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Analysis of Development in Stunted Children Based on Measurements within a Structured Play Therapy Context

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ABSTRACT: Stunting remains an important child health concern because developmental abilities may vary among affected children and cannot be fully represented by anthropometric status alone. This study aimed to analyze the development of stunted children based on developmental measurements within a structured play therapy context. An analytical observational study with a cross-sectional design was conducted among 358 stunted children aged 24 to 60 months in Makassar, Indonesia. Participants were selected using purposive sampling, with proportional sample allocation according to study area and KPSP age group. Development was assessed using the age-specific Kuesioner Pra Skrining Perkembangan (KPSP), while structured play therapy was used as a context for observing developmental responses. Overall KPSP results showed that 191 children (53.4%) had appropriate development, 124 (34.6%) had questionable development, and 43 (12.0%) had possible developmental deviation. Domain-specific assessment showed that 12.3% required further stimulation in the motor domain, 29.2% in the language domain, and 27.1% in the social-emotional domain. Cognitive data were available for 128 children, of whom 7.8% required further stimulation. Among 356 children with valid structured play observations, 84.6% demonstrated good or very good play quality. These findings demonstrate heterogeneous developmental profiles among stunted children, with relatively greater needs for further stimulation in language and social-emotional domains. Multidomain developmental assessment may complement growth monitoring, while structured play therapy may provide a child-appropriate context for observing developmental abilities without implying a causal therapeutic effect.

1. INTRODUCTION

Stunting remains an important child health problem because its consequences extend beyond impaired linear growth and may coincide with developmental vulnerabilities during a critical period of early childhood. In Indonesia, the 2024 Indonesian Nutritional Status Survey reported a national stunting prevalence of 19.8%, decreasing from 21.5% in 2023. Despite this decline, stunting continues to affect a substantial proportion of children and remains unevenly distributed across geographical and socioeconomic contexts. Therefore, monitoring children with stunting should not focus solely on anthropometric indicators but should also consider developmental functioning as an integral component of child health assessment (Badan Kebijakan Pembangunan Kesehatan, 2025).

Child development is a multidimensional process involving motor, language, cognitive, and social-emotional abilities. These abilities develop through interactions among biological maturation, nutritional status, health conditions, caregiving, learning experiences, and environmental stimulation. Evidence indicates that linear growth and developmental achievement do not necessarily progress in parallel across all children or developmental domains. A systematic review and meta-analysis showed that linear growth after 24 months was associated with several neurodevelopmental outcomes, although the magnitude and

consistency of these relationships varied across developmental measures and study contexts. This evidence suggests that anthropometric status alone cannot fully represent children's developmental functioning (Upadhyay et al., 2024).

Developmental heterogeneity has also been demonstrated specifically among children with stunting. A study involving 750 stunted children aged 12 to 59 months found variations in gross motor, fine motor, language, and social developmental outcomes, with developmental performance associated with nutritional, clinical, socioeconomic, and household characteristics (Mbabazi et al., 2024). Evidence from Indonesia further supports the importance of complementing anthropometric assessment with developmental evaluation. Jatnika et al. (2024) examined developmental characteristics among children with stunting and children with normal growth using the Child Development Card, reinforcing the relevance of integrating developmental information into the assessment of children with growth problems. Consequently, stunting should be understood as an important context of developmental vulnerability rather than as a condition that determines an identical developmental outcome in every child (Jatnika et al., 2024; Mbabazi et al., 2024).

Developmental monitoring is an important complement to growth monitoring in child health services. In Indonesia, developmental surveillance and screening are incorporated into child growth and development monitoring according to age. The Kuesioner Pra Skrining Perkembangan (KPSP) is used for early developmental screening and classifies developmental status as appropriate, questionable, or possible developmental deviation. As a screening instrument, the KPSP supports early identification of children who may require further developmental attention rather than establishing a clinical diagnosis. This distinction is particularly important among children with stunting because developmental screening provides information that cannot be obtained solely from anthropometric measurements (Kementerian Kesehatan RI, 2022).

