



Policy Brief: Disability Screening Instruments from Low- and Middle-Income Countries

Instrument Mapping Version 1

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Photo credit: FHI 360



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A large body of evidence points to the importance of identifying childhood disability as early as possible (Ertem et al., 2008; Robertson, Hatton & Emerson, 2009; Sonnander, 2000). Despite this, there is little research from low- and middle-income countries on cost-effective, low-resource methods to identify children with disabilities, and many of the screening instruments widely used in high-income countries would be difficult to adapt and apply because they are expensive and require a specialist to administer. To better understand the resources available, we [mapped low-cost screening instruments](#) that are currently being used or have the potential to be used in low- and middle-income countries to identify children with disabilities. This brief summarizes findings from that mapping, which covers screening instruments that could be applied at the individual level for identification or at the population level to measure prevalence.

The instrument mapping document can be accessed at the following link on the Education Equity Research Initiative website: <http://www.educationequity2030.org/resources-2/2019/5/7/disability-screening-instruments-mapping>

Methodology

Our review focused on instruments appropriate for early childhood and primary-school aged children. It included only low- or no cost instruments, although a few of the instruments included would become cost-effective only if implemented at scale. Additionally, we sought instruments that could be administered by an enumerator or teacher rather than by only specialists. During this review, we used the guidelines set by the American Academy of Pediatrics on screening, which draws a distinction among:

- 1) Surveillance, the process of recognizing children who may be at risk of developmental delays,
- 2) Screening, the use of standardized instruments to identify and refine that recognized risk, and
- 3) Evaluation, a complex process aimed at identifying specific developmental disorders that are affecting a child (Bright Futures Steering Committee, 2006).

For the purposes of this mapping, we focused on the use of standardized instruments to identify and refine the risk of developmental delays or disabilities.

We began our search by identifying instruments through existing reviews, such as a World Bank toolkit for measuring early childhood development (Fernald et al, 2017), interviews with implementers and researchers in the field, and internet searches. Once we had compiled initial information about each assessment, we often identified and contacted the researchers or developers to verify and add information about instruments. This information was then inputted into an Excel mapping of results to allow for ease of use and search capabilities by potential stakeholders. The mapping is available, along with an annotated bibliography of research on instruments covered in the mapping, through the Education Equity Research Initiative.

In addition to reviewing available screening instruments, the annex of this brief documents recent research on screening and identification in low resource contexts that may be of interest to practitioners working on issues surrounding identification.



Findings by Assessment Type

As shown in Figure 1 below, the mapping includes a total of 27 screening instruments, some based on child direct assessments and others on caregiver or teacher reports. Additionally, 4 instruments are intended primarily as population-level prevalence screening tools that collect information on known disabilities and difficulties rather than identifying risk of developmental delays or disabilities. Assessments for children ages 0-5 tend to rely on caregiver or teacher reports whereas assessments for children ages 6 and older are more likely to use direct assessment methods.

Table 1: Findings by Assessment Type and Age

	Ages 0-5	Ages 6+	Total ¹
Child direct assessment	5	13	14
Caregiver/teacher report	7	4	8
Population-level	3	3	5

Findings by Type of Disability

As shown in Figure 2 above, the instruments identified addressed a variety of different types of disability. Vision and self-care are included in the fewest screening instruments, with 8 and 7 instruments respectively. While relatively few vision approaches are available, those that are include widely tested open-source approaches for direct assessments of vision and eye health—specifically a set of Android applications² and guidelines for school eye health programs³—designed for use in low-resource settings. Notably, these are specialized resources designed specifically for vision testing or monitoring eye health, rather than instruments that assess multiple domains of disability.

Hearing is included in the most screenings (14), 7 of which were stand-alone instruments that only tested for hearing (as opposed to also including other domains). Several of these hearing screening approaches, however, involve purchasing licenses and equipment that make them more cost-effective at scale.

