Original Article

Psychometric Properties of "Pragati Pustak": A Parent Oriented Screening Tool for Developmental Delay

Suvarna S. Ganvir[1], Chetana Kunde[2], Jasmine A. Shaikh[3], Maheshwari Harishchandre[4], Shyam D. Ganvir[5]

[1]Professor & Head of Department of Neurophysiotherapy, Dr, Vitthalrao Vikhe Patil Foundations's College of Physiotherapy, Ahilyanagar, [2]Professor, Bharati Vidyapeeth (Deemed to be University) School of Physiotherapy, Pune [3]Assistant Professor,Dr.Vitthalrao Vikhe Patil Foundation's College of Physiotherapy, Ahilyanagar, [4]Associate Professor,Dept.of Neurophysiotherapy, Ahilyanagar, [5]Professor & Principal ,Dr.Vitthalrao Vikhe Patil Foundation's College of Physiotherapy, Ahilyanagar.

How to cite this article: Suvarna S. Ganvir, Chetna Kunde, Jasmine A. Shaikh et. al. Psychometric Properties of "Pragati Pustak": A Parent Oriented Screening Tool for Developmental Delay. Indian Journal of Public Health Research and Development/Vol. 17 No. 3, July-September 2026.

Abstract

Background: Early identification of developmental delay in infancy is crucial for timely intervention, especially in low-resource settings. Pragati Pustak, a culturally adapted parent-reported screening tool, addresses gaps in community-based surveillance for children up to 2 years.

Objectives: To develop and validate face/content validity and reliability of Pragati Pustak for detecting developmental delays.

Methodology: Iterative development via stakeholder focus groups and expert reviews yielded a bilingual, pictorial Yes/No booklet (milestones 3-24 months; warning signs 3-15 months). Face validity used 4-point Likert scales (15 experts, 15 parents). Content validity applied CVI metrics. Reliability assessed KR-20 internal consistency and Cohen's kappa test-retest (n=6998, 14-day interval).

Results: Face validity showed ≥80% endorsement. I-CVI ≥0.90; S-CVI/Ave=0.98. KR-20 ranged 0.60-0.95; kappa >0.85 (almost perfect).

Conclusion: Pragati Pustak offers robust psychometrics, enabling reliable parent-led screening in primary care.

Keywords: Developmental Delay, Pragati Pustak, Validity, Reliability, Developmental Milestones, Warning Signs.

Introduction

Developmental delay affects a significant proportion of children under 2 years of age, with an estimated prevalence of 1.5%–2.5% in India[1]. Such impairments have far-reaching consequences, impacting not only the affected child and family but

Corresponding Author: Suvarna S. Ganvir, Professor & Head of Department of Neurophysiotherapy, Dr, Vitthalrao Vikhe Patil Foundations's College of Physiotherapy, Ahilyanagar.

E-mail: suvarnaganvir@gmail.com

Submission date: Jan 23, 2026 **Revision date:** April 25, 2026 **Published date: June 29,2026**

also society at large. The long-term burden includes increased health-care expenditure, the need for specialized educational support, and a compromised quality of life[2, 3]. Evidence consistently demonstrates that early identification of developmental impairments, followed by timely intervention, plays a crucial role in minimizing functional limitations and reducing disability-related complications[4].early intervention is particularly important in resource-limited settings, where delayed access to appropriate health-care services can exacerbate developmental outcomes. Studies from the United States of America indicate that only approximately one-third of children with developmental delays are identified before reaching school age, thereby limiting opportunities for intervention during the most critical period of neurodevelopment[5]

Timely developmental surveillance and screening during early childhood may therefore serve as key strategies in reducing both the individual and societal burden of disability[6].

Early detection allows for prompt initiation of intervention when developmental plasticity is at its maximum, potentially decreasing the long-term costs associated with health care, rehabilitation, and special education services. Consequently, there is a strong need for accessible, community-based screening tools that facilitate early identification and referral of children at risk for developmental delay[7]. Developmental surveillance is defined as a flexible, longitudinal, and continuous process through which potential risk factors for developmental and behavioural disorders can be systematically identified[9]. Parents serve as the first and most critical point of contact in the longitudinal process of developmental surveillance, as they are a primary and reliable source of information regarding their child's development. Their observations play a vital role in accurate documentation and early recognition of developmental concerns[8]. Evidence-based initiatives such as the Learn the Signs. Act Early. campaign emphasize parental education as an effective strategy for improving awareness of typical developmental milestones and early warning signs of delay[9] The impact of disability is significantly greater among children with multiple impairments or those diagnosed with conditions such as cerebral palsy, epilepsy, growth and developmental delays, and emotional or behavioural disorders. In this context, previous studies have consistently demonstrated that parental reports regarding their child's development, learning, and behaviour provide valuable and valid information for developmental assessment and screening[10]

An ideal developmental screening method should therefore incorporate a standardized and validated tool with well-established psychometric properties. Additionally, such a tool should be easy to administer and interpret, cost-effective, and suitable for use in community and primary health-care settings to facilitate early identification and timely intervention[11]

Early identification of children at risk for developmental delay is essential to minimize the likelihood of long-term complications and disability. Parents, as primary caregivers and continuous observers of their child's growth and development, are uniquely positioned to contribute reliable and meaningful information for early identification[12].

Recognizing this, a community-oriented and parent-friendly screening tool, **Pragati Pustak**, was developed. This research report describes the development & validation of this tool through a standard procedure.

Methodology

Study Design and Setting

This study was designed as **a development and validation study** of a parent-oriented developmental screening tool.The Sample Size was not determined at the beginning of research study.The Saturation Principle was applied here.As the visits were made to the villages, the data was recorded & the final number is noted here.7 Villages near the Physiotherapy OPD were targeted & data was collected **(n-6998).**

Development of the Screening Tool

The development process began with a focused group discussion (FGD) involving key stakeholders, including a paediatrician, physiotherapist, social workers, and parents of children with developmental delay. Inputs obtained from all stakeholders were used to identify and finalize the components to

be included in the screening tool. Based on these discussions, a preliminary draft was developed and subsequently circulated among stakeholders for review and feedback. The initial draft comprised four pages detailing age-appropriate developmental milestones presented at three-month intervals.