Although standardized developmental instruments provide a systematic framework for assessment, the context in which young children demonstrate their abilities is also important. Play represents a developmentally appropriate activity through which children can move, manipulate objects, communicate, follow instructions, solve simple problems, express emotions, and interact with others. In pediatric nursing, developmentally appropriate assessment should consider not only whether a child can perform a particular task but also whether the assessment environment facilitates comfort, engagement, and observable developmental responses. Structured play may therefore provide a child-appropriate context for observing developmental abilities while maintaining predetermined assessment indicators and systematic observation procedures (Hockenberry et al., 2023).

The use of play as an assessment context is supported by play-based assessment approaches in early childhood research. A systematic review demonstrated that children's behavior during systematically organized play activities can provide relevant information about psychomotor, cognitive, and social-emotional functioning while highlighting the importance of integrated developmental assessment (Montoya-Fernández et al., 2024a). Further evidence from a play-based assessment battery indicates that structured activities can be incorporated into systematic developmental assessment while maintaining attention to reliability, construct validity, and content validity (Montoya-Fernández et al., 2024b).

Despite these developments, an important research gap remains. Studies involving children with stunting have predominantly examined developmental outcomes and their nutritional, biological, socioeconomic, and environmental correlates, whereas play-based assessment research has largely developed within early childhood education and general developmental settings. Evidence remains limited regarding the integration of standardized developmental measurement with structured play therapy as an observational context specifically among children with stunting, particularly in community child health and pediatric nursing settings (Mbabazi et al., 2024; Montoya-Fernández et al., 2024a).

Accordingly, the novelty of this study lies in integrating standardized developmental measurement with structured play therapy as a context for observing multidomain developmental responses among children with stunting. Structured play therapy was not positioned as an intervention intended to produce developmental change, and its therapeutic effectiveness was not evaluated. Instead, structured play activities provided a systematic and child-appropriate context in which developmental responses could be elicited and observed using standardized developmental indicators. Therefore, this study aimed to analyze the development of children with stunting based on developmental measurement results within a structured play therapy context, with particular attention to overall developmental status and motor, language, cognitive, and social-emotional developmental profiles (Mbabazi et al., 2024; Montoya-Fernández et al., 2024b).

2. MATERIALS AND METHODS

Study Design and Setting

This study employed an analytical observational design with a cross-sectional approach. The study was conducted among children with stunting aged 24 to 60 months in Makassar, Indonesia. A cross-sectional approach enabled developmental status, domain-specific developmental achievement, and structured play observations to be assessed within the same study period without prospective follow-up. Consequently, the design was intended to characterize developmental patterns and exploratory relationships rather than establish temporal or causal relationships (Wang and Cheng, 2020; Polit and Beck, 2021).

Structured play therapy was incorporated as the context in which developmental responses were elicited and observed. It was not administered as an experimental intervention intended to produce developmental improvement. This distinction was maintained throughout study implementation, analysis, and interpretation.

Population and Sample

The initial study population comprised 2,824 children. Following application of the study eligibility criteria, the accessible population consisted of 1,973 children with stunting aged 24 to 60 months. The minimum calculated sample size was 322 participants. After allowing for approximately 10% additional participants to accommodate potential incomplete or unusable data, the final sample consisted of 358 children.

Participants were selected using purposive sampling, with proportional sample allocation across study areas and KPSP age groups. Proportional allocation was used to distribute the predetermined sample across the study population and did not constitute a separate probability sampling technique. Participant selection was based on the eligibility criteria established in the approved research protocol (Campbell et al., 2020).

Research Variables and Instruments

The primary outcome was developmental status assessed using the age-specific Kuesioner Pra Skrining Perkembangan (KPSP), an instrument incorporated into the Indonesian program for stimulation, detection, and early intervention of child growth and development. Overall developmental status was interpreted according to standard KPSP scoring. Nine to ten “Yes” responses indicated appropriate development, seven to eight indicated questionable development, and six or fewer indicated possible developmental deviation (Kementerian Kesehatan RI, 2022).

In addition to the standard overall KPSP classification, domain-specific analysis was performed to characterize developmental profiles. Relevant age-specific KPSP indicators were mapped into motor, language, cognitive, and social-emotional domains according to the developmental abilities represented by each item. This mapping constituted an analytical procedure developed for the present study and was not intended to represent the original domain structure of the KPSP.

