e-ISSN : 2597-6052

MPPKI MEDIA PUBLIKASI PROMOSI KESEHATAN INDONESIA

Review Articles Open Access

A Systematic and Critical Review of Parental Program Integrated to Prevent and Manage Delay Development in Children

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ARTICLE INFO

Manuscript Received: 07 Feb, 2025
Revised: 20 May, 2025
Accepted: 11 Jun, 2025
Date of Publication: 03 Jul, 2025
Volume: 8
Issue: 7
DOI: 10.56338/mppki.v8i7.7442`

KEYWORDS

Parental-Based Program;
Delay Development;
Early Childhood

ABSTRACT

Introduction: Delay development is a crucial problem in the early childhood period. An effective parental program is an essential strategy to prevent and manage delayed development. However, limited number studies described how parental integrated to prevent and manage delay development systematically. This review aims to describe developmental delays and explore strategies for their prevention and management in early childhood.
Method: A total of 1,237 articles were extracted from four databases including, PubMed, Scopus, and Web of Science, using suitable keywords as; "parenting-based program," "delay development," "early childhood," and "parenting style." The appraisal of the systematic review was based on the PRISMA format.
Result: This review described four domains of developmental delays among childhood, such as physical, cognitive, language and social, and emotional development. There were nine tools for early childhood developmental screening. The effective parental program focused on the problem-solving, positive parent-child relationship, quality of communication, coaching the child, and stimulating the home learning environment.
Conclusion: Effective management suggested positive of the parental program on improvement of child development and child behaviors and improvement of antisocial personality. From the findings, healthcare providers should promote a parental-based program to prevent and manage the delayed development of the early childhood period.

Publisher: Fakultas Kesehatan Masyarakat Universitas Muhammadiyah Palu

INTRODUCTION

Delay development is a crucial problem in early childhood, with a prevalence of about 1% to 3% of the total population (1). The degree of developmental delay is further sub-classified as a mild developmental delay, which is functional age <33% below chronological age. The moderate developmental delay has a functional period of 34%–66% of chronological age, while children who have the functional age <66% of chronological age are considered severe developmental delay (2).

In general, delay development can be defined as a delay in two or more developmental domains of motoric, language, cognition, social, and activities of daily living among children (3). World Health Organization estimated that 5% of the world's children have some degree of moderate to severe disability (4). In Norway and Scandinavia, developmental disabilities occurred in 6.3 % to 33 % of children below school age (5).

The delayed development has negative impacts on emotional, behavioral, and health problems later in life (6, 7), difficulties in parent-child care and the parent-child relationship (8, 9), educational achievement (8), and economic impacts on the families and societies (10, 11).

Several factors were associated with delayed development in early childhood, including infection, under-nutrition, child abuse, neglect, and low birth weight. Family factors were also remained as a proxy to influence the delayed development, including low maternal education, large family size, and low level of developmentally enhancing parenting practice (12).

Parents play a fundamental role in child upbringing, from prenatal care to educational and developmental decision-making. The function of the parents starting from prenatal care to other critical decisions regarding the quality of time and relationship within the family, choice of early childhood education, and financial allocation devoted to promoting child development, moral development, development of disciplines as well as a healthy home environment (13). Their responsibilities encompass prenatal care, fostering a healthy home environment, managing the quality of family relationships, and making key choices about early childhood education and financial allocation to support child development, moral growth, and discipline. However, while the centrality of parents in these domains is well-documented, there remains a notable gap in understanding how variations in parental decision-making and resource allocation influence long-term outcomes across diverse socioeconomic and cultural contexts. This review seeks to address these under-researched aspects, providing insights into the nuanced ways in which parental roles shape developmental trajectories

A study confirmed that mothers' positive beliefs could improve children's behavioral problems and maternal stress among families of developmentally delayed families (14). Another study also examined the effects of the parent-child relationship on reducing the parent-child conflict in early childhood (15). Moreover, the parental program positively impacts cognitive ability, language ability, physical ability (gross and fine movement), social competence, and self-care ability of children with developmental delays (16).

However, the lack of skills in child care and child rearing is common among parents. It may confront delayed development and other problems such as child abuse and child neglect. Prior studies have highlighted the importance of early interventions but have not comprehensively established screening tools to assess developmental delays or evaluated parenting styles associated with early childhood development (9,15). This study aims to bridge these gaps by systematically extracting and synthesizing relevant research to identify effective methods for addressing these challenges, promoting early life development, and managing delayed development. By doing so, this review contributes original insights and practical strategies that can serve as guidelines for organizations and healthcare workers to enhance early childhood development outcomes effectively. Fruitful findings will benefit the responsible organization and health care workers to use as guidelines for improving early childhood development effectively in the future.

Objectives

This study has two main aims comprised of; 1) to describe the definition of delay development, its' components, and instruments for screening for delay development as well as instruments to assess parental styles, 2) to explore and describe narratively related studies toward parental-based program on preventing and managing delay development among early childhood period.

METHOD

Data Sources and search strategy

The systematic review utilized three databases: PubMed, Scopus, and Web of Science, to extract relevant articles related to parental-based programs for preventing delayed development. To ensure a rigorous and reproducible search process, the search strategy incorporated Boolean operators, filters, and specific MeSH terms where applicable.