Item generation was informed by a review of established developmental screening instruments, including the Denver II Developmental Screening Test, Bayley Scales of Infant and Toddler Development, Ages and Stages Questionnaire, Korean Developmental Screening Test, and existing Indian parent-reported tools[12]. The items were adapted to the local language and sociocultural context. Draft items were refined through iterative expert consultations involving a paediatrician, developmental paediatrician, physiotherapist, and neonatologists[12]. Cognitive interviews with parents were conducted to ensure clarity, cultural relevance, and feasibility for use in primary care and community settings[12].

The preliminary version of the tool consisted predominantly of detailed textual descriptions and required approximately 7–8 minutes to complete. During a second round of stakeholder consultation, concerns were raised regarding the length of the document and its limited suitability for parents with low literacy levels. Stakeholders recommended simplifying the format by incorporating pictorial representations supported by minimal text and including only key developmental milestones to improve feasibility and usability[12].

In response to these recommendations, the screening tool was refined into a concise two-page card format incorporating pictorial depictions of major developmental milestones from birth to 24 months of age[12]. Following consensus and approval from all focus group members, an initial batch of 20 copies was produced. The finalized tool was named *Pragati Pustak* (Progress Card), reflecting its purpose of systematically documenting a child's developmental progress, analogous to academic progress records used for school-going children[12].

Pragati Pustak is a dichotomous (Yes/No) parent-reported screening booklet designed to identify developmental delays and early warning signs in infants and young children[12]. Part A includes age-appropriate developmental milestones from 3 to 24 months, categorized into six age bands (3–4, 5–7, 8–10, 11–12, 13–18, and 19–24 months). Part B includes developmental warning signs from 3 to 15 months, divided into five age bands[12].

Face Validity

Face validity was assessed to evaluate the readability, feasibility, consistency of formatting and style, and clarity of language used in the screening tool[1, 9,] **Pragati Pustak** was evaluated independently by experts and parents to identify areas for improvement and potential additions[1, 9, 20]Fifteen experts (paediatricians, developmental specialists, paediatric physiotherapists, child psychologists, and speech pathologists) and 15 parents of children aged 3–24 months completed a standardized 4-point Likert-scale review form evaluating five core criteria, clarity, relevance ,ease of understanding, layout, and overall usability of the tool. Ratings of 3 ("quite") or 4 ("highly") indicated endorsement, with face validity expressed as percentage agreement (% endorsement) per item and overall.

All developmental milestone items (Part A) and warning sign items (Part B) were rated by both panels, with results visualized in Figures 10–13 showing item-level % endorsement across sequential items.

Content Validity

Following face validation, Pragati Pustak was reviewed for content validity by a panel of experts with experience in research methodology and child development, including professors and doctoral-level researchers[4, 6, 7, 8]. Content validity was quantified using the Content Validity Index (CVI) at both the item level (I-CVI) and scale level (S-CVI), following the methods proposed by Lynn and Polit & Beck[4,6,7,8]. The I-CVI was calculated as the proportion of experts who rated an item as relevant (score of 3 or 4 on a 4-point relevance scale), and the S-CVI was calculated as the average of the I-CVIs across all items (S-CVI/Ave) [4,6,7,8]. Experts evaluated the tool for readability, clarity, comprehensiveness, and relevance, and consensus was achieved

Reliability Assessment

Internal consistency of the dichotomous (Yes/No) items within each age band was assessed using the Kuder–Richardson Formula 20 (KR-20), which is equivalent to Cronbach's alpha for dichotomous data[4,6,7,8]. Test–retest reliability was assessed at the item level using Cohen's kappa coefficient[4,6,7,8] Agreement was interpreted according to Landis and Koch criteria: ≤0.40 poor to fair, 0.41–0.60 moderate, 0.61–0.80 substantial, and ≥0.81 almost perfect agreement[4,6,7,8] the sample (n=6998) was reassessed after a fixed interval of 14 days to estimate test–retest reliability. [1, 2,3,4,5]