For each domain, developmental achievement was calculated as the number of achieved indicators divided by the number of assessed indicators and multiplied by 100. Achievement of 75% or greater was operationally classified as Berkembang Sesuai Harapan (BSH), while achievement below 75% was classified as Memerlukan Stimulasi Lanjutan (MSL). This threshold was an operational decision rule established for the present study and was not an official KPSP cut-off. Because the number and composition of developmental indicators differed among age-specific forms, valid sample sizes could differ across developmental domains.

Data Collection Procedures

Following verification of participant eligibility, written informed consent was obtained from the parent or legal guardian. Developmental assessment was then conducted using the age-appropriate KPSP within structured play activities. The activities were organized to provide opportunities for children to demonstrate observable developmental responses involving movement, object manipulation, communication, following instructions, problem solving, and social interaction (Hockenberry et al., 2023).

Developmental responses were recorded according to the corresponding assessment indicators. Structured play was used to facilitate child engagement and developmental observation rather than as an experimental treatment. Data collection was conducted by the research team and trained field personnel under researcher supervision. Nursing students involved through

the research-based MBKM program assisted with field procedures, developmental observations, documentation, data entry, KPSP administration, and support during structured play sessions under supervision.

Statistical Analysis

Categorical variables were summarized using frequencies and percentages. Overall developmental status was analyzed according to the three standard KPSP classifications, whereas domain-specific achievement was summarized using the study-defined BSH and MSL categories. Analyses used the number of valid observations available for each variable.

Pearson's chi-square test was used exploratorily to examine patterns between overall KPSP classification and domain-specific developmental categories and structured play quality. Statistical significance was set at $p < 0.05$. Chi-square results were interpreted with consideration of expected cell frequencies. Analyses in which expected-frequency assumptions were not adequately satisfied were interpreted cautiously.

Because the overall KPSP classification and study-defined domain categories were derived partly from overlapping developmental indicators, their cross-tabulations were interpreted as exploratory internal developmental patterns rather than associations between fully independent constructs. Furthermore, the cross-sectional design did not permit causal inference (Wang and Cheng, 2020).

Ethical Considerations

The study received ethical approval from the Health Research Ethics Committee of Institut Nani Hasanuddin, Makassar, Indonesia (Approval No. 246/INSTITUT-NH/KEPK/V/2026). Written informed consent was obtained from the parents or legal guardians of all participating children before data collection. Participant privacy, confidentiality, safety, and comfort were maintained throughout developmental assessment and structured play observation.

3. RESULTS AND DISCUSSION

Participant Characteristics

A total of 358 children with stunting aged 24 to 60 months were included in the study. The largest age group was 36 months, comprising 95 children (26.5%), followed by 48 months with 74 children (20.7%) and 24 months with 73 children (20.4%). Children aged 60 months represented the smallest group, with five participants (1.4%). Of the total participants, 145 (40.5%) were male and 213 (59.5%) were female.

Table 1. Characteristics of study participants

Characteristic	n	%
Age 24 months	73	20.4
Age 30 months	50	14.0
Age 36 months	95	26.5
Age 42 months	33	9.2
Age 48 months	74	20.7
Age 54 months	28	7.8
Age 60 months	5	1.4
Male	145	40.5
Female	213	59.5

The distribution of participants across several age groups is relevant because developmental expectations change considerably between two and five years of age. Motor, language, cognitive, and social-emotional abilities should therefore be interpreted in relation to the child's developmental stage rather than assuming identical developmental expectations across the entire study

population (Hockenberry et al., 2023). The small number of children aged 60 months should also be considered when interpreting findings for this age group.

Overall Developmental Status and Age-Related Patterns

Based on the overall KPSP classification, 191 children (53.4%) had appropriate development, 124 (34.6%) had questionable development, and 43 (12.0%) had possible developmental deviation. Thus, while appropriate development represented the largest category, 46.6% of participants were classified as either questionable or possible developmental deviation.

