JURNAL PENDIDKAN BITARA
Volume 18 Special Issue (2025) / eISSN 2821-3173 (62-77)

This article was carefully selected from
6th International Conference on Special Education (ICSE) 2025,
organized by The Southeast Asian Ministers of Education Organization
Regional Centre for Special Educational Needs (SEAMEO SEN)

THE EFFECTIVENESS OF EARLY DETECTION AND INTERVENTION PROGRAMME FOR 4-6 YEARS OLD PRESCHOOLERS WITH DEVELOPMENTAL DELAYS IN MALAYSIA

*Mahfuzah Zainol, Iffah Rashida Mazlan, Che'Rozaniza Azizan, Solehah Misron & Rodiah Idris
Special Education Division, Ministry of Education, Blok E8, Kompleks E, Pusat Pentadbiran Kerajaan Persekutuan, 62604 W.P. Putrajaya, Malaysia
Corresponding email: mahfuzah_zainol@moe.gov.my

Published: 10 September 2025

To cite this article (APA): Zainol, M., Mazlan, I. R., Azizan, C., Misron, S., & Idris, R. (2025). The effectiveness of early detection and intervention programme for 4-6 years old preschoolers with developmental delays in Malaysia. *Jurnal Pendidikan Bitara UPSI*, *18*(Special Issue), 62-77. https://doi.org/10.37134/bitara.vol18.sp.7.2025

To link to this article: https://doi.org/10.37134/bitara.vol18.sp.7.2025

ABSTRACT

Early detection and intervention for developmental delays in preschool children are crucial for fostering school readiness skills. In response to this need, the Ministry of Education (MOE), through its Special Education Division, initiated the Early Detection and Intervention Programme for Preschool Children, also known as *Program Pengesanan Perkembangan dan Intervensi Murid Prasekolah* (ProsPIM) in 2024 to address this need systematically. This study aims to evaluate the effectiveness of ProsPIM in detecting and providing interventions for preschool children with developmental delays across Malaysia, focusing on motor skills, language development, personal-social skills, and cognitive development. A comprehensive developmental screening was conducted using the *Senarai Semak Pengesanan Perkembangan* (SSP) or Developmental Detection Checklist for children aged 4-6 years. Teachers underwent systematic training, with 9,411 preschool teachers (96.75% of the target population) trained through 96 nationwide workshops. Structured interventions were implemented using the Preschool Student Development Intervention Kit over 3-6 months. Out of 215,920 preschool children screened, 4,134 (1.91%) were identified with developmental delays. The age distribution of affected children was 4 years (3.7%), 5 years (38.8%), and 6 years (57.8%), with a gender distribution of 68% males and 32% females. Post-intervention assessments showed that 2,115 children (51%) achieved age-appropriate developmental milestones after 3-6 months of structured intervention targeting developmental delays. ProsPIM demonstrates significant effectiveness in early detection and intervention for developmental delays among preschool children. The 51% success rate in achieving age-appropriate development suggests that structured early intervention programmes can significantly improve developmental outcomes. These findings support the continued implementation and expansion of systematic early detection and intervention programmes in preschool settings.

Keywords: early intervention, developmental delay, preschool education, special education, Malaysia

INTRODUCTION

Early childhood development from birth to age six establishes crucial foundations for future learning outcomes through rapid brain development. Developmental delays during this period lead to significant lags in achieving age-appropriate milestones across motor, language, social, and cognitive domains (ALarjani and ALarjani, 2025), may negatively impact educational trajectories if left unaddressed (Tirkey, Verma, Namdeo and Gupta, 2023; Vitrikas, Savard and Bucaj, 2017). Given the significant risks posed by developmental delays, proactive intervention during early childhood becomes crucial to mitigate long-term educational and developmental impacts. Recognizing this critical need, the Ministry of Education (MOE) has strategically introduced the Early Detection and Intervention Programme for Preschool Children (ProsPIM) to address and support children's developmental trajectories systematically.

Research Objectives

This research aimed to: (1) evaluate the effectiveness of ProsPIM in identifying developmental delays in Malaysian preschoolers, and (2) analyze delay patterns among children aged 4–6 across various demographics. The study sought to create a comprehensive picture of developmental delay patterns in Malaysian preschoolers while assessing the efficacy of a nationwide intervention approach. By documenting the outcomes of systematic screening and intervention, this research aims to inform educational policy and practice, with potential implications for reducing the need for special education services through early intervention.

LITERATURE REVIEW

Global Context of Developmental Delays

Worldwide, 52.9 million children under the age of 5 have developmental disabilities, with 95% of them residing in low- and middle-income countries (Global Research on Developmental Disabilities Collaborators, 2018). At least one in six of these children face developmental challenges, which affect 10-15% of children, with prevalence varying by region (World Health Organization, 2015; 2020). These delays are often linked to risk factors such as poverty, poor health, inadequate nutrition, and insufficient care, which can lead to stunting and poor cognitive development (Grantham-McGregor et al., 2007; Vetrikas et al., 2017). In low- and middle-income countries, about one in three preschool-aged children do not meet key cognitive or socioemotional milestones, and an additional 16% experience physical growth delays (McCoy et al., 2016). These disparities are influenced by factors such as screening practices, rural living, and socioeconomic status. Research by Guralnick et al., (2017) highlights that early intervention leads to greater developmental improvements compared to delayed intervention. Additionally, early intervention has been found to improve outcomes for children with developmental delays (Ching et al., 2025; Noyes-Grosser et al., 2018), capitalizing on the brain’s neuroplasticity (Nelson et al., 2023; Abercrombie et al., 2022) and therefore, is particularly effective for children at risk of developmental delays (Vetrikas et al., 2017).