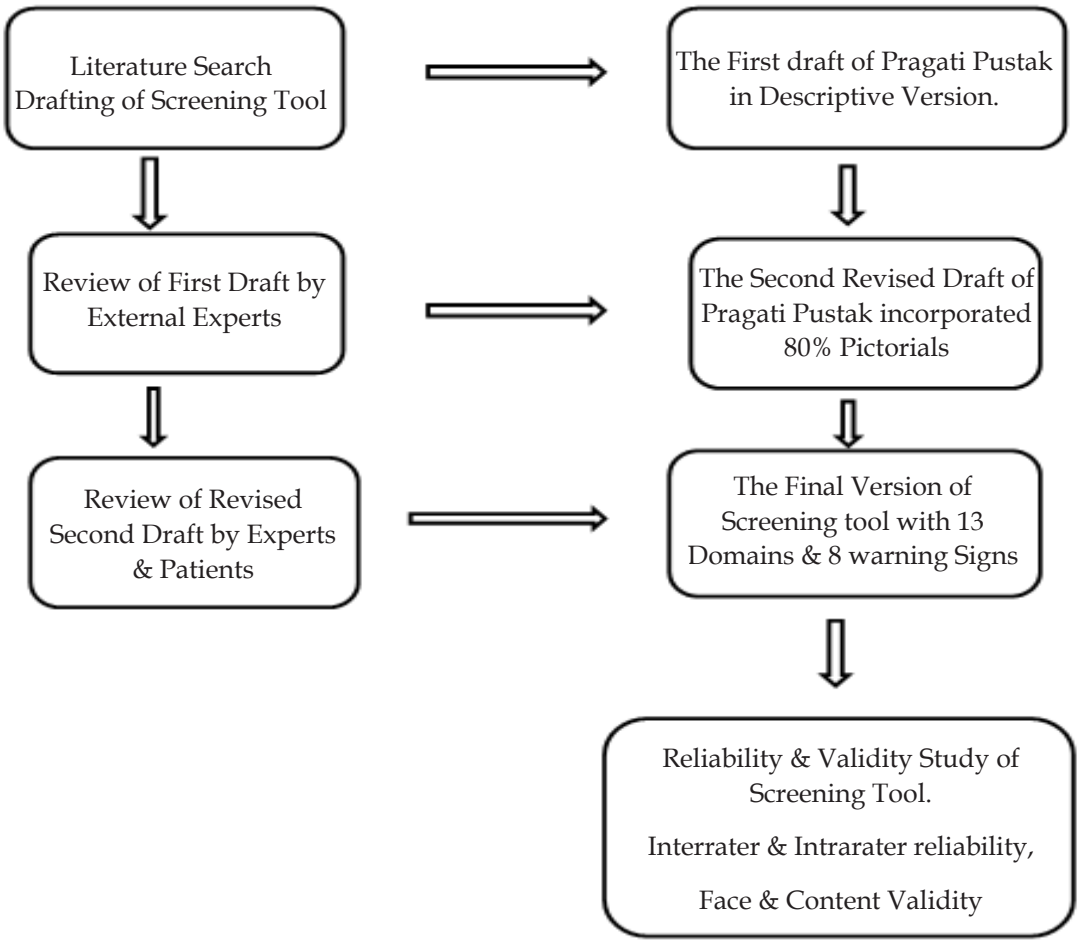

Fig. 1 Flow Chart outlining the development and validity of the questionnaire.

Statistical Analysis

All analyses were performed using IBM Statistical Package for Social Sciences V.25 software; KR-20 ≥0.70 and kappa ≥0.60 were considered acceptable thresholds based on developmental screening literature. Graphical displays (bar charts) were prepared to visually summarize I-CVI values for representative items and KR-20 values across age-bands for publication. [2, 4, 8]

Sensitivity and specificity analysis could not be performed due to absence of comparison with a gold standard tool.

Results

Face validity

Expert's demonstrated high endorsement across all items, with minor dips observed for specific items (Item 3 and Item 5 in developmental milestones; Items 2, 4, and 7 in warning signs).

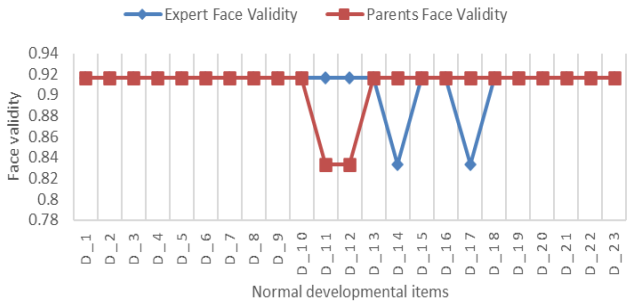

Figure 1: Face validity for normal developmental milestones

Figure 1. Experts' face validity ratings for developmental milestone items (all ≥80%, Item 3=82%, Item 5=85%) & Parents' face validity ratings for developmental milestone items (all ≥80%, Item 3=80%)

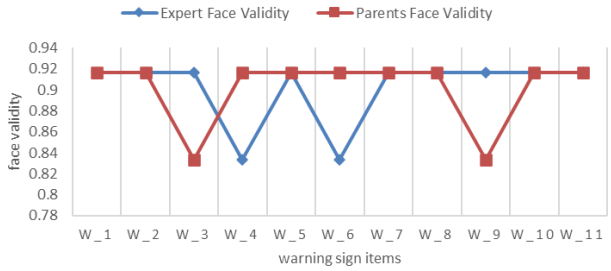

Figure 2: Face validity for warning signs

Figure 2. Experts' face validity ratings for warning sign items (all ≥80%, Items 2/4/7=80–86%) & Parents' face validity ratings for warning sign items (Items 2/4/8=78–82%).

Parent Panel (n = 15)

Parents showed consistently high endorsement, with slightly lower ratings for one developmental milestone item (Item 3) and three warning sign items (Items 2, 4, 8). Parental ratings validate the tool's acceptability for primary caregivers across literacy and socioeconomic levels.

Interpretation and Revisions

All 42 items (21 developmental milestones + 21 warning signs) achieved ≥80% endorsement from both panels, meeting established face validity thresholds. Items with borderline ratings (80–85%) received minor wording revisions based on qualitative feedback.

The final Pragati Pustak demonstrates excellent face validity (overall ≥90% endorsement) from both expert and end-user perspectives, supporting progression to content validity and psychometric testing phases.

Content Validity

Experts rated all developmental and warning-sign items as highly relevant to age-appropriate neurodevelopment and early detection of delay. At expert level, item-level CVI (I-CVI) for all items was ≥0.90, and the scale-level CVI (S-CVI/Ave) was 0.98, exceeding the commonly recommended minimum of 0.78–0.80 for I-CVI and 0.90 for S-CVI. [2,4,6,8]

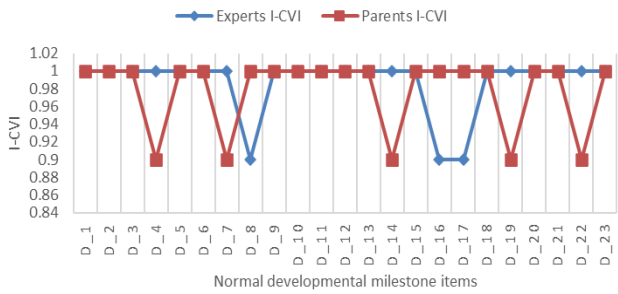

Figure 3: I-CVI for Developmental Milestones

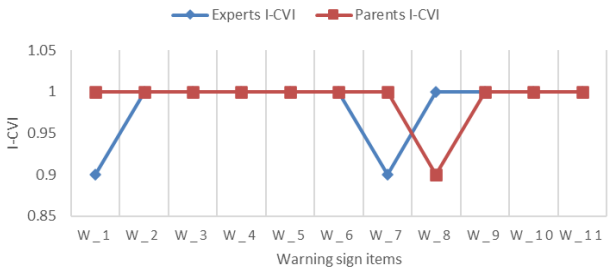

Figure 4: I-CVI for warning signs

Parents of newborns and young children similarly endorsed the clarity and relevance of items, with I-CVI ≥0.90 and S-CVI = 0.98 for the parent panel, supporting face and content validity from the end-user perspective. These indices are comparable to or higher than values reported for established parent-completed developmental tools such as the Ages and Stages Questionnaire and culturally adapted developmental screening tools. [1,3,5]

