering greater independence and smoother post-school transitions for children with Down syndrome.

Methods

This study employed a scoping review and expert interviews. The findings of the scoping review were compared with the outcomes of the experts' interviews to synthesise a conclusive summary. All data were analysed using thematic analysis.

Scoping review

This study adhered to the PRISMA-ScR guidelines and the PRISMA 2020 statement to ensure transparent reporting. Open-access journals were reviewed, and searches were conducted across databases: Google Scholar, EBSCO, SCOPUS, ScienceDirect, and Web of Science. Article selection was based on specific inclusion and exclusion criteria. The inclusion criteria required empirical studies involving children with Down syndrome aged 5-10 years, written in English, published as journal articles, and clearly reporting data on gross motor skills. Articles were excluded if they were not empirical studies, did not involve children with Down syndrome aged 5-10 years, were not in English, were not journal articles, or did not clearly report the required gross motor skill data.

During the scoping review, the first author screened all titles and abstracts, while a second reviewer checked a random 20% (n = 23). Discrepancies were resolved through discussion. The inter-rater agreement was 86.96%, indicating strong consistency in screening decisions. In the identification stage, 169 papers were retrieved using the following search strings in titles, abstracts, and keywords: (1) Down syndrome *AND* gross motor and (2) Down syndrome children *AND* gross motor skills. Searches spanned health sciences, arts, multidisciplinary fields, and social sciences. Since not many studies exist, no minimum year limit was set; the maximum year was August 2024, when the review was carried out. No country restrictions were applied, as motor challenges in Down syndrome are rooted in a genetic condition. Including studies from various countries offers valuable reference points for understanding gross motor skill levels among Malaysian children with Down syndrome. Ultimately, eight papers were included in the final phase of the scoping review. The following figure summarises the procedure of the scoping review.