Table 2. Overall developmental status based on KPSP

Developmental status	n	%
Appropriate development	191	53.4
Questionable development	124	34.6
Possible developmental deviation	43	12.0
Total	358	100.0

The distribution demonstrates that children with stunting did not exhibit a uniform developmental profile. Although all participants met the anthropometric criteria for stunting, 53.4% were classified as having appropriate overall development, whereas 46.6% were classified as having questionable development or possible developmental deviation. This finding indicates that anthropometric stunting and developmental status should not be treated as equivalent constructs. Comparable multidimensional developmental vulnerability has been reported in other settings. Oumer et al. (2022) identified developmental delay across gross motor, communication, problem-solving, personal-social, and fine motor domains and reported an association between stunting and developmental delay. Direct numerical comparison is not appropriate because that study used the ASQ-3 and included a different study population. Nevertheless, the findings support the importance of multidomain developmental assessment in children experiencing nutritional vulnerability (Oumer et al., 2022).

Recent meta-analytic evidence further demonstrates the complexity of developmental outcomes associated with stunting. Sideropoulos et al. (2025) reported heterogeneity across developmental outcomes and study contexts, reinforcing the importance of examining developmental domains separately and considering contextual factors rather than assuming a uniform developmental consequence of stunting (Sideropoulos et al., 2025).

Table 3. Overall KPSP developmental status according to age group

Age (months)	n	Appropriate n (%)	Questionable n (%)	Possible deviation n (%)
24	73	36 (49.3)	22 (30.1)	15 (20.5)
30	50	37 (74.0)	10 (20.0)	3 (6.0)
36	95	58 (61.1)	32 (33.7)	5 (5.3)
42	33	9 (27.3)	17 (51.5)	7 (21.2)
48	74	28 (37.8)	35 (47.3)	11 (14.9)
54	28	19 (67.9)	8 (28.6)	1 (3.6)

Age (months)	n	Appropriate n (%)	Questionable n (%)	Possible deviation n (%)
60	5	4 (80.0)	0 (0.0)	1 (20.0)
Total	358	191 (53.4)	124 (34.6)	43 (12.0)

The proportion classified as appropriate was lowest among children aged 42 months (27.3%), whereas 51.5% of this age group were classified as questionable. However, these descriptive differences should not be interpreted as developmental trajectories or evidence of age-related improvement or deterioration. Different children were assessed at each age in this cross-sectional study, and participant numbers differed substantially among age groups. Cross-sectional data characterize differences observed between groups at a particular period rather than within-child developmental change over time (Wang and Cheng, 2020).

Developmental Profiles Across Domains

Domain-specific analysis provided additional information regarding the distribution of developmental abilities. In the motor domain, 314 of 358 children (87.7%) were classified as BSH and 44 (12.3%) as MSL. Language indicators were available for 325 children, of whom 230 (70.8%) were classified as BSH and 95 (29.2%) as MSL. Social-emotional indicators were available for all 358 children, with 261 (72.9%) classified as BSH and 97 (27.1%) as MSL. Cognitive-domain indicators were available for only 128 children. Among these participants, 118 (92.2%) were classified as BSH and 10 (7.8%) as MSL.

Table 4. Domain-specific developmental profiles

Developmental domain	Valid n	BSH n (%)	MSL n (%)
Motor	358	314 (87.7)	44 (12.3)
Language	325	230 (70.8)	95 (29.2)
Cognitive	128	118 (92.2)	10 (7.8)
Social-emotional	358	261 (72.9)	97 (27.1)

BSH, Berkembang Sesuai Harapan; MSL, Memerlukan Stimulasi Lanjutan. BSH and MSL were operational study categories and are not standard KPSP classifications.

The relatively greater proportions requiring further stimulation in language (29.2%) and social-emotional development (27.1%) than in motor development (12.3%) indicate that developmental needs within the study population were not distributed uniformly across domains. These differences should not be interpreted as evidence that stunting selectively affects language or social-emotional development because the present study did not include a non-stunted comparison group and was not designed to establish domain-specific causal effects.

Evidence from Indonesia nevertheless supports the importance of examining development multidimensionally among children with stunting. Jatnika et al. (2024) assessed multiple developmental characteristics among children with stunting and children with normal growth, supporting the relevance of integrating developmental information with anthropometric assessment. Similarly, Oumer et al. (2022) reported different frequencies of developmental delay across several domains. Although the instruments and analytical approaches differed from those used in the present study, these findings support developmental profiling across multiple abilities rather than reliance on a single anthropometric or developmental indicator (Jatnika et al., 2024; Oumer et al., 2022).

