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Assessing Child Development Through Ai & Digital Tools

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INTRODUCTION

The Challenge of Early Developmental Assessment

The first few years of life are a time of fast child growth, with crucial times when children's brains are most receptive to learning and interaction. It is crucial to recognize children who are experiencing delays or who are growing differently throughout these formative years. Early detection of developmental delays allows children to benefit from therapy, special education programs, and other treatments that can greatly enhance their long-term results in school, employment, and quality of life.

However, these traditional methods of assessment require skilled professional and are time consuming. For example: Standard assessment tools like the Bayley's Scale of Infant and Toddler Development take hours to complete and requires training to administer properly. Shortage of skilled professional and resources in developing countries creates a critical gap, millions of children who could benefit from early intervention never gets assessed therefore never receive support. Recent studies show this gap is even persistent in developed countries and is far more severe in low to middle income countries.

How technology can be a possible solution

Artificial intelligence and digital tools offer a potential solution. Some of these are:

- It can be delivered through mobiles or tablets that can be used by parents.
- It assesses a child's development through games and activities that children enjoy.
- It can give results in fraction of minutes.
- It can be made less cultural biased than traditional western developed tests.
- It can be used by any trained person not only specialist.

The DEEP Study - A digital cognitive assessment tool

A recent study from rural India on development and testing of a digital cognitive assessment tool called DEEP (DEvelopmental Assessment on an E-Platform) is a proof of concept how the use of technology could overcome the shortcomings of traditional developmental assessment tools.

Methodology

The study by Bhavnani (2021) was conducted among 1,359 children from rural areas of India to evaluate the effectiveness of a digital cognitive assessment tool. The materials used included a tablet-based platform comprising a series of age-appropriate games and tasks designed to assess cognitive development in young children. For comparison and validation, the Bayley's Scale of Infant and Toddler Development, Third Edition (BSID-III), a standardized and widely accepted developmental assessment tool, was also employed.

Each child participated in both assessment procedures. The digital assessment was administered through tablets, while the BSID-III was conducted following standard administration protocols. Data obtained from the digital tool and the BSID-III were systematically analyzed and compared to examine the extent to which the digital assessment outcomes corresponded with those of the traditional gold-standard method. This comparative approach enabled evaluation of the validity and reliability of the digital tool for assessing cognitive development in early childhood.

Findings

The findings of the study indicated a strong concordance between the traditional and digital assessment methods. Analysis of the association between children's nutritional status, measured using height-for-age indicators, and cognitive development revealed nearly identical patterns across both assessment tools. Using the Bayley's Scale of Infant and Toddler Development, Third Edition (BSID-III), a 0.20 standard deviation increase in cognitive scores was observed for each unit improvement in height-for-age. Similarly, the DEEP (DEvelopmental Assessment on an E-Platform) tool demonstrated a 0.26 standard deviation increase in cognitive scores corresponding to each unit increase in height-for-age.

Furthermore, both BSID-III and DEEP showed comparable predictive validity, as they identified similar trajectories of cognitive development at three years of age. These findings suggest that the digital assessment tool performs on par with the conventional gold-standard measure in capturing the relationship between nutritional status and cognitive development in early childhood.

Why this is important

According to this study, a digital tool could be:

- **Accurate:** Generating outcomes comparable to clinical evaluations.
- **Scalable:** Made to work with a large number of kids without the need for specialized training.
- **Culturally appropriate:** Avoiding culturally specific content in favor of global image.
- **Practical:** Can be made available in areas with less physical connectivity.

AI for Early Detection of Autism Spectrum Disorder

Early detection of autism spectrum disorder (ASD) represents another important domain in which artificial intelligence and digital technologies have demonstrated considerable potential. ASD is a neurodevelopmental condition that typically emerges in early childhood and affects behaviour, social interaction and communication abilities. Timely identification of ASD enables early intervention and targeted management strategies, which can significantly improve developmental outcomes and overall quality of life for affected children.

What researchers has found

A review of 25 studies conducted by Solek (2025) examined the application of artificial intelligence in the detection of autism spectrum disorder among children aged 0–18 years. The reviewed studies employed a wide range of data modalities to train AI-based models, including analysis of facial movements

and expressions, eye-tracking data to assess visual attention patterns, evaluation of motor skills and movement behaviors, assessment of speech and communication characteristics, as well as biological inputs such as genetic information and brain imaging data. These diverse data sources enabled the development of AI systems capable of identifying behavioral and neurodevelopmental markers associated with autism.

The outcomes were outstanding

Many of the AI-based systems demonstrated high diagnostic performance, achieving sensitivity levels of approximately 90%, indicating their ability to accurately identify a large proportion of children who were truly affected by autism spectrum disorder. This high level of sensitivity reflects the strong potential of AI tools for early and reliable detection of autism. Additionally, these technologies offer dual benefits, as their interactive and digital nature may also contribute to enhancing children's familiarity with technology and fostering early exposure to basic computer science concepts.

Critical Gaps and Challenges

Limited Research on Diverse Conditions - Most research has focused on autism spectrum disorder and cognitive development. Very less is known about using AI to assess or support other important areas of development, such as social and emotional development, Language development in non-English languages (particularly important for India).

Research conducted by few countries - Current evidence is largely derived from studies conducted in a limited number of countries. There is a clear need for more research initiatives similar to the DEEP study across diverse geographical and socio-economic settings. In particular, AI-based research on autism detection and developmental assessment should be expanded to low-income and developing countries to enhance cultural relevance and generalizability.

Implementation and acceptance - Several barriers may hinder the adoption of AI-based assessment tools by healthcare professionals and educators. These include concerns regarding the acceptance and credibility of AI-generated results, the manner in which such findings can be integrated with clinical judgment, and inconsistencies arising from variations across different AI models. Addressing these issues is essential for successful implementation in real-world settings.

Ethical Concerns - Ethical issues constitute a major challenge in the application of AI-based developmental assessment tools. Key concerns include the secure storage, management, and protection of children's data to ensure privacy and confidentiality. There is also a potential risk of bias in AI systems, as outcomes may be influenced by race, gender, or socio-economic background if training datasets lack diversity. Furthermore, transparency in the functioning of AI tools is essential, and parents or caregivers must be adequately informed about how these systems evaluate children and generate assessment results to promote trust and ethical use.

CONCLUSION

The DEEP study from rural India demonstrates that a well-designed digital tool can reliably assess young children's cognitive development and predict their developmental outcomes over time. Research on AI for autism detection shows that machine learning systems can identify developmental differences with impressive accuracy, potentially speeding up the diagnostic process and reaching children who might otherwise go unidentified. For countries like India, where there are many children but relatively few developmental specialists, where early childhood malnutrition and developmental delays are common, and where technology access is growing, these digital tools could be transformative. These technologies not only offer scalable, culturally adaptable, and practical solutions but also open avenues for early intervention, improving long-term developmental outcomes and overall quality of life for children.

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