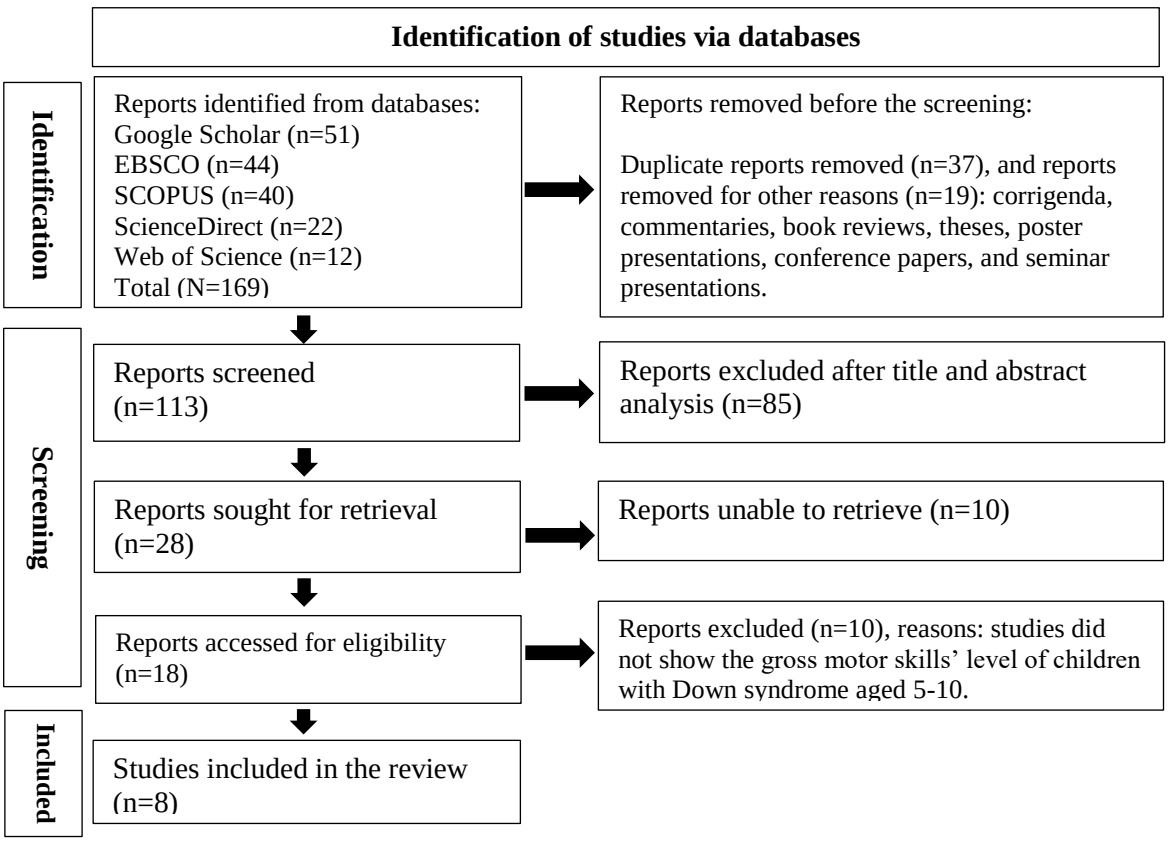

Figure 1. *Procedure of the scoping review based on the PRISMA 2020 flow diagram.*

Experts' Interview

Data were collected through semi-structured interviews to gain in-depth insights into the current gross motor skill development of Malaysian children with Down syndrome aged 5-10 years. Six experts were purposively selected based on their extensive experience, each with over 10 years of professional practice. The expert group consisted of two experts from the private sector, two from the government sector, one academic, and one with international private-sector experience. Each interview lasted approximately 30-45 minutes and was conducted either face-to-face or online, depending on the expert's availability.

Experts explored locomotor and ball skills relative to typically developing peers, identified which skills should be prioritised in intervention, and discussed the relationship between gross motor abilities and other aspects of daily living. All experts' opinions were based on their observations and professional experience working with children with Down syndrome in Malaysia and were highly relevant to the local society's circumstances.

RESULT

Scoping review

Eight papers were included in the final stage of the scoping review. The following table provides an overview of the selected articles.

Table 1. *List of selected articles*

No	Study	Participants	Methodology	Findings & Implications
1	Winders et al. (2019)	509 children with Down syndrome (275 males, 234 females).	Longitudinal study at two Down syndrome centres; 44 gross motor skills observed and analysed by therapists.	Gross motor skill timing remained consistent over 29 years with no gender differences. By approximately 68.1 months, 95% could jump once and run 100 ft in 15 s. The schedule guides early detection, peer comparison, and intervention.
2	Palisano et al. (2001)	121 children with Down syndrome, 1 month to 6 years.	Longitudinal study using GMFM to assess gross motor skills.	By age 5-6 years, 45-67% could run 15 ft and 52-84% could jump forward. Complex movements require more time; mastery may not occur by age six. Extended practice is needed to develop complex skills.
3	Çimen & Alp (2024)	2 children with Down syndrome, 6 to10 years.	17-week intervention with educational game program including walking, running, balancing, and jumping.	Program improved independent walking, running, balancing, and jumping. Simple movements are easier; game-based programs effectively enhance multiple motor skills.
4	Zalavadiya et al. (2023)	46 children with Down	Randomized controlled trial; pre- and post-tests	Brain gym improved gross and fine motor skills; control showed no change. Gross motor strongly correlated with