Search Terms and Boolean Operators

The following search strings were developed and applied: 1) "Parental-based program" AND "delayed development". 2) "Parenting styles" OR "early childhood" AND "screening tools for delayed development". 3) Each search term was tailored to the specific database, utilizing advanced search options. 4) In PubMed, Medical Subject Headings (MeSH) terms such as “Parental-based program” and “Developmental Delay” were combined using Boolean operators (AND/OR). 5) In Scopus and Web of Science, search filters included “Title/Abstract/Keywords” and “Exact phrase matching.”

The search strategy was pilot-tested to ensure comprehensiveness and reproducibility. Any inconsistencies in the retrieved results were resolved by refining the search terms and Boolean combinations.

Table 1. Database searching

Database	Search term	Retrieved
PubMed	Parental program AND Delay Development AND childhood Screening tools for delayed development	195 documents
Scopus	Parental program AND Delay Development/ Family-based program AND Delay Development Screening tools for delayed development	462 documents
Science Direct	Parental program AND Delay Development AND childhood Family-based program AND Delay Development Screening tools for delayed development	770 documents

Inclusion criteria

Suitable abstract and title related to the topic were reviewed for further screening if they met all of the following inclusion criteria. The inclusion criteria were as follow: 1) screening tools for delay development; 2) peer-reviewed research that measured parenting program of delay development among early childhood period who’s aged between 1 to 3 years; 3) regard to the parenting program, all prevention, and management strategies were involved in this review; 4) full-text English language publications, published between 2008 and 2022; 5) studies measured the parenting styles along with any determinants and predictors of developmental delay domains in quantitative studies such as experimental study and observational study.

Data screening and data extraction

The systematic review followed the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines to ensure transparent and reproducible reporting of the study selection process. The selection process is summarized in Figure 1 such as 1) Initial Search and Identification: The search strategy was applied across PubMed, Scopus, and ScienceDirect, yielding 1,427 records. Duplicate records were removed before proceeding to screening; 2) Title and Abstract Screening: A total of 1,204 records were excluded during this stage, based on the inclusion criteria. Common reasons for exclusion included irrelevance to the topic, lack of focus on the parental-based program, and failure to address delayed development measures; and 3) Full-Text Screening: Of the 223 abstracts screened, 21 full-text articles were assessed for eligibility.

The first reviewer used the inclusion criteria to examine each title and abstract of the studies. If the reviews did not match our inclusion criteria, they would be excluded from our listed data. The second reviewer extracted and grouped all articles based on the keywords and study designs. Both reviewers appraised and evaluated all relevant articles based on the guidelines.

To ensure consistency, two independent reviewers conducted the screening and selection process. Any disagreements between reviewers were resolved through discussion, with a third reviewer serving as an arbitrator when necessary. Inter-rater reliability was assessed using Cohen's Kappa, which achieved a score of 0.85, indicating a high level of agreement.

RESULTS AND DISCUSSION

The number of publications obtained at the inclusion stage was 145 in the last two decades, from 2007 to 2025. The data source was research articles (100 %).