Reliability

Internal consistency of the dichotomous items within each age-band was excellent, with KR-20 values ≥0.90 except age-band 8-10 months & 13-18 months across all 3–24-month age sections. These coefficients are similar to or higher than those reported for other standardized developmental screening tools such as the Korean Developmental Screening Test and parent-completed questionnaires used in primary care. [2,4,8,9]

Test–retest reliability at item level was very high, with Cohen's kappa exceeding 0.85 for all items, indicating almost perfect agreement over the retest interval. Such kappa values are well above the thresholds typically reported in developmental tool validation studies, where values in the 0.60–0.80 range are often considered adequate.[2, 3, 8]

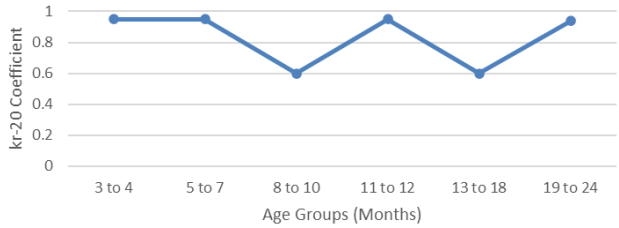

Figure 5: Normal Developmental items KR-20 coefficient

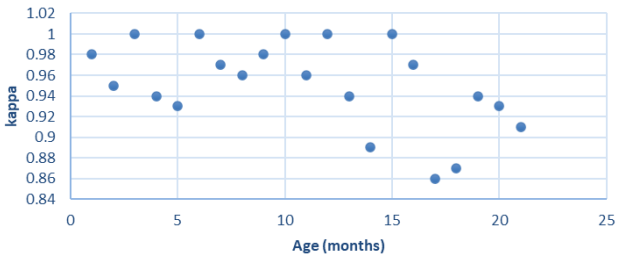

Figure 6: Test-retest reliability of normal developmental items

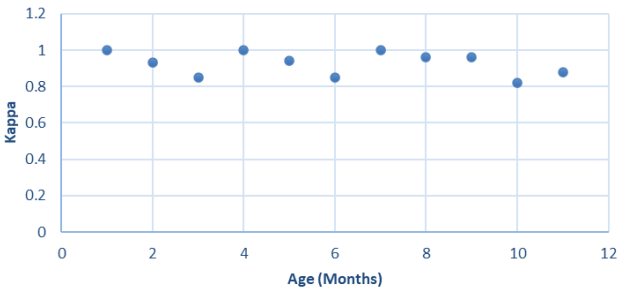

Figure 7: Test-retest reliability of warning signs

Kappa values above 0.85 indicate almost perfect stability and suggest that responses are not substantially influenced by random error or day-to-day variation in parental reporting.[8]

Discussion

Pragati Pustak emerged from an iterative, participatory process initiated through focus group discussions with pediatricians, physiotherapists, social workers, and parents etc. This multidisciplinary approach mirrors the expert-driven framework of the Denver Developmental Screening Screening Test (DDST-II) [46] where clinicians guided milestone selection, content verification, and refinement based on clinical judgment and population-specific patterns. As in DDST-II, expert consensus ensured milestones captured meaningful, observable functions, avoiding culturally biased or ambiguous items.

The initial text-heavy draft evolved into a concise, bilingual, pictorial screening card following expert feedback—a progression akin to the Korean Developmental Screening Test (K-DST) [47]which prioritized clarity, feasibility, and parental comprehension. The final tool features dichotomous (yes/no) items across six age bands (3–4, 5–7, 8–10, 11–12, 13–18, and 19–24 months) for milestones and five bands (3–15 months) for red flags, enabling precise monitoring during rapid developmental phas**es.**

Pragati Pustak experts iteratively verified developmental appropriateness in motor, social, and communication domains, aligning with expected trajectories while addressing sociocultural variability. Cultural adaptation incorporated parent cognitive interviews, as in

K-DST[47] To enhance interpretability and minimize response errors. Pictorial elements, informed by expert insights from DDST-II cross-cultural adaptations[48]. addressed literacy and caregiver education barriers, compensating for absent professional observation while retaining core developmental intent.

This framework aligns with Mukherjee et al. for embedding developmental surveillance in Indian primary care via low-literacy, culturally responsive tools for rural settings. By synthesizing expert-driven validation from DDST-II & and K-DST[47,48]. with parent-oriented feasibility, Pragati Pustak builds a strong psychometric foundation for scalable community screening.

Content validity

Pragati Pustak was robustly supported by high relevance ratings from expert and parent panels. All items achieved excellent item-level content validity indices (I-CVI) of 0.90–1.00, yielding a scale-level content validity index (S-CVI/Ave) of 0.98—exceeding recommended thresholds of I-CVI ≥0.78–0.80 and S-CVI/Ave ≥0.90. These metrics indicate strong consensus on milestone and red flag relevance, mirroring expert-driven validation in the Denver Developmental Screening Test-II (DDST-II) and culturally adapted parent-report tools.

Comparable to Hindi adaptations for 0–2-year-olds, Pragati Pustak's expert panels confirmed milestone appropriateness, with parental endorsement enhancing caregiver comprehension and acceptability. For newborns to 6 months, pictorial red flags (e.g., absent head control, poor social responsiveness) scored perfect I-CVIs, underscoring visual cues' role in boosting face and content validity for low-literacy parents—akin to Ages and Stages Questionnaire (ASQ) adaptations. These indices affirm Pragati Pustak's integration of expert knowledge, cultural adaptation, and parent-centered design, positioning it for effective early screening in rural Indian primary care[16].