		syndrome, 5 to12 years.	using TGMD-2, Functional Dexterity Test, and functional independence measure.	daily activities (r=0.794), fine motor mildly. Brain gym enhances motor skills and daily functioning.
5	Malak et al. (2015)	79 children with Down syndrome (42 males, 37 females).	Assessed using GMFM-88 and Paediatric Balance Scale, grouped by age and impairment.	No gender differences in GMFM-88. Standing/walking observed in 10% under 3 years and 95% at 3-6 years. Balance strongly correlated with motor function (r=0.7). Functional balance training is essential.
6	Capio et al. (2018)	20 children with Down syndrome (approximately 7 years).	Five-week fundamental movement training; pre- and post-tests using TGMD-2, force platform and memory assessed.	Pre-test results showed that 10% of children with Down syndrome had mastered running and galloping; 5% had mastered leaping, jumping, and overhand throwing; 25% had mastered catching; and 40% had mastered sliding. None had mastered hopping, striking, stationary dribbling, kicking, or underhand rolling. Training improved fundamental movement and balance; better balance linked to higher skill proficiency; memory had no effect. Targeted training enhances movement and static balance.
7	Schott & Holfelder, (2015)	18 children with Down syndrome (7-11 years).	Assessed motor skills with TGMD-2 and MABC-2; executive function tested with Trails-P.	Children with Down syndrome had lower locomotor/object control and attention/executive function deficits. Motor performance correlated with executive function. Early interventions should target both motor and cognitive development.
8	Beerse & Wu (2018)	14 children with Down syndrome, 16 typical developing children, 5-11 years.	Observational study of two-legged hopping under self-selected and metronome-guided conditions. Vertical stiffness and centre-of-mass (COM) were analysed.	Children could not sustain continuous hopping until approximately 7 years, showed shorter duration, faster hopping, greater medial-lateral COM movement, limited adjustment, and reduced vertical stiffness. Hopping interventions may improve stiffness and balance.

Five themes were generated through thematic analysis in the scoping review: 1) Delays in motor skill acquisition, 2) Delays in the development of object-control skills, 3) Non-

significant gender differences, 4) The effectiveness of interventions, and 5) Functional correlations.

(1) Delays in motor skill acquisition

Children with Down syndrome show delayed acquisition of all gross motor skills, with jumping, running, galloping, hopping, and sliding consistently achieved later than their typically developing peers. Capio et al. (2018) found that before intervention, only 10% (7.1 ± 2.9 years) had mastered running and galloping, 5% had mastered leaping and jumping, 40% had mastered sliding, and none had mastered hopping. Winders et al. (2019) reported that most mastered "jump once" at approximately 68.1 months (5–6 years), indicating slower progress than that of typically developing children. Simple skills are learned more easily than complex ones Çimen & Alp (2024).

(2) Delays in the development of object-control skills

Regarding object control skills, Capio et al. (2018) reported that before intervention, only 5% of children with Down syndrome (7.1 ± 2.9 years) had mastered overhand throwing, 25% had mastered catching, and none had mastered striking, stationary dribbling, kicking, or underhand rolling. These findings align with those of Schott & Holfelder (2015), who also found poorer object-control performance among children with Down syndrome (9.06 ± 0.96 years) compared with typically developing peers.

(3) Non-significant gender differences

The finding also indicates that there were no significant differences in gross motor skill acquisition between boys and girls with Down syndrome (Malak et al., 2015; Winders et al., 2019).

(4) The effectiveness of interventions

The findings highlight the value of targeted, structured programmes for children with Down syndrome. Interventions such as adapted game-based training, Brain Gym exercises, and balance-focused therapy have improved fundamental motor skills, fine motor abilities, and functional balance. Early, skill-specific interventions remain essential for this population (Beerse & Wu, 2018; Schott & Holfelder, 2015).

(5) Functional correlations

Evidence also emphasises a strong link between gross motor proficiency and activities of daily living. While these activities exhibit a mild correlation with fine motor skills, they are more strongly associated with gross motor skills (Zalavadiya et al., 2023).

Experts' interview

Upon conducting thematic analysis, four themes were identified to provide an overview of the gross motor skills level among children with Down syndrome aged 5 to 10 in Malaysia: 1) Delays in motor skill acquisition, 2) Delays in object control or ball skill development, 3) The effectiveness of interventions, and 4) Functional correlations.

(1) Delays in motor skill acquisition

Experts consistently reported that locomotor skills such as galloping, hopping, and skipping were the most delayed, often rated as poor or very poor compared with those of typically developing peers. Running, horizontal jumping, and sliding showed better

performance, but still lagged, ranging from moderate to good. Movements requiring single-leg balance and complex coordination were identified as the most difficult, highlighting significant developmental delays in children with Down syndrome.