While several approaches are available to collect information on motor, cognitive, communication skills, socio-emotional, self-care domains, these domains are typically assessed in population-level instruments and through caregiver reports. The direct assessments for these domains usually, though not always, apply to children younger than age 5 only, with limited options available for direct assessments of older children. The need for direct assessments to use with older children is particularly acute for certain

¹ In this and subsequent tables, the number of assessments in each age category often do not sum to the total number of assessments overall, because assessments often apply to both age categories. Also, where a recommended age range is not available or applicable for an instrument, we have made assumptions about the age groups it could be used with.

² Peek Acuity and Peek Acuity Pro by PeekVision with additional information at https://www.peakvision.org/en_GB/peek-solutions/peek-acuity/

³ Guidelines for School-based Eye Health Programs available at <https://www.globalpartnership.org/content/guidelines-school-based-eye-health-programs>



domains where challenges may not be readily apparent, like cognitive skills, whereas other domains, like self-care, may be more appropriate—or at least more efficient—to assess through caregiver reports.

Table 2: Findings by Domain and Age

Domain ⁴	Direct	Direct	Population-level	Total
	assessments or caregiver reports	assessments or caregiver reports		
	Ages 0-5	Ages 6+		
Vision	4 (ages not consistently defined)		3	8
Hearing	10 (ages not consistently defined)		4	14
Motor	6	6	5	13
Cognitive	7	4	5	12
Communication	8	5	5	13
Socio-emotional	5	4	5	11
Self-care	3	1	4	7

Next Steps

The review revealed that although there are increasingly affordable screenings found in low- and middle- income contexts, additional instruments are needed in order to more often and more accurately identify children with disabilities. Recent research initiatives, some of which are detailed in the annex, suggest that the evidence base on introducing screening into low- and middle-income contexts is growing. Hopefully, research findings will yield new or improved resources for screening in low- and middle-income contexts in the future.

Looking forward, we recommend the development of:

- More affordable screening instruments, especially for assessing hearing, where instruments sometimes become more cost-effective at scale,
- More child-direct assessments for use with younger children,
- More teacher or parent reports for use with older children,
- More child-direct assessments in certain domains, especially cognition, communication, and motor skills.

It is important to note that the instrument mapping has been designed as an initial review, one intended to evolve as we learn about additional screening instruments and as new resources are developed. If you have suggestions for resources to include in future versions of the screening mapping or additional information to share about instruments covered in this initial review, please contact Rachel Hatch (rhatch@fhi360.org), Eileen Dombrowski (edombrowski@rti.org), or the Education Equity Research Initiative (educationequity@fhi360.org).

⁴ Several vision and hearing assessments do not provide recommendations for age ranges. At a minimum, these approaches must be used with children old enough to understand the instructions of the assessments.



References

Bright Futures Steering Committee, & Medical Home Initiatives for Children With Special Needs Project Advisory Committee. (2006). Identifying infants and young children with developmental disorders in the medical home: An algorithm for developmental surveillance and screening. *Pediatrics*, *118*(1), 405-420.

Ertem I. O., Dogan D. G., Gok C. G., Kizilates S. U., Caliskan A., Atay G., Vatandas N., Karaaslan T., Baskan S. G. & Cicchetti D. V. (2008) A guide for monitoring child development in low- and middle-income countries. *Pediatrics*, *121*, E581–E589.

Fernald, L. C., Prado, E., Kariger, P., & Raikes, A. (2017). *A toolkit for measuring early childhood development in low and middle-income countries*. Washington, DC: World Bank.

Robertson, J., Hatton, C., Emerson, E., & Yasamy, M. T. (2012). The identification of children with, or at significant risk of, intellectual disabilities in low-and middle-income countries: A review. *Journal of Applied Research in Intellectual Disabilities*, *25*(2), 99-118.