Malaysian Context and Significance

Malaysia's early childhood education landscape has evolved significantly following the Education Act of 1996 and the National Education Blueprint 2013-2025, which established preschool education as a formal component of the national education system. However, systematic developmental screening approaches remain relatively recent innovations. Malaysia's demographic and geographic diversity present unique challenges for implementation.

Prior to ProsPIM, developmental screening was predominantly conducted in healthcare settings, often reaching only children with obvious concerns or those whose parents actively sought assessment. This reactive approach left many children with subtle developmental delays unidentified. In a recent study, Sahril et al. (2024) examined the prevalence of functioning difficulties among children aged 2 to 17 years in Malaysian households. The data were sourced from the National Health and Morbidity Survey 2019, which included the UNICEF Child Functioning Module. Of the 4,166 children analysed, 201 (4.7%) were found to experience at least one type of functional difficulty, corresponding to an estimated population of 362,601. The study also highlighted disparities between higher and lower income levels in Malaysia, as well as the relationship between age and functional difficulties in children. Higher income levels were associated with better health outcomes, thereby reducing the risk of developmental delays, while older age was linked to increased functional difficulties. Given these findings, ensuring access to early intervention is essential. ProsPIM addresses these challenges by implementing school-based screening, reaching children across diverse contexts, and shifting from a medical to an educational model of developmental surveillance.

Impact on Children's Education and Future Development

The Sustainable Development Goals require that, by 2030, every child must have access to high-quality early childhood development opportunities, healthcare, and pre-primary education. Unaddressed developmental delays significantly impact academic achievement, social integration, and long-term educational outcomes. In the United States (US), children with developmental delays are 18 times more likely to have received special education or early intervention services (Cogswell et al., 2022; Delgado et al., 2006).

In Malaysia, a significant number of children aged 6 to 7 years struggle with literacy and numeracy. Despite receiving remedial support through intervention programmes, many of these children continue to face challenges in these fundamental areas. This pattern aligns with international statistics indicating that at least 10-15% of all children have developmental disabilities, highlighting the need for early identification and intervention (Galen Centre for Health & Social Policy, 2025). The relationship between developmental domains and academic skills is well established. Motor skills development, particularly fine motor control, predicts handwriting ability and early literacy skills (Cameron et al., 2016; Øksendal et al., 2022). The trajectory of language development serves as a key foundation for literacy skills (McNeill et al., 2024). Personal-social skills directly affect classroom behavior and peer relationships (King & Boardman, 2006). Cognitive skills, including attention and executive function, underpin virtually all aspects of academic learning (Cowan, 2014).

Importance of Early Detection

Early detection is grounded in the concept of neuroplasticity, which refers to the brain's heightened capacity to reorganise neural pathways during the first six years of life (Nelson et al., 2023; Kolb & Gibb, 2011). Previous studies have emphasised that interventions initiated before the age of five yield significantly greater improvements than identical interventions delivered later (Barnett, 2011; Hwang et al., 2013). Early detection is essential, as it facilitates timely intervention during crucial periods of optimal neuroplasticity. It effectively prevents maladaptive compensatory behaviours, minimises cumulative developmental gaps, empowers parents with effective support strategies, and identifies individuals who would benefit from specialised educational approaches (Sahril et al., 2024; Scherzer et al., 2012). According to Amar (2008), professionals and therapists need to shift their perspective from service provision to capacity building through training. Thus, properly trained teachers can administer developmental screening tools with detection rates on par with those achieved through parental involvement, while substantially improving accessibility and cost-efficiency (Kiing et al., 2019).

Relationship of Developmental Foundations with Academic Skills

Strong developmental foundations across various domains serve as critical building blocks for academic achievement. Fine motor skills directly correlate with overall performance and language performance, affecting performance across academic subjects (Wang & Wang, 2024). Vocabulary at the age of five strongly predicts reading comprehension at age ten (Giguere & Hoff, 2023). Self-regulation, emotional awareness, and social problem-solving strongly predict classroom behavior and social acceptance (Garner & Waajid, 2012). Executive functions such as working memory, inhibitory control, and cognitive flexibility underpin virtually all aspects of academic learning and is significantly associated with mathematical gains across the preschool years (Vitiello & Greenfield, 2017).

Developmental Screening Approaches

Effective developmental screening tools must strike a decisive balance between sensitivity (identifying true delays) and specificity (accurately excluding non-delays) while remaining practical for large-scale implementation. The SSP used in ProsPIM has been explicitly designed for the Malaysian context, reinforcing the necessity for culturally appropriate screening tools. The fundamental principles of effective developmental screening include the following: (1) a comprehensive assessment that covers various developmental domains, (2) information collected from a variety of sources, such as parents and educators, (3) regular screenings conducted at key developmental milestones, and (4) established procedures for further evaluation when developmental concerns arise.

METHODOLOGY

This research employed a structured, multi-phase approach across Malaysia, comprising instrument development, professional training, implementation, and evaluation.

Phase 1: Development and Validation

The programme developed the SSP specifically for Malaysian preschools through multidisciplinary collaboration. This culturally appropriate, multilingual assessment tool evaluates five developmental domains: gross motor, fine motor, speech-language, personal-social, and cognitive skills. Validation included expert review (n=12), field testing (n=200), statistical analysis, and comparison with established screening measures, achieving 89% sensitivity and 91% specificity. Concurrently, an intervention kit aligned with national curriculum standards was developed, featuring teaching manuals, visual guides, progress tracking tools, and parental resources. Both assessment and intervention materials underwent verification by education and health ministry professionals.

Phase 2: Professional Training Programme

Implementation utilised a cascading training model beginning with the preparation of master trainers. The Training of Trainers programme consisted of intensive workshops covering developmental milestone recognition, SSP administration and interpretation, intervention implementation, and quality assurance protocols. In total, 64 master trainers representing all Malaysian states and federal territories were certified after achieving minimum competency on post-training assessments. Subsequently, these trainers conducted three-day workshops for 9,411 preschool teachers nationwide.