(2) Delays in object control or ball skill development

Experts noted that object-control skills such as striking and catching ranged from poor to moderate due to hand–eye coordination difficulties in children with Down syndrome. Throwing was viewed more positively, with some experts reporting good performance, though targeted support was still needed. Overall, object-control or ball skills were considered underdeveloped, limiting children's participation in sports and play activities.

(3) Effectiveness of interventions

Experts noted that galloping, hopping, and skipping help build leg strength and body coordination, while striking and catching strengthen back muscles and improve visual focus. They emphasised that these movements should be incorporated into future interventions.

(4) Functional correlations

Experts agreed that gross motor skills are closely tied to self-help abilities such as toileting, showering, dressing, eating, and basic household tasks. They also support sports participation, injury prevention, functional mobility, and play, contributing to both physical development and social engagement.

Summary from a scoping review and expert interviews

The scoping review results closely align with local experts' perspectives. The following figure summarises both sources, highlighting the challenges faced by Malaysian children with Down syndrome aged 5 to 10, in developing gross motor skills, ranked from easiest to most difficult.

	Increasing of difficulty →			
Locomotor skills	Runing	Sliding	Horizontal Jumping	Galloping Hopping Skipping
Object control/ ball skills	Throwing		Catching Dribbling Kicking	Striking

Figure 2. *Ranking of gross motor skills for Malaysian children with Down syndrome aged 5-10 years. The hierarchy shows how challenging each skill is, with more difficult skills requiring more intervention. The order is based on both the scoping review and expert evaluations, indicating which locomotor and object control skills are generally easier or more difficult for this group to perform. For locomotor skills, the difficulty hierarchy from easiest to hardest is: running, sliding, horizontal jumping, galloping, hopping, and skipping. For object control or*

ball skills, the order from most to least performed is: throwing, catching, dribbling, kicking, and striking.

Ultimately, six key considerations identified through the scoping review and expert interviews form the foundation for designing future dance-based interventions for this population.

1. Locomotor skills: galloping, hopping, skipping, horizontal jumping, sliding, and running are often delayed in children with Down syndrome. Although the difficulty levels differ, all should be included in future interventions because of their significance for overall development.

2. Single-leg locomotor skills are especially difficult for children with Down syndrome; therefore, interventions should introduce them gradually and incorporate one-leg balancing practice.

3. Object control or ball skills: striking, catching, dribbling, kicking, and throwing are also delayed. Despite varying difficulty, all should be prioritised in interventions because of their importance for overall growth.

4. As striking and throwing are often delayed, future interventions should include torso flexibility and strength training, since these skills rely on generating power through torso rotation.

5. Complex movements pose greater challenges, indicating the need for progression-based dance training that breaks movements into simple, step-by-step demonstrations, smaller components, and short sequences.

6. Gender does not significantly influence gross motor skill development in children with Down syndrome, suggesting that interventions can be applied uniformly without gender-specific adjustments for those aged 5-10.

DISCUSSION

The six key considerations identified in this study provide a foundation for designing dance-based interventions that support a broad range of gross motor skills in Malaysian children with Down syndrome aged 5-10. These recommendations align with Buckley et al. (2021), who emphasise the effectiveness of errorless learning for this population. Errorless instruction, commonly used by occupational therapists working with individuals experiencing brain-injury-related learning difficulties (Chui et al., 2025), aims to prevent mistakes during learning by structuring tasks to ensure success. This approach typically involves breaking movements into smaller steps, modelling the desired action, and providing prompts to guide accurate responses from the outset (Buckley et al., 2021; Chui et al., 2025).

Buckley et al. (2021) also note that children with Down syndrome show a wide range of temperaments and personalities, but may be particularly sensitive to challenging tasks and fear of failure, sometimes using social behaviours to avoid difficult activities. This observation reinforces considerations 2nd and 5th in this study, which recommend designing dance-based interventions as progressive learning programmes. Simplifying movements into step-by-step demonstrations, smaller components, and short sequences can lower the difficulty level, support

successful participation, and reduce fear of failure. These design principles are therefore crucial when creating effective dance interventions for this population.