Internal consistency

Pragati Pustak was assessed using the Kuder–Richardson Formula 20 (KR-20), appropriate for dichotomous response formats. KR-20 coefficients ranged from 0.60 to 0.95 across the 3–24-month age bands, with the majority of age groups demonstrating values above 0.90. These findings indicate strong internal consistency and unidimensionality of items assessing gross motor, fine motor, and developmental warning signs, supporting the coherence of the construct being measured.

Notably, the highest internal consistency was observed in the 3–7-month age bands, where KR-20 values reached 0.95. This period represents a critical window for early developmental surveillance, and the observed reliability is comparable to domain-level Cronbach's alpha coefficients reported for the Korean Developmental Screening Test (K-DST), which consistently exceed 0.70 for infants younger than 24 months. Such comparability reinforces the robustness of Pragati Pustak during early infancy, when subtle developmental deviations are most clinically significant.

Lower KR-20 values observed in the 8–10 and 13–18-month age bands likely reflect minor heterogeneity in developmental domains due to rapid skill acquisition and greater variability in milestone attainment during mid-infancy and early toddlerhood. Similar fluctuations in internal consistency have been reported in established parent-report screening tools, particularly in low- and middle-income country (LMIC) settings. Importantly, all coefficients met or exceeded acceptable benchmarks for developmental screening instruments, affirming the reliability of Pragati Pustak as a parent-administered screening tool for children aged 0–2 years.

Test–Retest Reliability

Test–retest reliability of Pragati Pustak demonstrated excellent temporal stability, with item-level Cohen's kappa coefficients exceeding 0.85 and reaching up to 1.00 over a 14-day interval. According to established interpretative guidelines, these values indicate near-perfect agreement and suggest that parental responses remained highly consistent over time, with minimal influence from recall bias or day-to-day variability in caregiver observation.

Particularly high agreement was observed for early developmental milestones in the 3–4-month age band, such as attainment of social smile and initiation of rolling, where kappa values ranged from 0.95 to 1.00. These findings exceed those reported in DDST-II validation studies conducted among Tehran infants aged 0–6 months, where test–retest kappa values typically ranged between moderate and substantial agreement (0.40–0.80). The superior stability observed in Pragati Pustak may be attributed to its pictorial format and simplified yes/no response structure, which enhances parental clarity and reduces interpretative ambiguity.

High test–retest reliability was also maintained for developmental red flags assessed up to 15 months of age, indicating consistent parental identification of concerning signs across time. This level of stability is comparable to that reported in Indian parent-oriented screening tools such as the Track & Act program, where repeated assessments

among toddlers demonstrated similarly high retest agreement. Collectively, these findings support the robustness of Pragati Pustak as a reliable parent-administered screening instrument capable of producing stable results across repeated administrations in early childhood.

Comparison to Established Tools

Tool	Age Range	KR-20/Alpha (Infants 0-24Months)	Kappa/Test-Retest	CVI/SCVI
Pragati Pustak	3-24 months	0.60-0.95	>0.85	0.98
ASQ(Indian)[37]	4-60 months	0.75-0.90	0.70-0.80	0.90
K-DST[38]	3-71 months	0.70-0.92	0.80(2-4 wk)	Not reported
Hindi DSQ[37]	0-6 yr	0.85-0.95	0.75	High Expert
DDST-II Persian[39]	0-6 yr	0.70-0.85	0.60-0.75	Moderate

Pragati Pustak matches or exceeds peers in reliability for 0-2 years, particularly in pictorial format suiting newborns' milestones.

Strengths for Newborns to 2 Years

Focusing on 0-12 months, Pragati Pustak excels in depicting primitive reflexes, head lag, and smiling (3-4 month band, KR-20=0.95), addressing high-risk periods where 70% of delays emerge.[11] Parent endorsements (ICVI=0.90+) confirm usability, unlike text-heavy tools failing low-literacy groups.[9] Field use identified 57 delays in 1020 infants across villages, with 49 referred timely, reducing long-term morbidity as in K-DST VLBW validations.[41]

Although Pragati Pustak was developed as a screening tool, its content framework was derived from established developmental assessment tools including **Denver Developmental Screening Test-II (DDST-II)** and **Bayley Scales of Infant and Toddler Development (BSID-II)**. However, **criterion validity against a gold standard tool (e.g., BSID-II)** was not performed in the present study, which is acknowledged as a limitation.

Despite high reliability and validity indices, screening tools are inherently associated with **false positive and false negative outcomes**. False positives may lead to unnecessary parental anxiety and additional referrals, whereas false negatives may delay early intervention in children with subtle developmental delays. The absence of criterion validation limits the ability to quantify these errors in the present study.

Limitations

Pragati Pustak shows reduced internal consistency (KR-20 <0.85) in mid-infancy bands (8–12 months), potentially due to rapid milestone variability. Absence of criterion validity against gold standards like Bayley Scales of Infant Development-II (BSID-II) limits confirmation of delay detection rates. Peer studies of parent-report tools report analogous gaps, advocating concurrent BSID administration for 0–24 month cohorts.

Future Directions

A revised Pragati Pustak is underway, incorporating additional warning signs across age bands (e.g., enhanced red flags for motor and social delays in 13–24 months) and provisions for repeated entries directly in the document for longitudinal tracking. Parallel validation of a digital app version is in process, though its reach remains limited by connectivity in rural areas; thus, the paper format will continue as the primary tool for community-based screening in low-resource Indian settings. Longitudinal sensitivity/specificity trials in diverse newborn cohorts will further enhance scalability across LMICs.

Ethics Approval and Consent

This study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki. Ethical clearance was obtained from the Institutional Review Board (IRB) of **Dr. Vithalrao Vikhe Patil Foundation's College of Physiotherapy**.