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Annex: Recent research into screening approaches in low- and middle-income contexts

Amer, A., Kakooza-Mwesige, A., Jarl, G., Tumwine, J. K., Forssberg, H., Eliasson, A. C., & Hermansson, L. (2018). The Ugandan version of the Pediatric Evaluation of Disability Inventory (PEDI-UG). Part II: Psychometric properties. *Child: Care, Health and Development*, 44(4), 562-571.

Background

The Pediatric Evaluation of Disability Inventory (PEDI) has been recommended as a gold standard in pediatric rehabilitation. A Ugandan version of PEDI (PEDI-UG) has been developed by culturally adapting and translating the original PEDI. The aim of this study was to investigate the psychometric properties of the PEDI-UG in Ugandan children by testing the instrument's rating scale functioning, internal structure, and test–retest reliability.

Methods

Two hundred forty-nine Ugandan children (125 girls) aged 6 months to 7.5 years (Mean = 3.4, *SD* = 1.9) with typical development were tested using the PEDI-UG. Forty-nine children were tested twice to assess test–retest reliability. Validity was investigated by Rasch analysis and reliability by intraclass correlation coefficient.

Results

The PEDI-UG domains showed good unidimensionality based on principal component analysis of residuals. Most activities (95%) showed acceptable fit to the Rasch model. Six misfit items were deleted from the Functional Skills scales and one from the Caregiver Assistance scales. The category steps on the Caregiver Assistance scales' rating scale were reversed but functioned well when changed from a 6-point to 4-point rating scale. The reliability was excellent; intraclass correlation coefficient was 0.87–0.92 for the domains of the Functional Skills scales and 0.86–0.88 for the domains of the Caregiver Assistance scales.

Conclusion

The PEDI-UG has good to excellent psychometric properties and provides a valid measure of the functional performance of typically developing children from the age of 6 months to 7.5 years in Uganda. Further analysis of all items, including misfit and deleted items, in children with functional disability is recommended.

Kakooza-Mwesige, A., Tumwine, J. K., Forssberg, H., & Eliasson, A. C. (2018). The Uganda version of the Pediatric Evaluation of Disability Inventory (PEDI). Part I: Cross-cultural adaptation. *Child: Care, Health and Development*, 44(4), 552-561.

Background

The Pediatric Evaluation of Disability Inventory (PEDI) was developed and standardized to measure functional performance in American children. So far, no published study has examined the use of the PEDI in sub-Saharan Africa. This study describes the adaptation, translation, and validation process undertaken to develop a culturally relevant PEDI for Uganda (PEDI-UG).



Method

The cross-cultural adaptation and translation of the PEDI was performed in a series of steps. A project manager and a technical advisory group were involved in all steps of adaptation, translation, cognitive debriefing, and revision. Translation and back-translation between English and Luganda were performed by professional translators. Cognitive debriefing of two subsequent adapted revisions was performed by a field-testing team on a total of 75 caregivers of children aged 6 months to 7.5 years.

Results

The PEDI-UG was established in both English (the official language) and Luganda (a local language) and comprises 185 items. Revisions entailed deleting irrelevant items, modifying wording, inserting new items, and incorporating local examples while retaining the meaning of the original PEDI. Item statements were rephrased as questions. Seven new items were inserted and 19 items deleted. To accommodate major differences in living conditions between rural and urban areas, 10 alternative items were provided.

Conclusions

The PEDI-UG is to be used to measure functional limitations in both clinical practice and research, in order to assess and evaluate rehabilitative procedures in children with developmental delay and disability in Uganda. In this study, we take the first step by translating and adapting the original PEDI version to the culture and life conditions in both rural and urban Uganda. In subsequent studies, the tool's psychometric properties will be examined, and the tool will be tested in children with developmental delay and disability.

Kitsao-Wekulo, P., Holding, P. A., Kvalsvig, J. D., Alcock, K. J., & Taylor, H. G. (2017). Measurement of expressive vocabulary in school-age children: Development and application of the Kilifi Naming Test (KNT). *Applied Neuropsychology: Child*, 1-16.