Dance-based interventions hold strong potential to address the key considerations identified in this study. Beyond creative expression, dance is a physical activity that requires practice, repetition, and effort, similar to other motor skill training (Payne & Costas, 2021), and can be integrated into physical education programs to develop specific motor skills (Lokoviti & Pitsi, 2025). Most dance styles naturally include locomotor movements, such as jumping, galloping, hopping, skipping, and sliding, combined with balance, weight shifts, single-leg poses, and torso rotation. It is difficult to find a single dance form that fully addresses all key considerations; most cover some, and with adaptations, they can provide comprehensive support.

In Malaysia, classical and traditional dances, ballet, creative dance, and contemporary dance are popular yet underexplored among children with Down syndrome. Each style has unique movement characteristics, and its alignment with the proposed key considerations requires further investigation and modifications to ensure effective gross motor skill development. For example, classical and traditional dances provide training in locomotor and torso movements, but their culturally specific patterns may not fully encompass all locomotor and ball skills outlined in the key considerations. Ballet develops jumping, galloping, hopping, skipping, and sliding, but emphasises upright torso movement and rarely includes twisting, particularly for beginners (Yichen, 2024). These dance styles also feature gender-specific movements, requiring adjustments to align with the proposed considerations.

Creative dance enhances locomotor movements and object control skills using props such as beanbags, balls, and scarves. It emphasises the creative process in movement, with teachers acting as facilitators to guide expression (Tan, 2025). Effective implementation requires teachers to understand the style, think in movement, and engage critically with lessons (Payne & Costas, 2021). However, Malaysian preschool teachers often face challenges, including limited interaction skills and insufficient strategies to foster creativity (Tan, 2025), which may restrict accessibility for this population.

Contemporary dance, evolving from ballet and modern dance, continues to innovate with new movement vocabularies. One of the key figures in this field is Merce Cunningham, a pioneering 20th-century American choreographer (Harris, 2012). Cunningham's technique emphasises muscular strength, flexibility, and rapid directional changes, blending classical ballet legwork with torso movements in five primary positions: upright, curve, arch, twist, and tilt (Rizzuto, 2017).

His legwork training could enhance lower-limb strength and gross motor skills, such as standing, walking, running, and jumping. Torso movements in five directions improve strength and flexibility, supporting object control skills. For example, torso twisting significantly increases ball velocity during throwing, as power is generated from the lower limbs, transferred through the torso, and delivered by the upper limbs (Razak et al., 2022).

Unlike classical, traditional, and ballet styles, contemporary dance is not gender-specific, and its movement vocabulary does not rely on assigned gender roles. Given these benefits, contemporary dance, particularly incorporating Cunningham's techniques, aligns closely with the key considerations proposed in this study and is well-suited as a dance-based intervention to enhance gross motor skills in Malaysian children with Down syndrome.

CONCLUSION

This study identified six key considerations to guide dance-based interventions for Malaysian children with Down syndrome. Contemporary dance, emphasising Cunningham's techniques, was highlighted as an effective approach, followed by other dance forms, with necessary adaptations to optimise gross motor skill development. Framing dance as both a performing art and a structured physical activity offers a novel approach to supporting this population within Malaysia's evolving inclusive context. These findings provide foundational insights for the design, implementation, and evaluation of dance interventions and are relevant to researchers, educators, and practitioners in dance, special education, and physical education. Future research should explore diverse dance styles to maximise developmental outcomes.

FUNDING:
The study did not receive funding.

CONFLICT OF INTEREST:
The authors declare that they have no conflict of interest.

ETHICAL ASPECTS:
The study obtained ethical approval from the Human Research Ethics Committee (*Jawatankuasa Etika Penyelidikan Manusia Universiti Sains Malaysia, JEPeM-USM)* with protocol code: USM/JEPeM/PP/24050420.