Written informed consent was obtained from all parents or legal guardians prior to inclusion in the study. Parents were informed about the purpose of the study, confidentiality of data, voluntary participation.

Financial Support and Sponsorship: Nil.

Conflicts of Interest: There are no conflicts of interest.

References

1. Girish GB, Anshita AA, Mamta MJ, Shahzadi SM. Impact of Hyperbilirubinemia on Neurodevelopmental Outcomes in Term and Late Preterm Neonates: A Prospective Observational Study in A Tertiary care NICU. Journal of Contemporary Clinical Practice. 2025 May; 11(5):496-503.
2. Kang, S. K., & Kadam, S. D. (2015). Neonatal Seizures: Impact on Neurodevelopmental Outcomes. Frontiers in pediatrics, 3, 101. https://doi.org/10.3389/fped.2015.00101
3. Anitha SR, Thomas T, Kumari SK, et al. Early intervention in developmental delay: A community-based study from rural South India. Indian J Pediatr. 2018;85(10):873-8. doi:10.1007/s12098-018-2702-5.
4. Centers for Disease Control and Prevention. Early intervention for autism spectrum disorder: What every pediatrician should know. Pediatrics. 2014;134(3):e755-9. doi:10.1542/peds.2014-2148.
5. Zwaigenbaum, L., Bauman, M. L., Stone, W. L., Yirmiya, N., Estes, A., Hansen, R. L., McPartland, J. C., Natowicz, M. R., Choueiri, R., Fein, D., Kasari, C., Pierce, K., Buie, T., Carter, A., Davis, P. A., Granpeesheh, D., Mailloux, Z., Newschaffer, C., Robins, D., Roley, S. S.,Wetherby, A. (2015). Early Identification of Autism Spectrum Disorder: Recommendations for Practice and Research. Pediatrics, 136 Suppl 1(Suppl 1), S10–S40. https://doi.org/10.1542/peds.2014-3667C
6. Segre G, Cargnelutti C, Bersani C, Njogu W, Roberti E, Campi R, et al. Early detection of neurodevelopmental disorders in African children living in informal settlements in Nairobi. BMJ Paediatrics Open. 2023;7:e002117. https://doi.org/10.1136/bmjpo- 2023-002117
7. Poon, Jennifer & LaRosa, Angela & Pai, Shashidhar. (2010). Developmental Delay: Timely Identification and Assessment. Indian pediatrics. 47. 415-22. 10.1007/s13312-010-0077-3.
8. Centers for Disease Control and Prevention. Learn the Signs. Act Early. Program overview. Atlanta: CDC; 2023. Available from:https://www.cdc.gov/ncbddd/actearly/index.html
9. Glascoe F. P. (1997). Parents' concerns about children's development: prescreening technique or screening test?. Pediatrics, 99(4), 522–528. https://doi.org/10.1542/peds.99.4.522
10. Shevell, M., Ashwal, S., Donley, D., Flint, J., Gingold, M., Hirtz, D., Majnemer, A., Noetzel, M., Sheth, R. D., Quality Standards Subcommittee of the American Academy of Neurology, & Practice Committee of the Child Neurology Society (2003). Practice parameter: evaluation of the child with global developmental delay report of the Quality Standards Subcommittee of the American Academy of Neurology and The Practice Committee of the Child Neurology Society. Neurology, 60(3), 367–380. https://doi.org/10.1212/01.wnl.0000031431.81555.16
11. van der Linde, J., Swanepoel, deW., Glascoe, F. P., Louw, E. M., & Vinck, B. (2015). Developmental screening in South Africa: comparing the national developmental checklist to a standardized tool. African health sciences, 15(1), 188–196. https://doi.org/10.4314/ahs.v15i1.25
12. Pitchik, H. O., Tofail, F., Akter, F., Shoab, A. K. M., Sultana, J., Huda, T. M. N., Rahman, M., Winch, P. J., Luby, S. P., & Fernald, L. C. H. (2023). Concurrent validity of the Ages and Stages Questionnaire Inventory and the Bayley Scales of Infant and Toddler Development in rural Bangladesh. BMC pediatrics, 23(1), 93. https://doi.org/10.1186/s12887-022-03800-6
13. Gupta, S., Shrivastava, P., Samsuzzaman, M., Banerjee, N., & Das, D. K. (2021). Developmental delay among children under two years of age in slums of Burdwan Municipality: A cross-sectional study. Journal of family medicine and primary care, 10(5), 1945–1949. https://doi.org/10.4103/jfmpc.jfmpc_1926_20
14. Bhattacharya T, Ray S, Das DK. Developmental delay among children below two years of age: a cross-sectional study in a community development block of Burdwan district, West Bengal. Int J Community Med Public Health . 2017 Apr. 24;4(5):1762-7. Available from: https://www.ijcmph.com/index.php/ijcmph/article/view/122
15. Venugopal GS, M. S. G, T. K. G, Jayan G, Binu GJ, Lawrence T. Prevalence and determinants of developmental delay among children below two years of age visiting an immunization clinic of a tertiary care centre in South India. Int J Contemp Pediatr . 2024 Sep. 24 ;11(10):1406-13. Available from: https://www.ijpediatrics.com/index.php/ijcp/article/view/6252
16. Mukherjee, S. B., Aneja, S., Krishnamurthy, V., & Srinivasan, R. (2014). Incorporating developmental screening and surveillance of young children in office practice. Indian Pediatrics, 51(8), 627–635. https://doi.org/10.1007/s13312-014-0465-1

17. Juneja, M., Mohanty, M., Jain, R., & Ramji, S. (2012). Ages and Stages Questionnaire as a screening tool for developmental delay in Indian children. Indian pediatrics, 49(6), 457–461. https://doi.org/10.1007/s13312-012-0074-9

18. Halek, M., Holle, D., & Bartholomeyczik, S. (2017). Development and evaluation of the content validity, practicability and feasibility of the Innovative dementia-oriented Assessment system for challenging behaviour in residents with dementia. BMC health services research, 17(1), 554. https://doi.org/10.1186/s12913-017-2469-8