Phase 3: Implementation and Data Collection

Teachers screened 215,920 children aged 4 to 6 years, identifying 4,134 (1.9%) with developmental delays. For these children, individualised intervention plans were developed and implemented through daily 15-to-30-minute targeted activities integrated into the regular curriculum. Parental involvement was facilitated through home activity education. Interventions spanned three to six months, depending on severity and progress. Follow-up assessments using the SSP determined whether interventions should continue, be modified, or concluded, including referrals for specialized services when necessary. Systematic teacher feedback provided qualitative data to complement quantitative outcome measures.

Participants

Teacher participants (N=9,411) from urban, suburban, and rural regions across Malaysia held a minimum qualification of a diploma in early childhood education, with 68% possessing bachelor's degrees. The mean teaching experience was 8.4 years (SD=4.2). Child participants with identified delays (N=4,134) comprised 4-year-olds (3.7%), 5-year-olds (38.8%), and 6-year-olds (57.8%), with a gender distribution of 68% male and 32% female. Geographic distribution was 33% urban, 51% suburban, and 16% rural. Exclusion criteria encompassed preschoolers outside the 4–6-year age range, those with confirmed medical diagnoses (e.g., intellectual disabilities, autism spectrum disorder), sensory impairments, or genetic syndromes associated with developmental delays.

RESULTS AND FINDINGS

The execution of the Early Detection and Intervention Programme for Preschool Children (ProsPIM) produced extensive data regarding the occurrence, trends, and responsiveness to treatment of developmental delays among preschoolers in Malaysia. This section outlines specific findings across different analytical dimensions.

Training Outcomes

The nationwide training initiative has successfully equipped 9,411 government preschool educators to conduct developmental screening and intervention, achieving an impressive 96.75% of the target population. Post-training evaluations revealed that:

i. 94.2% of trained educators scored above 80% in competency for administering screenings
ii. 89.7% demonstrated strong abilities in interpreting screening results
iii. 91.5% effectively executed intervention activities during practical assessments

These commendable competency rates indicate that the cascading training model has effectively prepared educators to undertake the critical roles of monitoring and intervening in developmental concerns.

Screening Outcomes

Among the 215,920 preschool children screened using the SSP, 4,839 (2.24%) were initially identified as having potential developmental issues that merited further assessment. After comprehensive evaluations, 4,134 children (1.91% of the screened population) were confirmed to have developmental delays that require intervention.
The prevalence of developmental delays varied significantly by:

Age Group:

i. 4-year-olds: 3.2% prevalence rate (which is higher than the overall average)
ii. 5-year-olds: 2.1% prevalence rate
iii. 6-year-olds: 1.6% prevalence rate

This trend of decreasing prevalence with increasing age underscores the importance of early detection, as some developmental delays may naturally resolve over time or through typical educational experiences.

Gender Distribution:

i. Males: 2.5% prevalence rate
ii. Females: 1.3% prevalence rate
The male-to-female ratio of 2.1:1 reflects global patterns, highlighting the need for targeted support for males who exhibit greater neurodevelopmental vulnerabilities.

Geographic Distribution:

i. Urban areas: 1.7% prevalence rate
ii. Suburban areas: 2.0% prevalence rate
iii. Rural areas: 2.3% prevalence rate

The higher prevalence in rural areas points to the necessity for enhanced access to early childhood stimulation resources, special education and healthcare services to foster development effectively.

Overall, these findings underscore the importance of ongoing efforts to strengthen early detection and intervention strategies, ensuring that all preschoolers receive the support and targeted intervention they need to thrive.

Patterns of Developmental Delay

The SSP assessment identified specific patterns of developmental delay across the five evaluated domains, with many preschoolers exhibiting delays in multiple areas. Table 1 presents the demographic distribution of preschoolers identified with developmental delays.

Table 1: Demographic Distribution of Preschoolers with Developmental Delays

Age group	*N*	Gender	*N* of preschoolers who needs intervention (pre-intervention)	N of preschoolers referred for further evaluation (post-intervention)
4 years	152	M=104, F=48	152	68
5 years	1,604	M=1,091, F=513	1,604	582
6 years	2,378	M=1,616, F=762	2,378	754
Total	**4,134**	M=2,811, F=1,323	4,134	1,404

The domain-specific patterns revealed distinct developmental profiles, with notable variations by age.

Gross Motor Skills
Table 2 presents the distribution of gross motor delays across specific skill components and age groups.

Table 2: Participants with Developmental Delay in Gross Motor Skills

Age group	*N*	Gross motor coordination	Balancing skills	Postural control
4 years	152	41 (27.0%)	25 (16.4%)	55 (36.2%)
5 years	1,604	1,005 (62.7%)	387 (24.1%)	344 (21.4%)
6 years	2,378	866 (36.4%)	1,403 (59.0%)	-
Total	**4,134**	1,912 (46.3%)	1,815 (43.9%)	399 (9.7%)

The analysis of gross motor development patterns revealed distinct age-related trends in specific skill components. Postural control issues were predominantly observed among younger preschoolers, particularly among 4-year-olds (36.2%), with prevalence decreasing significantly with age. In contrast, balancing skills showed an increasing prevalence of delay with age, affecting 16.4% of 4-year-olds but rising dramatically to 59.0% of 6-year-olds with identified delays.

Gross motor coordination challenges demonstrated a different pattern, being most prominent among 5-year-olds (62.7%) compared to both younger (27.0%) and older (36.4%) preschoolers. These divergent developmental trajectories suggest age-specific vulnerabilities in gross motor development and highlight the importance of targeted interventions that address different aspects of motor functioning at specific developmental stages.

Fine Motor Skills

Table 3 presents the distribution of fine motor delays across specific skill components and age groups.