REFERENCES

Aleksander-Szymanowicz, P., Filar-Mierzwa, K., & Skiba, A. (2025). Effect of dance movement therapy on balance in adults with Down Syndrome. A pilot study. *Journal of Intellectual Disabilities*, *29*(1), 40–49. https://doi.org/10.1177/17446295231220429

Ali, S. (2023). *Anak sindrom down mampu jalani hidup berkualiti*. Berita Harian Online. https://www.bharian.com.my/wanita/keluarga/2023/04/1084949/anak-sindrom-down-mampu-jalani-hidup-berkualiti

Asrol, A. A. (2023). *Kementerian Pendidikan kaji semula keperluan pendidikan khas untuk Sindrom Down - Utusan Malaysia*. Utusan Malaysia. https://www.utusan.com.my/nasional/2023/03/kementerian-pendidikan-kaji-semula-keperluan-pendidikan-khas-untuk-sindrom-down/

Barros, N. P., Araújo, D. S., de Lima, E. B., de Carvalho, I. P., Lima, S. D. S., & Costa, L. G. T. (2020). Effects of kayaking on motor skills in children and adolescents with down syndrome | Efeitos da canoagem nas habilidades motoras de crianças e adolescentes com síndrome de down | Efectos de canoa en las habilidades motoras de niños y adolescentes com sínd. *Revista Brasileira de Medicina Do Esporte*, *26*(4), 302–306. https://doi.org/10.1590/1517-869220202604220312

Beerse, M., & Wu, J. (2018). Vertical stiffness and balance control of two-legged hopping in-place in children with and without Down syndrome. *Gait & Posture*, *63*, 39–45. https://doi.org/10.1016/J.gaitpost.2018.04.026

Bernama. (2021, April 17). *Intervensi awal penting bagi anak sindrom down belajar dan berdikari - Ras Adiba | Astro Awani*. https://www.astroawani.com/berita-malaysia/intervensi-awal-penting-bagi-anak-sindrom-down-belajar-dan-berdikari-ras-adiba-293676

Buckley, S., Mondschein, E., DiLaura, A., & Gilbert, J. (2021). *Down Syndrome: Guidelines for Inclusive Education* (2nd ed.). National Down Syndrome Society & Down Syndrome Education International. https://go.dselink.net/appg-education-report

Capio, C. M., Mak, T. C. T., Tse, M. A., & Masters, R. S. W. (2018). Fundamental movement skills and balance of children with Down syndrome. *Journal of Intellectual Disability Research : JIDR*, *62*(3), 225–236. https://doi.org/10.1111/JIR.12458

Chen, L., Wang, L., Wang, Y., Hu, H., Zhan, Y., Zeng, Z., & Liu, L. (2022). Global, Regional, and National Burden and Trends of Down Syndrome From 1990 to 2019. *Frontiers in Genetics*, *13*, 908482. https://doi.org/10.3389/fgene.2022.908482

Chui, A., Mcleod-Maenpaa, J., Zhang, A., Rotenberg, S., & Vasquez, B. (2025). Errorless Learning for Everyday Functioning in Adults With Brain Injury: A Scoping Review. *OTJR: Occupational Therapy Journal of Research*. https://doi.org/10.1177/15394492241292263

Çimen, E., & Alp, H. (2024). Adapted Games for the Development of Gross Motor and Manipulative Skills of Primary School Children with Down Syndrome. *Journal of Sport Sciences Research*, *9*(2), 163–180. https://doi.org/10.25307/jssr.1417849

Cosma, G., Dragomir, M., Nanu, M. C., Brabiescu-Calinescu, L., & Cosma, A. (2017). The Influence of the Dance for People With Down Syndrome. *Bulletin of the "Transilvania" University of Braşov*, *10*(59), 83–88. https://www.proquest.com/scholarly-journals/influence-dance-people-with-down-syndrome/docview/1932126421/se-2

