Age Differences in DDST-II Fine Motor Milestones between Ghanaian and American Children

Samantha Costanzo, OTS, Carole Ivey, PhD, OTR/L, & Stacey Reynolds, PhD, OTR/L
Department of Occupational Therapy
Virginia Commonwealth University

Introduction

In May of 2014, a group of VCU OT students travelled to Ghana and conducted the Denver Developmental Screening Tool II (DDST-II) on 51 Ghanaian children. These developmental screenings served as preliminary data collection for a pilot study to create a culturally appropriate screening tool for the purpose of early identification and intervention of children with disabilities.

Background Information

Nearly 80% of the world's population living with a developmental disability lives in developing countries (World Health Organization [WHO], 2006). However, specific estimates of the prevalence of children with disabilities living in these countries are inconsistent and vary drastically depending on the cultural definition and characterization of disability and the tools used to identify and measure it (Bornstein & Hendricks, 2013). The WHO (1980) stated early identification of children with disabilities is the first step toward improving developmental outcomes. Yet, few culturally appropriate measures are available for use in developing nations where the majority of children with disabilities live (Bornstein & Hendricks, 2013). This has led to many developing nations using tools developed by Western nations to assess developmental outcomes. Unfortunately, these screening tools are often directly translated or adapted without being validated appropriately, potentially leading to inaccurate conclusions (Olade, 1984). Thus, WHO maintains that individual countries should develop culturally appropriate developmental assessment tools with normative data (Lansdown et al., 1996).

Hypothesis

Ghanaian children reach fine motor developmental milestones earlier than American children on the DDST-II.

Methodology

The DDST-II is a 125-item tool for screening function of birth to six year olds in four areas of function: Personal-Social, Fine Motor-Adaptive, Language, and Gross Motor (Frankenburg et al., 1992). The Fine Motor-Adaptive section is comprised of 26 items, though the items given vary based on child's age and ability. Current DDST-II test interpretation is based on a Denver, US sample.

Participants:

Participants were based on a convenience sample of children at a private school outside of Accra, Ghana, West Africa

- *N* = 51 Ghanaian children (15 males, 36 females)
- Age Range: 17 – 72 months

Data Analysis:

- Ghanaian Fine Motor scores were compared to normative ages determined by the DDST-II
- Used Fine Motor skill items with at least two children passing between 75th and 90th percentiles to determine expected 90th percentile age for Ghanaian children
- Compared with 90th percentile age noted by the DDST-II age lines
- Used an unpaired t-test to test for significance

Results

Six fine motor items resulted in at least 2 children passing the item between the 75th and 90th percentiles

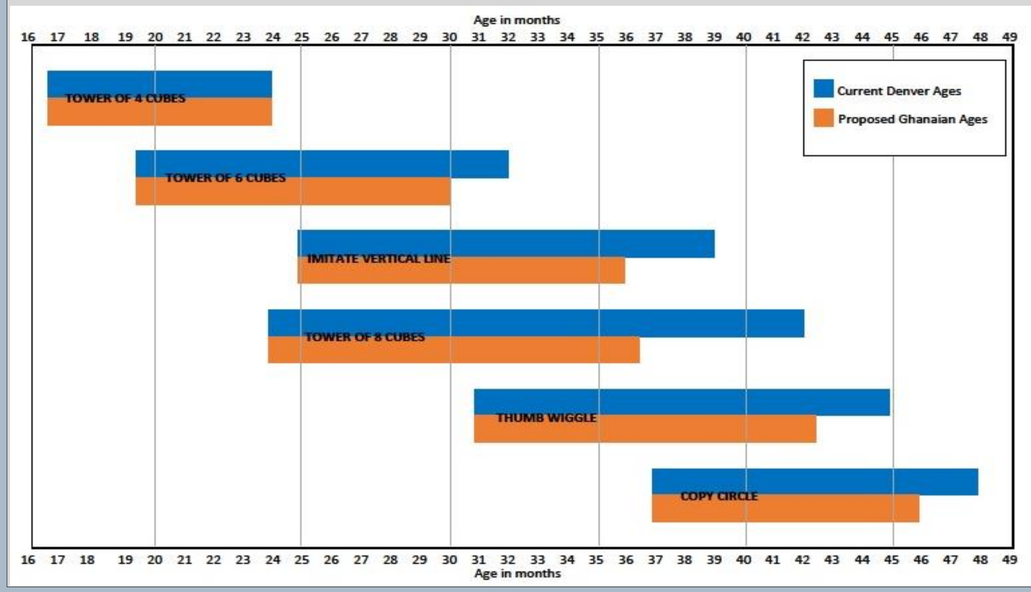
- Five items had significant age differences and were completed at an earlier age by Ghanaian children (Table 1)
  - Building a tower of 6 cubes
  - Imitating a vertical line
  - Building a tower of 8 cubes
  - Wiggling your thumb
  - Copying a circle
- One item was not significantly different
  - Building a tower of 4 cubes