Table 3: Participants with Developmental Delays in Fine Motor Skills

Age group	*N*	Object manipulation	Visual perceptual	Coordination
4 years	152	38 (25.0%)	81 (53.3%)	78 (51.3%)
5 years	1,604	446 (27.8%)	946 (59.0%)	891 (55.5%)
6 years	2,378	1,211 (50.9%)	1,350 (56.8%)	1,797 (75.6%)
Total	**4,134**	1,695 (41.0%)	2,377 (57.5%)	2,766 (66.9%)

Analysis of fine motor development revealed distinctive patterns across skill components and age groups. Visual-perceptual challenges remained relatively consistent across age groups, affecting approximately 53-57% of preschoolers with identified delays regardless of age (53.3% of 4-year-olds, 59.0% of 5-year-olds, and 56.8% of 6-year-olds). In contrast, object manipulation difficulties increased substantially with age, more than doubling in prevalence from 25.0% among 4-year-olds to 50.9% among 6-year-olds.

Fine motor coordination was the most prevalent fine motor challenge overall, with a particular prominence among 6-year-olds, affecting 75.6% of preschoolers with developmental delays. This high prevalence of coordination difficulties among preschoolers approaching school entry raises significant concerns regarding handwriting readiness and early academic functioning, given the established relationship between fine motor proficiency and early literacy development.

Speech and Language Skills

Table 4 presents the distribution of speech and language delays across specific skill components and age groups.

Table 4: Participants with Developmental Delay in Speech and Language Skills

Age group	*N*	Receptive language	Expressive language	Communication
4 years	152	83 (54.6%)	112 (73.7%)	114 (75.0%)
5 years	1,604	736 (45.9%)	1086 (67.7%)	995 (62.0%)
6 years	2,378	980 (41.2%)	1571 (66.1%)	1321 (55.6%)
Total	**4,134**	1799 (43.5%)	2769 (67.0%)	2430 (58.8%)

Analysis of speech and language development indicated clear trends and age-specific vulnerabilities. Expressive language deficits were the most significant challenge, affecting 73.7% of 4-year-olds, 67.7% of 5-year-olds, and 66.1% of 6-year-olds, highlighting the need for targeted intervention. In contrast, receptive language difficulties diminished with age, from 54.6% in 4-year-olds to 41.2% in 6-year-olds, suggesting natural improvement in comprehension skills. Pragmatic language and conversational difficulties were most prevalent among younger preschoolers, with 75.0% of 4-year-olds demonstrating challenges, decreasing to 62.0% and 55.6% at ages 5 and 6, respectively. These findings emphasise the importance of early intervention for communication skills, particularly for preschoolers facing the greatest challenges.

Personal-Social Skills

Table 5 presents the distribution of personal-social delays across specific skill components and age groups.

Table 5: Participants with Developmental Delay in Personal-Social Skills

Age group	*N*	Self-help skills	Social	Emotional/ Pragmatic
4 years	152	27 (17.8%)	118 (77.6%)	61 (40.1%)
5 years	1,604	304 (19.0%)	322 (20.1%)	585 (36.5%)
6 years	2,378	289 (12.2%)	672 (28.3%)	890 (37.4%)
Total	**4,134**	620 (15.0%)	1112 (26.9%)	1536 (37.2%)

An examination of personal-social development patterns revealed significant variations across specific skill components and age groups. Notably, self-help skills exhibited the lowest prevalence of delays, affecting only 15% of preschoolers overall, with minimal age-related variation (17.8% of 4-year-olds, 19.0% of 5-year-olds, and 12.2% of 6-year-olds). This suggests that functional independence develops robustly, even among preschoolers with other developmental challenges.

In contrast, social skill difficulties were particularly high among 4-year-olds (77.6%) but decreased markedly with age (20.1% of 5-year-olds and 28.3% of 6-year-olds), indicating considerable natural maturation in peer interaction abilities during the preschool years. Meanwhile, delays in emotional and pragmatic skills showed relatively consistent patterns across age groups (40.1% of 4-year-olds, 36.5% of 5-year-olds, and 37.4% of 6-year-olds), suggesting that these aspects of socio-emotional functioning may benefit from more targeted interventions, as they appear less responsive to general maturation and typical preschool experiences.

Cognitive Skills

Table 6 presents the distribution of cognitive delays across specific skill components and age groups.

Table 6: Participants with Developmental Delay in Cognitive Skills

Age group	*N*	Attention	Memory	Literacy/ Thinking Skills
4 years	152	36 (23.7%)	83 (54.6%)	96 (63.2%)
5 years	1,604	1109 (69.1%)	955 (59.5%)	1148 (71.6%)
6 years	2,378	1890 (79.5%)	1076 (45.2%)	1156 (48.6%)
Total	**4,134**	3035 (73.4%)	2114 (51.1%)	2400 (58.1%)

An analysis of cognitive development revealed significant age-related trends in various aspects of cognitive functioning. Attention difficulties notably increased with age, affecting only 23.7% of 4-year-olds with developmental delays. This percentage rose sharply to 69.1% among 5-year-olds and 79.5% among 6-year-olds. This sharp rise may indicate heightened attentional demands as preschoolers prepare for formal schooling, scoring important concerns regarding school readiness.

Memory challenges were prevalent across all age groups, impacting roughly half of the preschoolers with identified delays: 54.6% of 4-year-olds, 59.5% of 5-year-olds, and 45.2% of 6-year-olds. This pattern suggests a consistent vulnerability in memory function throughout the preschool years.

Additionally, difficulties with literacy and thinking skills were particularly pronounced among 4-year-olds (63.2%) and 5-year-olds (71.6%), showing a relative decline among 6-year-olds (48.6%). This trend may reflect both the increased cognitive maturation in older preschoolers and the cumulative benefits of preschool exposure to pre-literacy and cognitive development activities, highlighting the value of early educational experiences in nurturing these foundational academic skills.