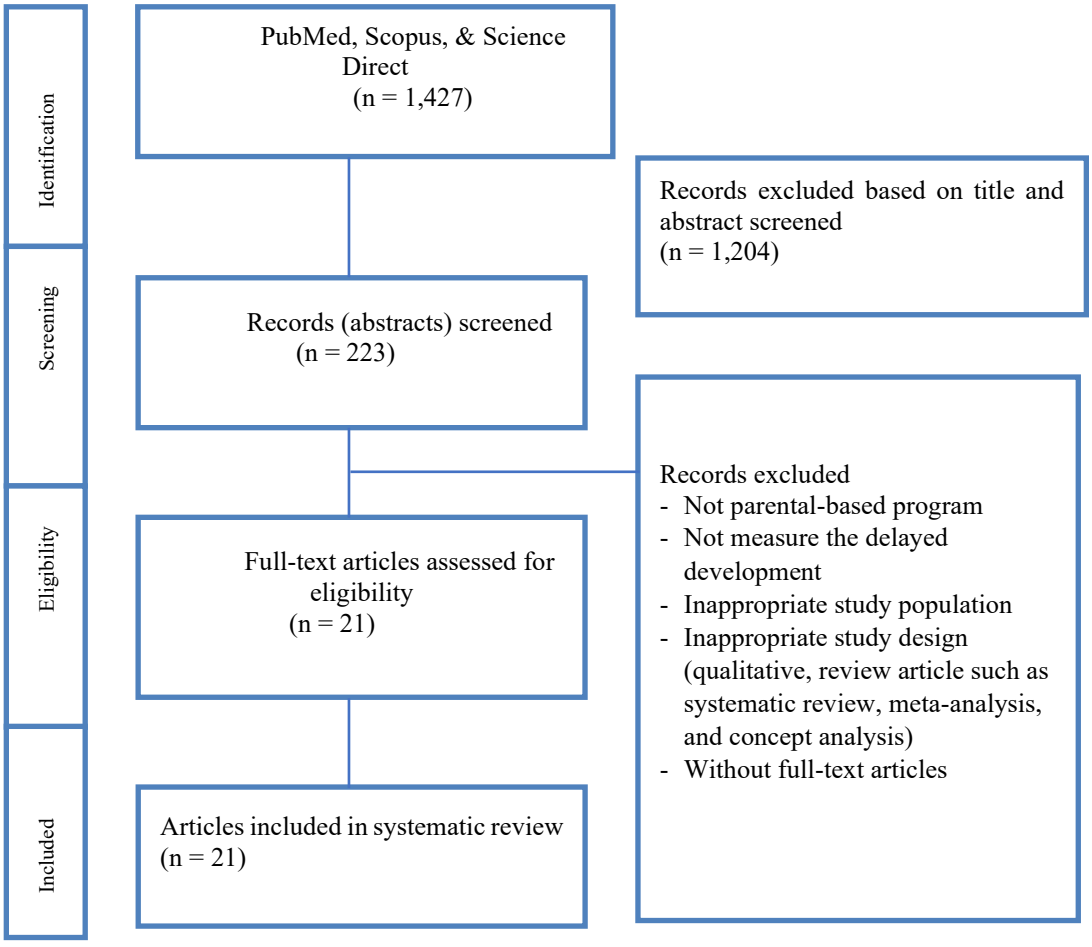

Figure 1. Summary of evidence search and selection criteria based on PRISMA format

Assessment on quality of review articles

The thirteen-item checklist tool adapted from the Consolidated Standards of Reporting Trials (CONSORT) was used to identify the quality of each study (17). The components of this instrument consisted of; 1) adequate sequence generation, 2) allocation adequately concealed, 3) blinding of participants, 4) blinding of participants or healthcare providers, 5) blinding of outcome assessor, 6) incomplete outcome data adequately addressed, 7) selective reporting, 8) group similarity at baseline, 9) Co-intervention, 10) compliance, 11) intention to treat analysis, 12) timing of outcome assessment, and 13) free of other bias. Among thirteen items, a score of 0 was defined as an unmet

indicator, while one was described as a met indicator. Total scores could be classified as low (0–4), moderate (5–9), or high (10–13) quality. CONSORT provides a standardized checklist for evaluating the quality of RCT reporting. This ensures that all included studies meet a baseline level of methodological rigor, enhancing the reliability of the systematic review

For correlational studies, the quality appraisal tool adapted from an instrument in previously published systematic reviews (18). It was used to assess four areas of the study comprised of; research design, sampling technique, outcomes measurement, and statistical analysis. Thirteen criteria were evaluated in the tool, with a total of 13 possible points. Based on assigned points, studies were categorized as low (0–4), moderate (5–9), or high quality (10–13).

Synthesis of results

Content analysis was used in this review to synthesize the results. The narrative summary of key findings was described by textual explanation with matrix tables without using meta-analysis because of the heterogeneity of study designs and the limited number of studies involved in this review.

Quality assessment

Table 2 showed an appraisal of article assessment for the experimental study, while table 3 indicated the appraisal from the observational study. Twelve experimental studies were considered a high validity rating. Six correlation studies also reported the high validity rating of articles. Overall, the previous studies in this review have a low risk of bias.

Table 2. Quality assessment summary of cross-sectional studies

Quality assessment summary of correlational studies	Study 4	Study 14	Study 15	Study 16	Study 17	Study 18
Design						
1. Was the study prospective?	1	1	1	1	1	1
2. Was probability sampling used?	1	1	1	0	0	0
Sample						
3. Was the sample size justified?	1	1	1	1	1	1
4. Was the sample drawn from more than one site?	1	1	1	1	0	0
5. Was anonymity protected?	1	1	1	1	1	1
6. Response rate more than 60%	1	1	1	1	1	1
Measurement						
7. Was the factor measured for reliability?	1	1	1	1	1	1
8. Was the factor measured using a valid instrument?	1	1	1	1	1	1
Measurement of DV						
9. Are the effects observed rather than self-reported?	0	0	0	0	0	0
10. Did the scale used for measuring the outcomes have an internal consistency of more than 70	1	1	1	1	1	1
11. Was a theoretical model/framework used for guidance?	1	1	1	1	1	1
Statistical analysis						
12. If multiple factors were studied, are correlations analyzed	1	1	1	1	1	1
13. Are outlier managed	1	1	1	1	1	1
Total	12	12	12	11	10	10
Overall study validity rating: (0-4 = low; 5-9 = Medium; 10-13 = High)						

RESULTS

Search results

Using a search strategy, we identified 1,427 articles from different databases between 2008 and 2022. After the title and abstract screening, 1,204 articles were removed out from the list. After the abstract screened process, we excluded 223 articles from the list because it was not related to the topic of delay development, not related to the parental-based program, inappropriate study population, and articles without full text. Finally, 21 articles for further investigation with full-text available studies. Of 21 articles, 15 were experimental study design, and 6 were conducted with the observational study.

Definition of delay development

Childhood delay development can be defined as a delay in two or more developmental domains of motor, language, cognition, social, and activities of daily living (3). Impacts of delayed development may affect a child's ability to deal with their daily life and failure to compete with skills in learning, thought, perception, and social relationships with others (3).

The domain of child development

In general, delayed developmental domains among childhood were 1) physical growth, 2) cognitive-behavioral development, 3) language development, and 4) emotional or social-environmental development. Explanatory details would be as follows;

Physical Development

In the early childhood period, physical development, including learning how to walk and access the new territory. Boundless energy and insatiable curiosity drive the child to explore the environment and master new skills. Increased motor skills, immaturity, and lack of experience also place the toddler at risk for accidental injury.