The cognitive-domain result requires particular caution. Although 92.2% of children with available cognitive indicators met the operational BSH criterion, this result was based on only 128 of the 358 participants. Cognitive information was unavailable for 230 children because the relevant study-defined indicators were not represented consistently across all age-specific KPSP forms. Consequently, the 92.2% value cannot be generalized to the entire study population and should not be interpreted as evidence that cognition was the strongest developmental domain.

Structured Play Quality and Developmental Status Structured play quality was available for 356 participants. Among valid observations, 179 children (50.3%) demonstrated good play quality and 122 (34.3%) demonstrated very good play quality. Fifty-one children (14.3%) were classified as sufficient and four (1.1%) as poor. Overall, 301 of 356 children (84.6%) demonstrated good or very good structured play quality.

Table 5. Quality of children's participation during structured play

Structured play quality	n	%
Poor	4	1.1
Sufficient	51	14.3
Good	179	50.3
Very good	122	34.3
Total valid observations	356	100.0

The high proportion of good and very good play quality should be interpreted from an assessment perspective. It indicates that most participating children were able to engage with the structured play activities sufficiently for developmental responses to be observed. It does not demonstrate that structured play therapy improved developmental status. Play-based assessment literature supports the use of systematically organized play activities to elicit observable developmental behaviors and emphasizes the potential of play-based approaches to assess multiple developmental abilities (Montoya-Fernández et al., 2024a; Montoya-Fernández et al., 2024b).

Exploratory cross-tabulation showed systematic correspondence between overall KPSP classification and the study-defined developmental domains. The Pearson chi-square statistic was $\chi^2 = 138.120$, $df = 2$, $p <$

0.001 for motor development, $\chi^2 = 94.840$, $df = 2$, $p < 0.001$ for language development, and $\chi^2 = 100.014$, $df = 2$, $p < 0.001$ for social-emotional development. Expected-frequency assumptions were adequately satisfied for these analyses. For the cognitive domain, $\chi^2 = 10.269$, $df = 2$, $p = 0.006$, but 33.3% of cells had expected counts below five, with a minimum expected count of 0.55. The exploratory analysis of KPSP classification and structured play quality produced $\chi^2 = 31.140$, $df = 6$, $p < 0.001$, but 25.0% of cells had expected counts below five, with a minimum expected count of 0.47. These two results therefore require cautious interpretation.

More importantly, statistical correspondence between overall KPSP classification and domain-specific classifications should not be interpreted as an independent predictive association. Overall KPSP status and the study-defined domains were derived partly from overlapping developmental indicators. Some statistical correspondence is therefore structurally expected. These analyses are more appropriately interpreted as exploratory evidence of internal developmental patterns rather than evidence that KPSP status causes or independently predicts domain-specific developmental outcomes. Similarly, the observed relationship between KPSP classification and structured play quality does not establish directionality or causality (Wang and Cheng, 2020).

Integrated Interpretation, Implications, Strengths, and Limitations

Taken together, the findings demonstrate substantial heterogeneity in development among children with stunting. First, 53.4% of participants were classified as having appropriate overall development, whereas 46.6% were classified as questionable or possible developmental deviation. Second, developmental needs differed across the study-defined domains, with relatively greater proportions requiring further stimulation in language and social-emotional development than in motor development. Third, most children were able to engage at a good or very good level during structured play observation. These findings support the view that anthropometric status, standardized developmental screening, multidomain developmental profiling, and child-appropriate observation provide complementary rather than interchangeable information (Mbabazi et al., 2024; Hockenberry et al., 2023).

The importance of developmental context is also supported by Mbabazi et al. (2024), who reported that developmental performance among children with stunting was associated not only with nutritional and clinical characteristics but also with

family care and stimulation-related factors. These findings support a broader developmental perspective in which growth status, environmental stimulation, and observable developmental functioning are considered together rather than independently (Mbabazi et al., 2024).