Geographic Distribution of Developmental Delays

Table 7 presents the distribution of developmental delays across geographic classifications.

Table 7: Participants with Developmental Delay by Geographic Classification

Demographic Classification	*N*	*N* of preschoolers who needs intervention (pre-intervention)	N of preschoolers referred for further evaluation (post-intervention)
Urban (Major cities)	1364	1364	439 (32.2%)
Sub-urban	2116	2116	787 (37.2%)
Rural	654	654	178 (27.2%)
Total	**4134**	4134	1404 (34.0%)

The geographic analysis revealed clear patterns in the distribution of developmental delays across Malaysia's diverse regions. A significant concentration of identified cases was observed in suburban areas, which accounted for 51.2% of all reported delays, despite representing a smaller proportion of the total population. This disproportionate representation suggests that socioeconomic or environmental factors unique to suburban communities may impact developmental outcomes.

In contrast, urban centres reported relatively lower identification rates, contributing only 33.0% of identified delays, even with their higher population densities and more extensive access to early childhood services. This finding challenges the assumption that developmental surveillance is more thorough in urban areas with enhanced healthcare and educational resources.

Rural areas recorded the lowest absolute numbers, comprising just 15.8% of identified delays. However, when analysed by prevalence rates rather than total counts, rural regions demonstrated the highest percentage of developmental delays within their populations, at 2.3%, compared to 2.0% in suburban and 1.7% in urban areas. This paradoxical finding suggests that, while fewer total cases are identified in rural settings, preschoolers in these communities may face proportionately greater developmental vulnerabilities. This highlights the need for intervention strategies that are specifically tailored to geographic contexts.

DISCUSSIONS, RECOMMENDATIONS AND CONCLUSIONS

The findings from this nationwide implementation of the Early Detection and Intervention Programme for Preschool Children (ProsPIM) provide valuable insights into the prevalence, patterns, and responsiveness to intervention of developmental delays among Malaysian preschoolers. These results have significant implications for educational policy, teacher training, and multidisciplinary collaboration in addressing developmental needs in early childhood.

Prevalence and Patterns

The overall prevalence rate of 1.91% for developmental delays is lower than global estimates of 5-15% (WHO, 2020) potentially reflecting methodological factors including the exclusion of previously diagnosed children.This is similar to the prevalence study by Sahril et al. (2024), which documented a lower prevalence of children's functional difficulties (4.7%) compared to other countries.This can be attributed because of other environmental factors such as healthcare access and socioeconomic status. The gender distribution (68% male) aligns with established patterns in developmental research by Lai et al. (2018), while age-related patterns that demonstrated higher prevalence in younger preschoolers (3.2% at age 4 versus 1.6% at age 6)—suggest some delays resolve naturally over time.

Domain-specific analysis revealed concerning patterns, including high rates of fine motor coordination challenges among 6-year-olds (75.6%) and persistent expressive language difficulties (67.0% overall). Although there are limited studies and inconsistent findings on the differences in developmental delays between rural and urban areas, the geographic disparities in this study showed higher prevalence in rural areas (2.3%) compared to urban centres (1.7%), echoing previous research by Sahril et al. (2024) and Lai D.C et al. (2018). These differences between urban-rural areas may be influenced by various external factors such as access to health care, parental education and community (Sahril et al., 2024).

Intervention Effectiveness

Post-intervention outcomes demonstrate that 51% of preschoolers with identified delays achieved age-appropriate developmental milestones after 3-to-6 months of teacher-implemented intervention. Domain-specific responsiveness varied significantly, with personal-social skills (72.8% improvement) and speech-language development (64.7%) showing the strongest gains, while fine motor (48.2%) and cognitive delays (46.5%) showed more modest improvements.

Age-related response patterns revealed stronger outcomes among 4-year-olds (68.4% improvement) compared to 6-year-olds (43.1%), supporting the neuroplasticity principle that earlier intervention yields better outcomes (Nelson et al., 2023). Notably, rural preschoolers showed the strongest response to intervention despite having the highest initial prevalence rates, suggesting the approach may help reduce regional disparities.

Implementation Factors

The successful training of 9,411 preschool teachers (96.75% of target population) with high competency rates (94.2% for screening, 91.5% for intervention) demonstrates the effectiveness of the cascading training model. Implementation success factors included the practical nature of intervention materials, curriculum integration, and parent information resources.

Challenges identified included time constraints, limited parental engagement in some communities, difficulties with large class implementation, and the need for specialist support with complex cases. These challenges align with international research on teacher-implemented developmental interventions (Kiing et al., 2019; Khasanah et al., 2020; Landry et al., 2009; Nasir & Efendi, 2016).

Multidisciplinary Collaboration

A key strength of ProsPIM was its foundation in multidisciplinary collaboration, including developmental paediatricians, occupational therapists, speech-language pathologists, and educational psychologists. This collaborative approach enabled the successful translation of specialized therapeutic principles into teacher-implemented activities.

However, the finding that 34% of preschoolers required further evaluation after intervention underscores that teacher-implemented approaches, while effective for many preschoolers, cannot fully replace specialized assessment and therapy for more complex developmental needs. This highlights the importance of strengthening referral pathways between educational and healthcare systems to ensure comprehensive developmental support for all preschoolers.

Educational and Policy Implications

The ProsPIM findings yield significant implications for educational practice and policy development in Malaysia, firmly grounded in the study's empirical results.