Delayed physical development will occur when failure to develop new skills on the gross motor domain such as walking lately and maybe mildly hypotonic, especially in the lower limbs (19).

Table 3. Quality assessment summary of experimental studies

No	Quality assessment summary of experimental studies	Study 1	Study 2	Study 3	Study 5	Study 6	Study 7	Study 8	Study 9	Study 10	Study 11	Study 12	Study 13	Study 19	Study 20	Study 21
1	Random sequence generation	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2	Allocation concealment	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
3	Blinding of participants	NM	1	NM	NM	1	1	1	1	NM	1	NM	1	1	1	1
4	Blinding of personnel/care providers	NM	NM	NM	0	1	1	NM	0	NM	0	NM	NM	NM	NM	NM
5	Blinding of outcome assessor	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
6	Complete outcome data	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
7	Selective reporting	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
8	Group similarity of baseline	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
9	Co-interventions	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
10	Compliance	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
11	Intention to treat analysis	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

No	Quality assessment summary of experimental studies	Study 1	Study 2	Study 3	Study 5	Study 6	Study 7	Study 8	Study 9	Study 10	Study 11	Study 12	Study 13	Study 19	Study 20	Study 211
12	The timing of outcome assessment	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
13	Other bias	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Total		10	11	10	10	12	12	12	12	10	11	11	12	12		
Overall study validity rating: (0-4 = low; 5-9 = Medium; 10-13 = High)																

Cognitive skill

Cognition can be defined as the process of acquiring or manipulating knowledge, including abilities such as memory, problem-solving, and analytical skills (20). For infants and the early childhood period, cognitive development includes problem-solving with objects, such as learning how to accumulate the objects and understanding of mathematics by demonstrating to know what it means when someone asks for "one" or "two" or something. While a school-aged showed the development of cognitive skills by learning more complex information with abilities on the analytical aptitude, processing speed, and logical reasoning.

Genetics has proved to play a role in a child's developing skills. Empirical evidence also confirmed that genetic and environmental interaction has a positive association with child development. Children with more stimuli at home and responsive caregivers were more cognitively advanced than children who have less stimulating dwellings (21).

Language development

The development of children's language starts long before the emergence of the first word (22). Early indicators of language development could be identified in several skills, including babbling, pointing, and gesturing in infancy, the emergence of first words and sentences in the first two years (23). Contrary to the preschool indicators, language development is the ability to produce and understand terms.

Home environments and family relationships can stimulate language development. Children whose parents are not literate were associated with delays developmentally of speech and vocabulary (24). Also, less infant-directed speech has reduced lexical richness and sentence complexity, contributing to vocabulary growth (25).

Social and emotional development domains

Social and emotional development has been associated with many domains of children's development. The relationship between children and their caregivers becomes a center of social and emotional development in the first two years of life. A study confirmed that warm and responsive relationships within the family are essential to build trust and help them deal effectively with frustration, fear, and other negative emotions (26). In the preschool period, the social and emotional developmental skills can be expanded into several developmental skills, including children's social competence, behavior management, social perception, and self-regulatory abilities, to demonstrate emotional and behavioral control in stressful situations. The summary of childhood developmental domains is presented in table 4.

Table 4. The domains of childhood development

Developmental Domain	Skill/component/defining
Physical developmental domain	Gross movements, fine movements, hand to eye coordination, and balance and
Cognitive developmental domain	Cognitive development comprises two subdomains, including 1. Intellectual development of childhood - Capability to process the thoughts - Hold adequate attention - Remember the events - Understand the environment

Developmental Domain	Skill/component/defining
Language developmental domain	- Capacity to plan, predict, regulate and evaluate any given task or situation experience 2. Childhood creativity - Using fantasy to mold the identity - Self-expression in a different situation
The social and emotional development domain	1. Correct sound production to express the words 2. Proper use of words 3. Grammatically correct language 4. Appropriate tone, gestures, and body language in some situations The social and emotional development domain deals are the children's ability to understand the expressions of emotions, form attachments, play with others, and handle peer pressure.

Screening instruments on childhood development

The early childhood development assessments must be valid and reliable across diverse sociocultural contexts to ensure accurate identification and intervention. Moving forward, the review will explicitly examine whether and how each tool accommodates cultural differences, including language variations, cultural norms, and socioeconomic factors, to provide a more comprehensive understanding of their applicability in diverse populations. This addition will strengthen the review's relevance and utility for global child development practices. Screening instruments on childhood development were identified from previous studies as follows:

Cognitive development instrument

The Basley Scale of Infant Development-II was commonly used to measure cognitive development in childhood. It has been applied in one study to address children's mental and motor development (27). The BSID-II demonstrates high internal consistency across its subscales, with Cronbach's alpha values typically ranging between 0.80 and 0.90, indicating strong reliability. The content validity of the BSID-II was developed based on extensive research in child development, ensuring that its items comprehensively represent key developmental milestones