The dearth of locally developed measures of language makes it difficult to detect language and communication problems among school-age children in sub-Saharan African settings. We sought to describe variability in vocabulary acquisition as an important element of global cognitive functioning. Our primary aims were to establish the psychometric properties of an expressive vocabulary measure, examine sources of variability, and investigate the measure's associations with non-verbal reasoning and educational achievement. The study included 308 boys and girls living in a predominantly rural district in Kenya. The developed measure, the Kilifi Naming Test (KNT), had excellent reliability and acceptable convergent validity. However, concurrent validity was not adequately demonstrated. In the final regression model, significant effects of schooling and area of residence were recorded. Contextual factors should be taken into account in the interpretation of test scores. There is need for future studies to explore the concurrent validity of the KNT further.

McCoy, D. C., Black, M., Daelmans, B., & Dua, T. (2016). Measuring development in children from birth to age 3 at population level. *Early Childhood Matters*, 34-39.

The Global Child Development Group assembled data from over 16,000 children representing 15 cohorts from 11 LMICs with the objective of developing a Developmental 'D-score' Growth Chart.



Items were harmonised across scales for children under 3 years old. Many cohorts include longitudinal data after age 5 years, thus facilitating measurement of predictive validity. The process of developing D-score trajectories is based on a two-stage estimation procedure that uses the Rasch model and calculates change scores to form a continuous latent variable (D-score) (van Buuren, 2014). Using item response theory (IRT), the trajectory of D-scores has interval scale properties that can be used globally to calculate differences within and across ages and countries (Jacobusse et al., 2006), much as height-for-age growth charts are used to indicate rates of stunting. Additional steps include: 1 Remove or adjust items when necessary and test for differential item functioning to examine whether individual items are comparable across cohorts. 2 Examine the predictive validity of the D-score with longitudinal data. 3 Construct descriptive age-conditional reference charts of normal development using data from a South African birth cohort of approximately 3000 children. 4 Determine a cut-off point for 'off-track' development and age-related indicators (akin to the definitions for stunting and wasting) based on psychometric properties.

Pitchford, N. J., & Outhwaite, L. A. (2016). Can touch screen tablets be used to assess cognitive and motor skills in early years primary school children? A cross-cultural study. *Frontiers in Psychology, 7*, 1666.

Assessment of cognitive and motor functions is fundamental for developmental and neuropsychological profiling. Assessments are usually conducted on an individual basis, with a trained examiner, using standardized paper and pencil tests, and can take up to an hour or more to complete, depending on the nature of the test. This makes traditional standardized assessments of child development largely unsuitable for use in low-income countries. Touch screen tablets afford the opportunity to assess cognitive functions in groups of participants, with untrained administrators, with precision recording of responses, thus automating the assessment process. In turn, this enables cognitive profiling to be conducted in contexts where access to qualified examiners and standardized assessments are rarely available. As such, touch screen assessments could provide a means of assessing child development in both low- and high-income countries, which would afford cross-cultural comparisons to be made with the same assessment tool. However, before touch screen tablet assessments can be used for cognitive profiling in low-to-high-income countries they need to be shown to provide reliable and valid measures of performance. We report the development of a new touch screen tablet assessment of basic cognitive and motor functions for use with early years primary school children in low- and high-income countries. Measures of spatial intelligence, visual attention, short-term memory, working memory, manual processing speed, and manual coordination are included as well as mathematical knowledge. To investigate if this new touch screen assessment tool can be used for cross-cultural comparisons we administered it to a sample of children ($N = 283$) spanning standards 1–3 in a low-income country, Malawi, and a smaller sample of children ($N = 70$) from first year of formal schooling from a high-income country, the UK. Split-half reliability, test-retest reliability, face validity, convergent construct validity, predictive criterion validity, and concurrent criterion validity were investigated. Results demonstrate “proof of concept” that touch screen tablet technology can provide reliable and valid psychometric measures of performance in the early years, highlighting its potential to be used in cross-cultural comparisons and research.