Preschool Curriculum Enhancement

The prevalence patterns across developmental domains highlight specific areas requiring targeted emphasis within the National Standard-Based Curriculum for Preschool. With 73.4% of identified preschoolers showing attention difficulties and 66.9% exhibiting fine motor coordination challenges, these foundational skills demand systematic development within daily activities. The preschool curriculum should incorporate structured play activities specifically targeting executive function development and fine motor refinement as precursors to academic learning (Wang & Wang, 2024). The successful integration of developmental support activities within the regular curriculum demonstrated by ProsPIM should inform curriculum reforms to balance developmental foundations with academic content, supporting previous findings that strong developmental foundations significantly predict academic success in early primary grades (Abercrombie et al., 2022; Guralnick, 2017; Yage & Ali, 2025)

Play-Based Learning Opportunities

The significant improvement in developmental outcomes through play-based intervention activities (contributing to the 51% overall success rate) provides compelling evidence for expanding play opportunities within preschool settings. This aligns with research demonstrating that structured play activities support multiple developmental domains simultaneously while enhancing engagement (Lai N.K et al., 2018; Pesce et al., 2016). Implementation should include extended periods for structured and free play, outdoor opportunities emphasizing gross motor development, and teacher-facilitated activities targeting specific developmental domains identified as vulnerable in our findings.

Professional Development Models

The successful implementation by regular preschool teachers (achieving 94.2% competency in screening administration) demonstrates that the developmental expertise of the early childhood workforce can be effectively enhanced through structured training. Pre-service and in-service teacher education should incorporate comprehensive training in developmental domains, milestone recognition, and evidence-based intervention strategies. The cascading training model employed in ProsPIM provides an effective template for nationwide professional development initiatives.

Multidisciplinary Support Systems

While teacher-implemented interventions proved effective for many preschoolers, the finding that 34% required further specialized evaluation highlights the need for strengthened collaboration between education and healthcare sectors. Policy development should focus on establishing formal collaborative frameworks between ministries, developing school-based consultation models for allied health professionals, and implementing telehealth options for rural communities, where prevalence was highest (2.3%) but intervention response was strongest.

Special Education Enrolment

Perhaps most significantly, the 51% success rate in achieving age-appropriate development through relatively brief, teacher-implemented interventions suggests many developmental delays can be effectively addressed before formal schooling, potentially reducing the need for special education placement. This preventive approach aligns with previous studies that emphasise the importance of early intervention, and comprehensive teacher training within the preschool settings, thus representing both sound educational practice and fiscal responsibility (Delgado et al., 2006; Landry et al., 2009; Tirkey et al., 2023).

RECOMMENDATIONS

Based on our comprehensive findings, we propose the following evidence-based recommendations to strengthen developmental support for Malaysian preschool children:

Policy Development

Policy development is designed to enhance preschool education through several key initiatives. It mandates a minimum of 60 minutes of daily play, both structured and unstructured, aimed at fostering significant developmental improvements, particularly in resource-limited rural areas. The curriculum will be revised to focus on developmental domains that are essential for academic readiness, specifically addressing attention difficulties and fine motor challenges faced by many preschoolers.

To facilitate this, a formal intersectoral committee will be established, comprising representatives from the Ministries of Education and Health. This committee will work to create standardised referral protocols and improve service delivery. Furthermore, the policy places a strong emphasis on early developmental screening and intervention, particularly for younger preschoolers and those in rural areas, as evidence shows that such interventions are most effective for 4-year-olds.

Educational Practice

The recommendations derived from our comprehensive findings emphasise the importance of a holistic approach to support the developmental needs of Malaysian preschool children. Addressing the varying aspects of early childhood education, we suggest enhancing teacher training programmes to equip educators with the skills needed to foster a nurturing and stimulating environment. This includes incorporating play-based learning strategies that promote cognitive, social, and emotional development. Additionally, engaging parents and communities in the educational process is crucial, as it creates a collaborative framework that supports children's learning both at school and home. Furthermore, we advocate for increased access to quality educational resources and infrastructure, particularly in underserved areas, to ensure that all children have the opportunity to thrive. By implementing these evidence-based recommendations, we can create a robust foundation for lifelong learning and development in preschoolers throughout Malaysia.

Professional Development

Professional development in early childhood education is crucial for enhancing teacher effectiveness and improving child outcomes. It should focus on integrating comprehensive knowledge of child development and intervention skills into all training programmes, ensuring that educators are well-equipped to recognize milestones and implement appropriate interventions. Joint training opportunities between education and healthcare students can foster collaborative practices, reflecting a multidisciplinary approach that benefits both educators and children. Furthermore, emphasizing the connection between early developmental foundations and academic achievement is essential, as it helps educators understand how developmental domains influence specific academic skills. To sustain these improvements, ongoing coaching and mentoring support is necessary, as research shows that teachers who receive continuous coaching exhibit higher fidelity in intervention practices and achieve better outcomes for children. Overall, a robust professional development framework is vital for fostering a skilled workforce that can navigate the complexities of early childhood education effectively.

These recommendations, grounded in our nationwide study, provide a framework for strengthening developmental support within the Malaysian education system. Implementation could significantly enhance developmental outcomes for preschool children, potentially reducing special education needs while strengthening foundations for academic success.

CONCLUSION

This research is a crucial initiative to address developmental delays in the Malaysian preschool system. It demonstrates that early identification and intervention can significantly enhance developmental outcomes before children start formal schooling. Findings from this nationwide implementation indicate that 51% of identified preschoolers achieved age-appropriate development after 3 to 6 months of teacher-led intervention.

This approach challenges the notion that specialized clinical services are necessary for developmental support, showing instead that well-trained teachers can effectively provide this assistance, especially in communities with limited healthcare resources. The initiative highlights the need for focused support in areas such as fine and gross motor skills, and speech and language, while also indicating that personal-social and cognitive skills can improve rapidly during preschool.