Physical development instrument

Two studies applied the Height for age z-scores (28) and Barley Scale of Infant Development-II (27) to measure physical development among childhood periods. Another study used the Peabody Developmental Motor Scale-Second Edition to measure physical development (29). The instrument consisted of 6 sub-domains: reflexes, stationary, locomotion, object manipulation, grasping, and visual-motor integration. The PDMS-2 demonstrates strong internal consistency, with Cronbach's alpha values ranging between 0.89 and 0.98 for various subscales. This indicates high reliability of the scale in assessing motor abilities

Language development instrument

Two instruments were used to measure childhood language development, including Mandarin-Chinese Communicative (CDI) (29) and Communicative Development-Inventory Scale (28). The Mandarin-Chinese Communicative Developmental Inventory focused on measuring language and communication development, including expressive, vocabulary, semantic function, sentence complexity, and word combination. At the same time, the Communicative Development-Inventory Scale focused on measuring 18-month speech with a 60-word vocabulary checklist in the local language. The Mandarin-Chinese CDI exhibits high internal consistency, with Cronbach's alpha values exceeding 0.90 across various subdomains (e.g., vocabulary production and comprehension). The content validity of Mandarin-Chinese CDI was developed and adapted from the MB-CDI through extensive pilot testing and cultural modifications, ensuring that items are culturally and linguistically appropriate for Mandarin-speaking children

Social development instrument

In this review, only one study addressed the social development among childhood periods using the Scale of Strengths and Difficulties (30). This instrument focused on social interaction and relationships with others. The SDQ demonstrates acceptable to good internal consistency across its subscales, with Cronbach's alpha values ranging between 0.70 and 0.85. Factor analyses support the five-domain structure of the SDQ, indicating that it accurately measures distinct yet related constructs of social development and behavioral challenges

Instruments to assess parenting styles and psychological problems

Poor parenting style has been proven as an influential factor in the delay in childhood development. Assessment of parental style and psychological problems that occurred when rearing the child is necessary for healthcare providers to consider and use as a guideline for improving the parent-child relationship.

The inclusion of the Parenting Behavior and Style Scale and the Parents' Depression Scale offers new insights by linking specific parental behaviors and psychological well-being directly to early childhood developmental outcomes. Unlike prior studies that may have assessed parenting practices or child development in isolation, this review synthesizes how variations in parenting styles measured systematically by the Parenting Behavior and Style Scale interact with parental mental health, captured by the Parents' Depression Scale, to influence developmental trajectories. There were several instruments to indicate the parental style, such as:

Parenting Behavior and Style Scale

Seven studies applied various instruments to measure the parenting behavior and parenting style among parents. Two studies involved the Parent Sense of Competence Scale (31, 32). one study applied the Positive Parenting-Parent Report (33). one study applied the Parenting Scale (34), one study applied the Parenting and Family Adjustment Scale (35). Another study applied the Parenting Behaviors Questionnaire (36), and one study used the Parenting Style and Dimension Questionnaire (37). All of the instruments were self-administered checklist questionnaires by parents with positive and negative items of a rating scale to determine their practices on child-rearing.

Parents' Depression Scale

Many shreds of evidence showed a positive correlation between parents' depression with parenting style on child-rearing. Six previous studies used questionnaires to measure the parents' depressive symptoms, including Beck Depression Inventory (38), Parental Stress Scale (34), 14-item Maternal Emotional Style Questionnaire (39), Depression Anxiety Stress Scale (DASS) (32), and Depression Scale (27). Another study used a Self-reported measure of the mother's depressive symptoms to address the psychological problem during taking care of the children (28). All of the instruments to assess the parental psychological problems were also a self-report checklist.

Parental program to prevent delay development

Parenting becomes an essential strategy for preventing and managing childhood delay development. An effective parental program can improve the skill of parents and children behaviors. However, many parents are reluctant to adjust intensively to management due to preventing delayed development. Concerning this issue, specific strategies to approach management delay development include; Triple P-Positive Parenting Program (Triple-P) (34, 35, 40) to promote positive parental style. Individual and group-based parenting program (28, 30-33, 38, 41) to enhance experience sharing among parents, Conditional cash transfer program (28) to improve positive behaviors of family members, and Smalltalk intervention (41) to improve the positive relationship and effective communication between parents and children. Elaborated details of each study can be summarized in table 5.

Table 5. Parental-based program on prevention of delay development among early childhood period

No	Author/Year	Design	Program	Parenting-Based Family Function Intervention	Instruments	Outcomes	
						Child Development	**Parents outcomes**
1	Hutching et al. (38)	RCT	Group-based parenting program	• Relationship-enhancing and discipline strategies • Emphasis on learning principles rather than prescriptions for becoming effective problem-solvers • Role-play rehearsal of new skills • Homework with reading and practice assignment • Encouraging to keep records of their practice at home and set the goals • Weekly feedback	• Beck depression inventory-II (BDI-II) • Parenting stress index • Schedule of growing skill (SGS-II)	The child showed a significant on child development and child behaviors	The intervention group showed a positive effect on mental well-being
2	Scott et al. (30)	RCT	Parenting program	Parenting intervention • Offering to groups of six to eight children over 13-16 weeks covered of the program including play, praise, and rewards; limit-setting and handling misbehavior • Receiving videotaped scene to show about how to handle the children • Supporting on practice alternative ways of managing the children • Weekly supervision to ensure adherence to the manual	• The scale of the strengths and difficulties questionnaire and self-report delinquency instrument to measure antisocial behaviors • A five-minute speech sample was used to assess the child relationship quality	The children were improved on antisocial personality after receiving the program	The parent expressed emotion was warmer after receiving the program; however, no significant difference indirect observation of parenting
3	Donnelly et al. (31)	Correlation study			• Child behavior checklist for ages 1 ½ was used to measure the problem of childhood. • The family impact questionnaire (FIQ) was used to measure the family impact of the child, including feeling about parenting and social relationship, positive feelings about parenthood.	The results showed a positive effect on reducing child behavior problems among childhood.	The results also were significant in reducing the negative parent-child interaction.