From a pediatric nursing and community child health perspective, the findings reinforce the importance of incorporating developmental monitoring into the care of children with stunting. Stunting should not automatically be interpreted as developmental delay, but developmental assessment should not be omitted merely because anthropometric monitoring has already identified a growth problem. Children classified as questionable or possible developmental deviation require appropriate follow-up according to developmental screening procedures, while complementary domain-specific information may help identify developmental areas that warrant additional attention and stimulation (Kementerian Kesehatan RI, 2022; Hockenberry et al., 2023).

The study also contributes methodologically by integrating standardized developmental measurement with a structured play context. Play-based assessment literature indicates that systematically organized play can provide opportunities for children to demonstrate developmental abilities through movement, object manipulation, communication, problem solving, and social interaction (Montoya-Fernández et al., 2024a; Montoya-Fernández et al., 2024b). The present study applies this perspective to children with stunting in a community setting. Nevertheless, this contribution concerns the context and process of developmental assessment, not the effectiveness of structured play as a therapeutic intervention.

Several limitations should be considered. The cross-sectional design precludes conclusions regarding developmental trajectories and causal relationships. Purposive participant selection may limit generalizability beyond the study population. Participant numbers were unequal across age groups, particularly at 60 months. The domain-specific categories were derived through study-defined mapping of KPSP indicators and an operational 75% threshold rather than independently validated domain scales. Cognitive-domain information was available for only 128 children, limiting direct comparison with other domains. In addition, some chi-square analyses contained small expected frequencies, and the statistical correspondence between overall KPSP and domain-specific classifications was partly influenced by overlapping indicators. These limitations require conservative interpretation of inferential findings (Wang and Cheng, 2020).

Despite these limitations, the study included a relatively large sample of 358 children with stunting and combined standard developmental screening with complementary multidomain profiling. Structured play also provided a child-appropriate context for observing developmental responses without redefining play as an experimental treatment. Future studies should validate the domain-mapping framework against independent standardized developmental measures, use longitudinal designs to examine developmental trajectories, and evaluate whether structured play-based assessment provides additional validity, feasibility, or acceptability compared with conventional developmental assessment procedures (Montoya-Fernández et al., 2024a).

4. CONCLUSION

This study demonstrates that children with stunting exhibit heterogeneous developmental profiles that cannot be fully represented by anthropometric status alone. Among 358 children with stunting, 53.4% had appropriate overall development, while 34.6% had questionable development and 12.0% had possible developmental deviation based on KPSP assessment. Domain-specific profiling further demonstrated variation in developmental achievement, with relatively greater proportions requiring further stimulation in the language and social-emotional domains than in the motor domain. Cognitive findings should be interpreted cautiously because cognitive indicators were available for only a subset of participants.

Structured play therapy provided a child-appropriate context for eliciting and observing developmental responses, with most children demonstrating good or very good engagement during structured play activities. However, these findings do not demonstrate therapeutic effectiveness because structured play was not evaluated as an intervention. Integrating standardized developmental screening with multidomain developmental profiling and structured play observation may complement anthropometric monitoring and provide a more comprehensive understanding of developmental needs among children with stunting. Future longitudinal studies using independently validated developmental measures are needed to examine developmental trajectories and further evaluate the validity and practical utility of structured play-based developmental assessment (Montoya-Fernández et al., 2024a).

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AUTHOR CONTRIBUTIONS

Rezeki Nur: Conceptualization, Methodology, Formal Analysis, Investigation, Data Curation, Project Administration, Supervision, Writing Original Draft, Writing Review and Editing.

Andi Suriyani: Investigation, Validation, Data Curation, Writing Review and Editing. Kasmawati Karim: Investigation, Validation, Data Curation, Writing Review and Editing. All authors read and approved the final manuscript.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

ETHICS STATEMENT

The study received ethical approval from the Health Research Ethics Committee of Institut Nani Hasanuddin, Makassar, Indonesia (Approval No. 246/INSTITUT-NH/KEPK/V/2026). Written informed consent was obtained from the parents or legal guardians of all participating children before data collection. Participant privacy, confidentiality, safety, and comfort were maintained throughout the study.

DATA AVAILABILITY STATEMENT

The data supporting the findings of this study are available from the corresponding author upon reasonable request, subject to ethical and confidentiality requirements.

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