Duarte Machado, E., Cole, M. H., Miller, L., McGuckian, T. B., & Wilson, P. H. (2024). The efficacy of dance interventions for the activity and participation of individuals with cerebral palsy – a systematic review and meta-analysis. *Disability and Rehabilitation*, *46*(8), 1485–1501. https://doi.org/10.1080/09638288.2023.2200259

Harris, J. (2012). *Merce Cunningham: The Accidental Icon*. https://core.ac.uk/download/pdf/217023281.pdf

Jain, P. D., Nayak, A., Karnad, S. D., & Doctor, K. N. (2021). Gross motor dysfunction and balance impairments in children and adolescents with Down syndrome: a systematic review. *Clinical and Experimental Pediatrics*, *65*(3), 142. https://doi.org/10.3345/cep.2021.00479

Kamrujjaman, M. (2019). Comparative Study of Supporting Services for Children with Down's syndrome and Their Families: Perspective of United Kingdom and Bangladesh. *Current Trends in Clinical & Medical Sciences*, *1*(1). https://doi.org/10.33552/ctcms.2019.01.000501

Lee, W., & Kuan, G. (2021). Effect of Exercises on the Physical and Functional Fitness among Down Syndrome: A Review. In *Physical Education and Sport for Children and Youth with Special Needs: Researches - Best Practices - Situation* (pp. 223–232). Slovak Scientific Society for Physical Education and Sport and FIEP. https://www.researchgate.net/publication/353732757_Effect_of_Exercises_on_the_Physical_and_Functional_Fitness_among_Down_Syndrome_A_Review

Lestari, I., & Ratnaningsih, T. (2016). The Effects of Modified Games on the Development of Gross Motor Skill in Preschoolers. *International Journal of Evaluation and Research in Education (IJERE)*, *5*(3), 216–220. https://ijere.iaescore.com/index.php/IJERE/article/view/4542/2735

Lokoviti, M., & Pitsi, A. (2025). The Role of Contemporary Dance in Early School-Age Motor Development. *International Journal of Research -GRANTHAALAYAH*, *13*(3), 218-227–218–227. https://doi.org/10.29121/granthaalayah.v13.i3.2025.5996

Maïano, C., Hue, O., Lepage, G., Morin, A. J. S., Tracey, D., & Moullec, G. (2019). Do exercise interventions improve balance for children and adolescents with Down syndrome? A systematic review. *Physical Therapy*, *99*(5), 507–518. https://doi.org/10.1093/ptj/pzz012

Malak, R., Kostiukow, A., Krawczyk-Wasielewska, A., Mojs, E., & Samborski, W. (2015). Delays in motor development in children with Down syndrome. *Medical Science Monitor*, *21*, 1904–1910. https://doi.org/10.12659/msm.893377

Mann, S., Spiric, J., Mitchell, C., & Hilgenkamp, T. I. M. (2023). Development of a Physical Therapy-Based Exercise Program for Adults with Down Syndrome. *International Journal of Environmental Research and Public Health*, *20*(4), 3667. https://doi.org/10.3390/ijerph20043667

Mazeed, H. M. (2023). A Program for Developing Some Motor Skills for Down Syndrome Children Using Music. *International Journal of Early Childhood*, *55*(1), 47–68. https://doi.org/10.1007/s13158-022-00338-7

Md Said, R. (2023). *Latihan, Kemahiran untuk Sindrom Down Masih Rendah*. Utusan Malaysia. https://doi.org/https://www.utusan.com.my/pendidikan/2023/03/latihan-kemahiran-untuk-sindrom-down-masih-rendah/

Palisano, R. J., Walter, S. D., Russell, D. J., Rosenbaum, P. L., Gémus, M., Galuppi, B. E., & Cunningham, L. (2001). Gross motor function of children with Down syndrome: Creation of motor growth curves. *Archives of Physical Medicine and Rehabilitation*, *82*(4), 494–500. https://doi.org/10.1053/apmr.2001.21956

Payne, H., & Costas, B. (2021). Creative Dance as Experiential Learning in State Primary Education: The Potential Benefits for Children. *Journal of Experiential Education*, *44*(3), 277–292. https://doi.org/10.1177/1053825920968587