Table 5. Continued

No	Author/Year	Design	Program	Parenting-Based Family Function Intervention	Instruments	Outcomes	
						Child Development	Parents outcomes
4	Bodenmann et al. (40)	RCT	Triple P-Positive Parenting Program (Triple-P)	• Providing parents knowledge about parenting • Providing anticipatory developmental guidance to parents with mild behavior difficulties • Active skill training to solve behavior problems • Individual and group session, or self-help parenting program for parents with severe behavioral challenges • Behavioral family intervention for resolving the relationship conflict, parental depression, or high levels of stress	• Parenting scale for measuring parent's dysfunctional discipline style • Parenting sense of competence to evaluate parenting role • Parent problem checklist for measuring inter-parental conflict • Eyberg child behavior inventory to measure the parental perception of disruptive behavior • Dyadic adjustment scale to measure the quality of the relationship	The program was associated with the lower rates of child's misbehaviors	The intervention showed a positive effect on parenting, parenting self-esteem, and decreasing stressor-related parenting.
5	Hsieh et al. (29)	RCT	Family-centered program	• Individualized training for improving children recognition, communication, physical function, and social interaction • Emphasize parental engagement • Nurtured parent-child and parent, educator, and therapist interaction • Shared information and experiences with professionals and other parents	• The Mandarin-Chinese communicative developmental inventory • Peabody developmental scales-second edition • Child health questionnaire • Pediatric quality of life	The program was a positive effect on health-related quality of life and improved physical health, global function.	The intervention also showed a positive effect on parental health-related quality of life.
6	(41)	Quasi-experimental	Parenting program	• Drawing up the goals of the occupational therapy plan • Designing integrated rehabilitation activities to promote children's cognition, language, action, social, and self-care abilities and induce functional activity in children. • Enhancing parental care skills and encouraging parent-child interaction.	• Parent-report measures for measuring the parent's responsively • Observational test for measuring parent-child interactional to promote positive child cognitive, language, and social-emotional skill		The program showed a positive effect on verbal responsively and home learning activities among parents.

Table 5. Continued

No	Author/Year	Design	Program	Parenting-Baed Family Function Intervention	Instruments	Outcomes	
						Child Development	**Parents outcomes**
7	Lachman et al. (33)	RCT	Parenting program	• Designing the goals of children behaviors • Child-led play • Emotional communication • Praise and rewards • Instruction-giving and household rules • Nonviolent discipline such as ignoring negative attention-seeking behavior • Practicing parenting skills and group discussion • Implementing parenting skills at home	• Harsh parenting-parent report • The positive parenting-parent report was assessed to measure positive parenting. • Child behavior problem-parent report • Observed parenting and child behavior • Parenting stress, Parental depression, perceived support	The program was a positive effect on child behaviors	The program was a positive effect on parent-report of positive parenting and assessment of the parent-child play
8	Leung et al. (34)	RCT	Group Triple-P program	• 2-hour group sessions and two telephone contact follow-up sessions • Mini lecturer, discussion, role play, and exercise	• Eyberg child behavior inventory • Parental stress scale • Parenting scale • Parent problem checklist • Client satisfaction questionnaire	The intervention showed a lower level of child behavior problems	The intervention showed a positive effect on parental stress, dysfunctional discipline style, and parental conflict scores.
9	Guo et al. (35)	RCT	Group Triple-P program	• 4x2 hours group sessions for four weeks. • Telephone consultation for each week • Discussion, watching the video, role play, and homework for parents • Skill on parenting such as the strategy to develop a good relationship, encouraging the desirable behaviors, teaching new skills and behaviors, and managing children's misbehaviors	• The parenting and family adjustment scale • The child adjustment and parent efficacy scale • Parenting in a child's academic context questionnaire • Academic problem behavior questionnaire • Parental perception of child academic achievement • Parent-report academic self-regulation questionnaire • Client satisfaction questionnaire	The program showed a positive effect on increasing child reports of positive parenting.	The program showed a positive impact on child adjustment problems, parenting practice, parental adjustment, and parenting self-efficacy.
10	Shin et al. (47)	RCT	Home-based intervention	• Three months of weekly training of development skill • Five core developmental modules such as communication language/literacy, exploration, and approaches to learning (problem-solving and reasoning) • Age-appropriate activities, interactions, parents task	• The VABS II-survey interview form to assess the children's development •	After receiving the program, the intervention positively affected adaptive behaviors, socialization, and communication skills.	
11	Fernald et al. (28)	RCT	BDH program	• Taking children to preventive health check-ups • Inquiring about the minimum level of attendance at school for school children. • Assessment of cognitive or language function in children • Education evaluation	• Communicative development inventory (CDI) • Height for age z-scores (54) • A self-reported measure of the mother's depressive symptoms	The intervention group showed a positive effect on the number of words to say among children and	There is no significant effect on maternal depressive symptoms or parental harshness.