Geographic analysis reveals higher prevalence and stronger intervention responses in rural areas, suggesting that targeted investment in these communities could reduce disparities in developmental outcomes and school readiness. Moreover, the research findings suggest that early intervention can lower the risk of later special education placement, making this approach both educationally effective and fiscally responsible.

Looking forward, the success of ProsPIM offers a strong basis for expanding developmental support in Malaysia. By enhancing collaboration, improving teacher training, engaging parents, and evaluating outcomes, the country has an opportunity to create an integrated model of developmental support in early childhood education. In summary, the ProsPIM initiative evidence that with the right training and resources, developmental delays can be effectively addressed within mainstream educational settings, positively shaping the futures of thousands of Malaysian preschoolers.

REFERENCES

Abercrombie, J., Wiggins, L., & Green, K. K. (2022). CDC's "Learn the Signs. Act Early." developmental milestone resources to improve early identification of children with developmental delays, disorders, and disabilities. *Zero to Three, 43*(1), 5–12. PMID: 37207257; PMCID: PMC10193264.

ALarjani, N. F., & ALarjani, N. F. (2025). Pediatric rehabilitation: Using occupational therapy to support developmental milestones. *Tec Empresarial*, *7*(1), 575–602. https://revistastecac.cr/index.php/TEC/article/view/683/606Amar, H. S. (2008). Meeting the needs of children with disability in Malaysia. *Med J Malaysia*. Mar;63(1):1-3. PMID: 18935722.

Barnett, W. S. (2011). Effectiveness of early educational intervention. *Science, 333*(6045), 975–978. https://doi.org/10.1126/science.1204534

Cameron, C. E., Cottone, E. A., Murrah, W. M., & Grissmer, D. W. (2016). . How are motor skills linked to children's school performance and academic achievement? *Child Development Perspectives*, 10(2), 93–98. https://doi.org/10.1111/cdep.12168

Ching, T. Y. C., Cupples, L., Seeto, M., Zhang, V., Hou, S., Wong, A., Flynn, C., Marnane, V., Leigh, G., & Dillon, H. (2025). Early intervention influences 9-year speech, language, cognitive, and quality-of-life outcomes in deaf or hard-of-hearing children. *Ear & Hearing*. Advance online publication. https://doi.org/10.1097/AUD.0000000000001657

Cogswell, M. E., Coil, E., Tian, L. H., Tinker, S. C., Ryerson, A. B., Maenner, M. J., Rice, C. E., & Peacock, G. (2022). Health needs and use of services among children with developmental disabilities—United States, 2014–2018. *MMWR Morbidity and Mortality Weekly Report, 71*(12), 453–458. https://doi.org/10.15585/mmwr.mm7112a3

Cowan N. (2014). Working Memory Underpins Cognitive Development, Learning, and Education. *Educ Psychol Rev*. *Jun 1;26(2),* 197-223. https://doi.org/10.1007/s10648-013-9246-y

Delgado, C. E. F., Vagi, S. J., & Scott, K. G. (2006). Tracking Preschool Children with Developmental Delay: Third Grade Outcomes. *American Journal on Mental Retardation. 111(4)2, 99-306.* https://doi.org/10.1352/0895-8017(2006)111[299:tpcwdd]2.0.co;2

Galen Centre for Health & Social Policy. (2025, February). Universal screening for developmental disabilities for children in Malaysia: Malaysian Paediatric Association. *Code Blue*. [access: https://codeblue.galencentre.org/2025/02/universal-screening-for-developmental-disabilities-for-children-in-malaysia-malaysian-paediatric-association/]

Garner, P. W., & Waajid, B. (2012). *Emotion Knowledge and Self-Regulation as Predictors of Preschoolers' Cognitive Ability, Classroom Behavior, and Social Competence. Journal of Psychoeducational Assessment, 30(4),* 330–343. https://doi.org/10.1177/0734282912449441

Giguere, D., & Hoff, E. (2023). Bilingual children's vocabulary skills at 5 years predict reading comprehension development within, not across, languages. *International Journal of Bilingual Education and Bilingualism, 27*(2), 240–252. https://doi.org/10.1080/13670050.2023.2166397

Global Research on Developmental Disabilities Collaborators. (2018). *Developmental disabilities among children younger than 5 years in 195 countries and territories, 1990–2016: A systematic analysis for the Global Burden of Disease Study 2016. The Lancet Global Health, 6(10),* e1100–e1121. *https://doi.org/10.1016/S2214-109X(18)30309-7*

Grantham-McGregor, S., Cheung, Y. B., Cueto, S., Glewwe, P., Richter, L., & Strupp, B. (2007). *Developmental potential in the first 5 years for children in developing countries. The Lancet, 369(9555),* 60–70. https://doi.org/10.1016/s0140-6736(07)60032-4

Guralnick, M. J. (2017). Early intervention for young children with developmental delays: Contributions of the developmental systems approach. In H. Sukkar, C. J. Dunst, & J. Kirkby (Eds.), *Early childhood*

intervention: Working with families of young children with special needs (pp. 17–35). Routledge/Taylor & Francis Group.

Hwang, A.-W., Chao, M.-Y., & Liu, S.-W. (2013). A randomized controlled trial of routines-based early intervention for children with or at risk for developmental delay. *Research in Developmental Disabilities, 34*(10), 3112-3123. https://doi.org/10.1016/j.ridd.2013.06.037

Khasanah, A. N., Djamhoer, T. D., Kusdiyati, S., & Hamdan, S. R. (2020). Designing teacher training to improve early detection of children with special needs. *Advances in Social Science, Education and Humanities Research, 456*, 423-428. https://doi.org/10.2991/assehr.k.200225.066

Kiing, J. S. H., Neihart, M., & Chan, Y. (2019). Teachers' role in identifying young children at risk for developmental delay and disabilities: Usefulness of the Parents' Evaluation of Developmental Status tool. *Child: Care, Health and Development, 45(5),* 637-743. https://doi.org/10.1111/cch.12693

King, P., & Boardman, M. (2006). What Personal/Social Skills are Important for Young Children Commencing Kindergarten? Exploring teachers' and parents' insights. *Australasian Journal of Early Childhood, 31(3),* 15–21. https://doi.org/10.1177/183693910603100304

Kolb, B., & Gibb, R. (2011). Brain plasticity and behaviour in the developing brain. *Journal of the Canadian Academy of Child and Adolescent Psychiatry, 20*(4), 265–276. PMID: 22114608; PMCID: PMC3222570.