19. Faruk, T., King, C., Muhit, M., Islam, M. K., Jahan, I., Baset, K. U., Badawi, N., & Khandaker, G. (2020). Screening tools for early identification of children with developmental delay in low- and middle-income countries: A systematic review. BMJ Open, 10(11), e038182. https://doi.org/10.1136/bmjopen-2020-038182

20. Du, W., Alias, B. S., & Wahab, J. L. A. (2025). Content validation and content validity index calculation for teacher innovativeness instrument among Henan private universities in China. Communications on Applied Nonlinear Analysis, 32(10s), 175–187. https://doi.org/10.52783/cana.v32.4705

21. Handage, S., & Chander, M. (2021). Development of an instrument for measuring the student learning outcomes: A content validation process. Indian Journal of Extension Education, 57(3), 1–7. https://doi.org/10.48165/IJEE.2021.57302

22. Nur A. M. L. Hakim, M. R. Pairan, & M. I. Zakaria. (2025). Step-by-step guide to calculating content validity index (CVI) for single constructs using Excel. International Journal of Research and Innovation in Social Science, 9(3), 1717–1726. https://doi.org/10.47772/IJRISS.2025.90300135

23. Kim, C. Y., Jung, E., Lee, B. S., Kim, K. S., & Kim, E. A. (2019). Validity of the Korean Developmental Screening Test for very-low-birth-weight infants. Korean journal of pediatrics, 62(5), 187–192. https://doi.org/10.3345/kjp.2018.07381

24. Ganvir, Suvarna; Kunde, Chetana; Harishchandre, Maheshwari; Ganvir, Shyam1. Pragati Pustak – A parent-oriented screening tool for identification of developmental delay in children till 2 years of age. Physiotherapy - The Journal of Indian Association of Physiotherapists 13(1):p 5-8, Jan–Jun 2019. | DOI: 10.4103/PJIAP.PJIAP_29_18

25. Radecki L, Sand-Loud N, O'Connor KG, Sharp S, Olson LM. Trends in the use of standardized tools for developmental screening in early childhood: 2002–2009. Pediatrics. 2011 Jul 1;128(1):14-9.

26. Al-Madaney, M. M., & Fässler, M. (2023). Development and validation of a tool to assess researchers' knowledge of human subjects' rights and their attitudes toward research ethics education in Saudi Arabia. BMC medical ethics, 24(1), 94. https://doi.org/10.1186/s12910-023-00968-z

27. Bailey, D. B., Jr, Hebbeler, K., Scarborough, A., Spiker, D., & Mallik, S. (2004). First experiences with early intervention: a national perspective. Pediatrics, 113(4), 887–896. https://doi.org/10.1542/peds.113.4.887

28. Rahi, J. S., Manaras, I., Tuomainen, H., & Hundt, G. L. (2004). Meeting the needs of parents around the time of diagnosis of disability among their children: evaluation of a novel program for information, support, and liaison by key workers. Pediatrics, 114(4), e477–e482. https://doi.org/10.1542/peds.2004-0240

29. Sices, L., Egbert, L., & Mercer, M. B. (2009). Sugar-coaters and straight talkers: communicating about developmental delays in primary care. Pediatrics, 124(4), e705–e713. https://doi.org/10.1542/peds.2009-0286

30. Schonwald, A., Huntington, N., Chan, E., Risko, W., & Bridgemohan, C. (2009). Routine developmental screening implemented in urban primary care settings: more evidence of feasibility and effectiveness. Pediatrics, 123(2), 660–668. https://doi.org/10.1542/peds.2007-2798

31. Glascoe F. P. (2003). Parents' evaluation of developmental status: how well do parents' concerns identify children with behavioral and emotional problems?. Clinical pediatrics, 42(2), 133–138. https://doi.org/10.1177/000992280304200206

32. Benasich, A. A., & Brooks-Gunn, J. (1996). Maternal attitudes and knowledge of child-rearing: associations with family and child outcomes. Child development, 67(3), 1186–1205.

33. Pinto-Martin, J. A., Dunkle, M., Earls, M., Fliedner, D., & Landes, C. (2005). Developmental stages of developmental screening: steps to implementation of a successful program. American journal of public health, 95(11), 1928–1932. https://doi.org/10.2105/AJPH.2004.052167

34. Berry, A. D., Garzon, D. L., Mack, P., Kanwischer, K. Z., & Beck, D. G. (2014). Implementing an early childhood developmental screening and surveillance program in primary care settings: lessons learned from a project in Illinois. Journal of pediatric health care : official publication of National Association of Pediatric Nurse

Associates & Practitioners, 28(6), 516–525. https://doi.org/10.1016/j.pedhc.2014.04.008