						•	the probability words combining two or more words.	
12	Havighurst et al. (39)	RCT	Emotion-focused parenting program	• The program taught parents to emotion coach their children through a series of exercises, role-play, instructional materials, and psycho-education • Three sessions on attending to children's lower intensity emotions and then reflecting, labeling, and empathizing with the child's emotion		• 14-item maternal emotional style questionnaire (MESQ) • Difficulties in emotional regulation scale (DERS) • The general health questionnaire-28 to assess the parent well-being • The Eyberg child behavior inventory	The results showed decreasing problematic child behaviors	The results showed a positive effect on emotion coaching and a significant reduction in emotion dismissing with their children. The results also improved child behaviors.
13	Hayes et al. (32)	RCT	Parenting program	• Designing a care plan for the mother included parental well-being, parent-child interactions, child development, child behavior, play, safety, feeding/diet, settling /sleep, and daily routine. • The group work included maternal health nurse-led discussions on settling, sleep difficulties, lactation, breastfeeding, infant formula, weaning, first solids, reading child's cues, and challenging behaviors. • Sleep intervention focused on settling strategies and regular checking.		• Depression anxiety stress scale (DASS) was used to measure parental distress. • The parenting sense of competence scale (PSOC) was used to measure parental self-efficacy. • A goal achievement scale was used to address the child's behaviors • Severe behavior assessment form was used to measure a child's problem behaviors	The results showed decreasing problematic child behaviors	The results showed a positive effect on depression improvement, anxiety, stress, parental satisfaction

While the categorization of programs effectively highlights the range of strategies available, the review would benefit from a stronger emphasis on how these programs innovatively integrate behavioral and structural interventions. By comparing these interventions with earlier models that often focused solely on either behavioral or structural elements, this review highlights how these programs represent an evolution in addressing delayed development. This perspective adds depth to the synthesis and underscores the innovative potential of integrating multifaceted strategies for improved outcomes.

Triple P-Positive Parenting Program (Triple-P)

Triple P-Positive Parenting Program (Triple-P) is a multi-level program. It offers treatment to solve severe behavioral, emotional, and developmental delay problems among children aged 0 to 16 years by enhancing parents' knowledge, skills, and confidence in dealing with child care and child-rearing. This strategy starts from the education and counseling approach as a crucial point of behavior change. It explores the method to solve the relationship conflict within the family, parental depression, and other behavioral difficulties (40). Several studies have confirmed that this Triple-P had a positive effect on preventing delayed development (42, 43). Another study was also showed declination in the rate of child abuse and the reduction of foster care placements (44).

Small talk program

A small talk program was developed in collaboration with service providers and parents to improve the ability of child language, communication, social, and emotional development. Specific goals of this program included firstly increasing the frequency of responsive parenting behaviors such as tuning in, following the child's lead, listening and talking, coaching the child with both quantity and quality of communication with gentle and warm engagement. The second strategy was to stimulate the home learning environment, such as sharing a book reading, supporting children's play, learning daily routines, community resources involvement, and monitoring media use. In contrast, education programs consisted of information related to self-care practice, personal agency to influence self-confidence and build connectedness (41). To support parent behavior change, healthcare providers facilitated parents' on-home coaching by engaging their children in routine activities using family-centered practices (45).

Conditional cash transfer (CCT) program

CCT program was designed as a cash transfer program requiring certain behaviors of household members to receive program benefits. The study was assumed that in low-income families, child development is affected not only by poverty but also by the negative mood of their parents when faced with an economic crisis. The program aimed to evaluate the impacts of the CCT program on child development across the countries. The primary outcomes were psychosocial, language, and cognitive development during the childhood development period (46).

The effects of the parental program on child and parents' outcomes

Summary of the impacts of intervention programs among children and parents can be summarized as follows:

Childhood development

Several studies showed a positive effect of the parental program on reducing delay development and aggressive behaviors (38, 40) and antisocial personality (30). Other health outcomes related to the quality of life and physical health (29), adaptive behaviors, socialization, and communication skill (47), and child's language development were significantly different after receiving the parental program.

Mothers with delayed development have an impact on poorer concurrent and later physical health than the mother of children with typical development. These conditions also could develop child behavioral problems and parenting stress (27). Another evidence confirmed a positive association between parenting style and children's behavior, and those children's problematic behaviors could be predicted with over-reactive parenting (36). For this reason, the parental program was effective in improving the child's development.

Parents' outcomes

This review examined the effect of the parental program on parents' outcomes. Five studies showed improvement in stress-related parenting (34, 40), emotion, and mental well-being (31, 38). It was also found the improvement of the parent-child relationship (31), verbal responsiveness of parents (41), parental satisfaction (32), and parental quality of life (29) after receiving the parental program. Other studies showed an association between positive beliefs of parents on their stress reduction and parenting style (14, 37).

DISCUSSION

We conducted a systematic review of 21 existing studies focused on a parental program to prevent and manage delayed development in childhood. Managing developmental delay and maintaining a specific parenting style among parents could avoid the risk of morbidity and reduce the negative impacts on emotional, behavioral, and health problems.