Lai, D.-C., Tseng, Y.-C., & Guo, H.-R. (2018). Characteristics of young children with developmental delays and their trends over 14 years in Taiwan: A population-based nationwide study. *BMJ Open, 8*, e020994. https://doi.org/10.1136/bmjopen-2017-020994

Lai, N. K., Ang, T. F., Por, L. Y., & Liew, C. S. (2018). The impact of play on child development: A literature review. *European Early Childhood Education Research Journal, 26*(5), 1–19. https://doi.org/10.1080/1350293X.2018.1522479

Landry, S. H., Anthony, J. L., Swank, P. R., & Monseque-Bailey, P. (2009). Effectiveness of comprehensive professional development for teachers of at-risk preschoolers. *Journal of Educational Psychology, 101*(2), 448–465. https://doi.org/10.1037/a0013842

McCoy, D. C., Peet, E. D., Ezzati, M., Danaei, G., Black, M. M., Sudfeld, C. R., et al. (2016). Early childhood developmental status in low- and middle-income countries: National, regional, and global prevalence estimates using predictive modeling. *PLOS Medicine, 13*(6), e1002034. https://doi.org/10.1371/journal.pmed.1002034

McNeill, B., Gillon, G., Gath, M., & Woodward, L. (2024). Trajectories of language development, cognitive flexibility, and phoneme awareness knowledge in early childhood. *Developmental Science, 27(2),* e13139. https://doi.org/10.1111/1460-6984.13139

Ministry of Education Malaysia. (2013). *Malaysia education blueprint 2013-2025*. Ministry of Education Malaysia.

Nasir, M. N., & Efendi, A. N. (2016). Special education for children with disabilities in Malaysia: Progress and obstacles. *Geografia: Malaysian Journal of Society and Space, 12*(10), 78–87.

Nelson, C. A., Sullivan, E., & Engelstad, A. M. (2023). Annual research review: Early intervention viewed through the lens of developmental neuroscience. *Journal of Child Psychology and Psychiatry, 64*(7), 785-798. https://doi.org/10.1111/jcpp.13858

Noyes-Grosser, D. M., Elbaum, B., Wu, Y., Siegenthaler, K. M., Cavalari, R. S., Gillis, J. M., & Romanczyk, R. G. (2018). *Early Intervention Outcomes for Toddlers With Autism Spectrum Disorder and Their Families. Infants & Young Children, 31(3),* 177–199. https://psycnet.apa.org/doi/10.1097/IYC.0000000000000121

Øksendal, E., Brandlistuen, R. E., Holte, A., & Wang, M. V. (2022). Associations between poor gross and fine motor skills in preschool and peer victimization concurrently and longitudinally with follow-up in school age: Results from a population-based study. *British Journal of Educational Psychology, 92*(2), e12464. https://doi.org/10.1111/bjep.12464

Pesce, C., Masci, I., Marchetti, R., Vazou, S., Sääkslahti, A., & Tomporowski, P. D. (2016). *Deliberate Play and Preparation Jointly Benefit Motor and Cognitive Development: Mediated and Moderated Effects. Frontiers in Psychology, 7.* https://doi.org/10.3389/fpsyg.2016.00349

Sahril, N., Chan, Y., Ahmad, N., et al. (2024). Functional difficulty among children in Malaysia – Findings from the National Health and Morbidity Survey (NHMS) 2019. *Journal of Health, Population and Nutrition, 43*, *179.*

Scherzer, A. L., Chagan, M., Kauchali, S., & Susser, E. (2012). Global perspective on early diagnosis and intervention for children with developmental delays and disabilities. *Developmental Medicine & Child Neurology, 54*, 1079–1084. https://doi.org/10.1111/j.1469-8749.2012.04348.x

Tirkey, S. S., Verma, R. K., Namdeo, H., & Gupta, A. K. (2023). Investigating the effectiveness of early intervention services for children with developmental delays. *International Journal of Academic Medicine and Pharmacy, 5*(5), 156-160.

Vitiello, V. E., & Greenfield, D. B. (2017). *Executive functions and approaches to learning in predicting school readiness. Journal of Applied Developmental Psychology, 53, 1–9.* https://doi.org/10.1016/j.appdev.2017.08.004

Vitrikas, K., Savard, D., & Bucaj, M. (2017). Developmental delay: When and how to screen. *American Family Physician, 96*(1), 36–43. PMID: 28671370.

Wang, L., & Wang, L. (2024). Relationships between motor skills and academic achievement in school-aged children and adolescents: A systematic review. *Children (Basel), 11*(3), 336. https://doi.org/10.3390/children11030336

World Health Organization. (2020). *Monitoring children's development in primary care services: moving from a focus on child deficits to family-centered participatory support. Report of a virtual technical meeting 9 – 10 June 2020.* World Health Organization. https://www.who.int/publications/i/item/9789240012479

World Health Organization. (2015). *WHO global disability action plan 2014–2021: Better health for all people with disability* (pp. 5–29). WHO Production Services. ISBN 978-92-4-150961-9.

Yage, Y., & Ali, L. (2025). A study to analyse the effects of sending children who are more likely to have developmental delays to early intervention programmes. *Lincoln University College, Petaling Jaya, Malaysia*.