35. King, T. M., Tandon, S. D., Macias, M. M., Healy, J. A., Duncan, P. M., Swigonski, N. L., Skipper, S. M., & Lipkin, P. H. (2010). Implementing developmental screening and referrals: lessons learned from a national project. Pediatrics, 125(2), 350–360. https://doi.org/10.1542/peds.2009-0388
36. Bailey, D. B., Jr, Hebbeler, K., Scarborough, A., Spiker, D., & Mallik, S. (2004). First experiences with early intervention: a national perspective. Pediatrics, 113(4), 887–896. https://doi.org/10.1542/peds.113.4.887
37. Jain, R., Arora, A., Anand, R., Malhotra, S., Mittal, M., & Juneja, M. (2017). Designing and Validation of a Hindi-language Parent Self-report Developmental Screening Tool. Indian pediatrics, 54(7), 550–555. https://doi.org/10.1007/s13312-017-1066-6
38. Chung, H. J., Yang, D., Kim, G. H., Kim, S. K., Kim, S. W., Kim, Y. K., Kim, Y. A., Kim, J. S., Kim, J. K., Kim, C., Sung, I. K., Shin, S. M., Oh, K. J., Yoo, H. J., Yu, H. J., Lim, S. J., Lee, J., Jeong, H. I., Choi, J., Kwon, J. Y., … Eun, B. L. (2020). Development of the Korean Developmental Screening Test for Infants and Children (K-DST). Clinical and experimental pediatrics, 63(11), 438–446. https://doi.org/10.3345/cep.2020.00640
39. Shahshahani, S., Vameghi, R., Azari, N., Sajedi, F., & Kazemnejad, A. (2010). Validity and Reliability Determination of Denver Developmental Screening Test-II in 0-6 Year-Olds in Tehran. Iranian journal of pediatrics, 20(3), 313–322.
40. Fischer, V. J., Morris, J., & Martines, J. (2014). Developmental screening tools: Feasibility of use at primary healthcare level in low- and middle-income settings. Journal of Health, Population and Nutrition, 32(2), 314–326. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4216967/
41. Ganvir, S., Rai, S., Harishchandre, M., Ganvir, S., & Kunde, C. (2023). 'Pragati Pustak' A parent-oriented screening tool for identification of developmental delay: Utility and efficacy (7-year longitudinal study) [Poster presentation]. World Physiotherapy Congress 2023, Dubai, United Arab Emirates. World Physiotherapy. https://world.physio/congress-proceeding/pragati-pustak-parent- oriented-screening-tool-identification-development-delay
42. Chandrasekar, K., Venkatesh, L., Ramkumar, V., Subramaniyan, B., & Varadharajan, V. (2023). Validation of a developmental screening tool from a national health program in India for screening speech-language disorders among children. Wellcome Open Research, 8, 576. https://doi.org/10.12688/wellcomeopenres.20103.1
43. Ganz, J. B., Morin, K. L., Foster, M. J., Vannest, K. J., Genç Tosun, D., Gregori, E. V., & Gerow, S. L. (2017). High-technology augmentative and alternative communication for individuals with intellectual and developmental disabilities and complex communication needs: a meta-analysis. Augmentative and alternative communication (Baltimore, Md. : 1985), 33(4), 224–238. https://doi.org/10.1080/07434618.2017.1373855
44. Bornman, J., Romski, M., King, M., Madima, V., & Sevcik, R. A. (2020). Supporting Early Communication Skills of Children with Developmental Disorders in South Africa: Caregiver and Clinician Perspectives about Mobile Health Applications. Infants and young children, 33(4), 313–331. https://doi.org/10.1097/iyc.0000000000000177
45. Moon, S. J., Hwang, J., Hill, H. S., Kervin, R., Birtwell, K. B., Torous, J., McDougle, C. J., & Kim, J. W. (2020). Mobile device applications and treatment of autism spectrum disorder: a systematic review and meta-analysis of effectiveness. Archives of disease in childhood, 105(5), 458–462. https://doi.org/10.1136/archdischild-2019-318258
46. Frankenburg, W. K., Dodds, J., Archer, P., Shapiro, H., & Bresnick, B. (1992). The Denver II: a major revision and restandardization of the Denver Developmental Screening Test. Pediatrics, 89(1), 91–97.
47. Kim, D., Choe, Y. J., Durrani, B. A. Z., Kim, E., Byeon, J., & Eun, B. L. (2023). Korean Developmental Screening Test for Infants and Children (K-DST): development, applications, and implications for future early childhood development interventions. Clinical and experimental pediatrics, 66(7), 288–293. https://doi.org/10.3345/cep.2022.00906
48. Kuralbayeva, A. & Pilten, Gülhiz & Tasova, A. & Ibragimova, A.. (2025). DENVER II AND OTHER DEVELOPMENTAL SCREENING TESTS' SIGNIFICANCE IN ASSESSING CHILD DEVELOPMENT. BULLETIN SERIES OF PEDAGOGICAL SCIENCES. 85. 10.51889/2959-5762.2025.85.1.030.
49. Chattopadhyay, Nandita; Mitra, Kaninika1; Basu, Swati; Pal, Ranabir; Ghosh, Amrita. Risk Factors of Impediment of the Early Childhood Development in Rural Bengal. Journal of Applied Sciences and Clinical Practice 5(2):p 85-90, May–Aug 2024. | DOI: 10.4103/jascp.jascp_19_24

50. Walker, S. P., Wachs, T. D., Grantham-McGregor, S., Black, M. M., Nelson, C. A., Huffman, S. L., Baker-Henningham, H., Chang, S. M., Hamadani, J. D., Lozoff, B., Gardner, J. M., Powell, C. A., Rahman, A., & Richter, L. (2011). Inequality in early childhood: risk and protective factors for early child development. Lancet (London, England), 378(9799), 1325–1338. https://doi.org/10.1016/S0140-6736(11)60555-2

51. Faruk, T., King, C., Muhit, M., Islam, M. K., Jahan, I., Baset, K. U., Badawi, N., & Khandaker, G. (2020). Screening tools for early identification of children with developmental delay in low- and middle-income countries: a systematic review. BMJ open, 10(11), e038182. https://doi.org/10.1136/bmjopen-2020-038182

52. Warren, R., Kenny, M., Bennett, T., Fitzpatrick-Lewis, D., Ali, M. U., Sherifali, D., & Raina, P. (2016). Screening for developmental delay among children aged 1-4 years: a systematic review. CMAJ open, 4(1), E20–E27. https://doi.org/10.9778/cmajo.20140121

53. Aldharman, S. S., Al-Jabr, K. H., Alharbi, Y. S., Alnajar, N. K., Alkhanani, J. J., Alghamdi, A., Abdellatif, R. A., Allouzi, A., Almallah, A. M., & Jamil, S. F. (2023). Implications of Early Diagnosis and Intervention in the Management of Neurodevelopmental Delay (NDD) in Children: A Systematic Review and Meta-Analysis. Cureus, 15(5), e38745. https://doi.org/10.7759/cureus.38745

54. Shin, Y., Park, E. J., & Lee, A. (2025). Early Intervention for Children With Developmental Disabilities and Their Families via Telehealth: Systematic Review. Journal of medical Internet research, 27, e66442. https://doi.org/10.2196/66442.