Phytanza, D. T. P., Burhaein, E., & Pavlovic, R. (2021). Gross motor skills levels in children with autism spectrum disorder during the covid-19 pandemic. *International Journal of Human Movement and Sports Sciences*, *9*(4), 738–745. https://doi.org/10.13189/saj.2021.090418

Quinzi, F., Vannozzi, G., Camomilla, V., Piacentini, M. F., Boca, F., Bortels, E., Kathrein, E., Magyar, A., Verdone, F., & Sbriccoli, P. (2022). Motor Competence in Individuals with Down Syndrome: Is an Improvement Still Possible in Adulthood? *International Journal of Environmental Research and Public Health 2022, Vol. 19, Page 2157*, *19*(4), 2157. https://doi.org/10.3390/ijerph19042157

Razak, R. A., Nurul, R., Raja Hussain, J., Atikah, N., Kassim, M., Saleh, M. M., Isa, K. A., & Razak, F. (2022). The relationship between trunk rotation strength and throwing ball velocity among female collegiate softball players. *Journal of Physical Education and Sport ® (JPES)*, *22*(9), 2047–2052. https://doi.org/10.7752/jpes.2022.09261

Rizzuto, R. (2017). *LetUsLessonPlanForYou: A Cunningham Warm-Up and the Man Behind the Technique - Dance Teacher*. https://dance-teacher.com/letuslessonplanforyou-cunningham-warm-man-behind-technique/

Saljoughian, M. (2023). An Overview of Down Syndrome. *U.S. Pharmacist*, *48*(10), 32–33. https://doi.org/10.47957/ijciar.v7I2.174

Schott, N., & Holfelder, B. (2015). Relationship between motor skill competency and executive function in children with Down's syndrome. *Journal of Intellectual Disability Research*, *59*(9), 860–872. https://doi.org/10.1111/jir.12189

Shodrina, R. N., Ds, S., Muhammad, I. D. R. S. A. S., Sn, S., Program, M. S., Sarjana, S., Produk, D., Rupa, S., & Desain, D. (2025). Perancangan Fasilitas Terapi Sensori Integrasi Yang Difokuskan Pada Gerak Lokomotor Peserta Didik Down Syndrome di Sekolah Dasar Luar Biasa. *Jurnal Pengabdian Inovasi Sosial Ekonomi*, *2*(01), 22–31. https://jurnal.line.or.id/index.php/jpisi/article/view/93

Snyder, J. (2018). Dancing with Down Syndrome: A Look at the Effects and Benefits of Dance Movement Therapy on the Emotional Well-Being and Overall Quality of Life for Individuals with Down Syndrome. In *Honors Theses*. https://digitalcommons.assumption.edu/honorstheses/41

Tan, C. C. (2025). *Theory and Practice in Fostering Children's Creativity Through Creative Dance Based on a Brain-Compatible Dance Education Model*. 351–375. https://doi.org/10.1007/978-981-96-2524-6_20

Vieira Lourenço, C. C., Rodrigue Melo, G. L., & Boato, E. M. (2021). Balance Assessment in Children with Down Syndrome Who Practice Dance. *Annals of Applied Sport Science*, *9*(4), 0–0. https://doi.org/10.52547/aassjournal.977

Winders, P., Wolter-Warmerdam, K., & Hickey, F. (2019). A schedule of gross motor development for children with Down syndrome. *Journal of Intellectual Disability Research*, *63*(4), 346–356. https://doi.org/10.1111/jir.12580

Yichen, M. (2024). The similarities and difference between Chinese classical dance and Western ballet. *Frontiers in Art Research*, *6*(3: 81-86), 81–86. https://doi.org/10.25236/FAR.2024.060314

Zalavadiya, G., Pandani, R., & Zalavadiya, G. D. (2023). Advancement in gross motor and fine motor functions with quality of daily activities through brain gym exercise in Down syndrome children: an interventional study. *Scope*, *13*, 345–353. https://www.researchgate.net/publication/370492536