Four domains of childhood development were extracted from various studies to demonstrate a common problem in delayed development. Each part indicated global aspects of childhood development, including physical, cognitive, language, and emotional or social development. Each domain is interlinked. When any domain faced the problems earlier, the others would be affected in the later period. Physical growth and motor skills lay the foundation for children's ability to explore their environment, which in turn stimulates cognitive and social development. Studies have shown that children with delayed motor skills are at a higher risk for cognitive impairments due to limited engagement with their surroundings (48). Poor gross motor coordination has been linked to reduced opportunities for social interaction during play, which can hinder emotional regulation and social skills (49).

Cognitive abilities, such as memory, problem-solving, and attention, are essential for language acquisition and understanding social contexts. Evidence suggests that cognitive delays, particularly in early executive functioning, impede a child's ability to process and respond to language, leading to delays in expressive and receptive communication (50).

Children with speech or language delays often struggle with peer relationships and are more likely to experience frustration or social isolation (51). Research by Tomasello (2003) highlights the bidirectional relationship between language and social cognition, emphasizing that deficits in one domain can restrict the development of the other (52).

Almost all of the instruments to screen for childhood delay development found in our systematic review are focused on four domains of development. The instruments can be fitted with different contexts of each country by translating into the local language and a simple way of using by healthcare providers.

Those instruments are commonly used in the early childhood period from 1 month to 4 years. For example, the Mandarin-Chinese Communicative Developmental Inventory scale was carried out among 12 to 30 month period (53); MacArthur-Bates Communicative Development Inventories scale was carried out among children aged 16 to 30 months (54). Peabody Developmental Motor Scale was carried out among children aged 2.5 years old (55), and Bayley Scales of Infant Development (BSID) and Infant Development Scale (IDS) were carried out for infants and toddlers between 1 month to 42 months period (56). The early the developmental problem has been found, the promptly an action is needed.

Among the parents, several instruments from our systematic review indicated an association between the psychological problems of parents and delayed the development of the child. In general, the instruments were self-checklists when they faced depressive symptoms, anxiety, stress, and emotional disturbance. The advantage of the self-report does not require specialized training to administer and can be used across different settings.

This review found that the parental program approach used collaborative strategies across studies, including participatory learning, positive communication, good parental-child relationship, problem-solving, and effective responsiveness. Some authors proposed different methods to prevent and manage the delayed development, including the Triple P-Positive Parenting Program (Triple-P), Small talk Intervention, and Conditional cash transfer program. The strategy from different programs was sufficient to prevent and manage child development and improve the parents' abilities to perform appropriate parental style. A previous literature review summarized the key finding toward a family-based intervention by enhancing parental knowledge and skill on proper child-rearing will significantly improve a child's developmental outcomes (57)

Findings from this systematic review showed that parental programs positively affect parent responsiveness, child communication, and child-parent language interactions. However, the program did not have a positive impact on expressive language development. Another systematic review also demonstrated the effectiveness of the early childhood development program on preventing developmental delay (58). Therefore, the recent systematic review focused on the parental program, particularly those incorporating the parenting style strategies for managing and controlling the developmental delay among childhood.

Previous studies have proved the positive association between parenting style and child ability in gross and fine movement, social competence, and the ability to perform self-care (16). This also improves the mothers' parenting stress who has children with developmentally delayed (14).

Strengths and Limitations

Most of the previous systematic reviews focused only on parental-based programs to prevent and manage childhood delay development without a detailed description of tools to screen for child development and not focused on parental psychological problems and screening tools. In our study, we involved our review focused on domains of childhood development and screening tools, parental styles, psychological issues, screening tools, parental programs to prevent and manage delay development, and health outcome measures. The findings from this study provided valuable information for healthcare providers for the effective designing of the parental program to prevent and manage delayed childhood development. However, this study still encountered some limitations since we described results in a narrative form rather than systematic and meta-analysis. This is due to a few publications focused on preventing delay programs for the childhood population.

CONCLUSION

This review describes the valuable information regarding the parenting-based program to prevent delayed development in early childhood. The findings of this study provide valuable insights for designing effective parental programs to prevent developmental delays in early childhood. The family-centered program should be integrated to implement the parenting-based program for program effectiveness.

AUTHOR'S CONTRIBUTION STATEMENT

All authors contribute in this study. RAP draft and writing this systematic review, KC review and edit the content of this study, AMU and WS assisting in searching the articles

CONFLICTS OF INTEREST

We declared that there is no conflict of interest in this study.

DECLARATION OF GENERATIVE AI AND AI-ASSISTED TECHNOLOGIES IN THE WRITING PROCESS

We declared that the writing of this manuscript is not assisted by generative AI or AI-Assisted technologies. All contents are edited by the English expert to improve the writing.

SOURCE OF FUNDING STATEMENTS

This article is part of the project which is funded by Indonesia Endowment Fund for Education (LPDP Scholarship)

ACKNOWLEDGMENTS

We acknowledge Mahidol University for facilitating the database for conducting this review. Our special thanks to the Indonesian Government and Indonesia LPDP scholarship Indonesia Endowment Fund for Education (LPDP Scholarship) for study grant supports.

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