Table 1: Comparison of Ghanaian and US Children on DDST-II

Denver Test Item	Ghanaian Sample Population			US Denver Data	*p*-value
	n	90th percentile age	Standard deviation	90th percentile age	
Tower 4	45	23.25	4.877	24	0.438
Tower 6	47	29.9	4.838	32	0.033*
Imitate Vertical Line	47	36.18	4.588	39	0.003*
Tower 8	46	36.6	5.54	42	0.001*
Thumb Wiggle	36	42.5	5.384	45	0.028*
Copy Circle	44	46	4.159	48	0.008*

*Significant at p<0.05 level

Chart 1: Comparison of Current Denver Ages and Proposed Ghanaian Ages



Limitations

- Small sample size
- Convenience sample of students in a private school outside of the capital city
  - There are ten regions and nine major tribes in Ghana; this pilot study was only able to access a small portion of one region, but all would need to be included to develop true normative ages
- Conducting the DDST-II
  - Language barrier
  - Novelty of certain items (e.g., drawing a person)
  - Novelty of people administering the screening (i.e., this was the first time many of the Ghanaian children had seen a white person)
  - Inexact ages for some children through school records
- Use of means and standard deviations derived from percentiles in the Denver II Manual instead of the raw data for analysis

Conclusions

The hypothesis was partially supported as Ghanaian children passed five fine motor skill items on the Denver II earlier than American children. This was also supported through observation from administering the screening to this sample population

- These children are taught to use a pencil and start copying shapes and letters earlier than in the U.S.
- Prior instruction and experience in test items may have resulted in age differences
- May not hold true across larger group of Ghanaian children who do not start school at 2 years old

Implications

This provides initial support for researching normative ages for the Ghanaian population

- Screening tools need to accurately represent cultural differences in development in order to be adequately sensitive to identifying children with developmental disabilities
- Chart 1 shows the proposed Ghanaian ages in comparison to the current ages

Future Research

Ultimately, the goal of this pilot study is to determine true normative ages for test items and develop a culturally appropriate developmental screening tool for Ghana to identify children with developmental disabilities earlier and more accurately, in order to provide more adequate intervention services.

References

Bornstein, M. H., & Hendricks, C. (2013). Screening for developmental disabilities in developing countries. *Social Science and Medicine*, *97*, 307-315.doi:10.1016/ j.socscimed.2012.09.049

Frankenburg, W. K., Dodds, J., Archer, P., Bresnick, B., Maschka, P., Edelman, N., & Shapiro, H. (1992). *DENVER II Technical Manual.* Denver Developmental Materials; Denver, CO.

Lansdown, R. G., Goldstein, H., Shah, P. M., Orley, J. H., Guo Di, K. K., Kumar, K. V., … Reddy, V. (1996). Culturally appropriate measures for monitoring child development at family and community level: A WHO collaborative study. *Bulletin of the World Health Organization*, *74*(3), 283-290.

Olade, R. A. (1984). Evaluation of the Denver Developmental Screening Test as applied to African children. *Nursing Research*, *33*(4), 204-207.

World Health Organization. (1980). *Early detection of handicap in children: Report on a WHO working group.* Denmark: WHO Regional Office for Europe. Euro Reports and Studies. Retrieved from http://whqlibdoc.who.int/euro/r&s/EURO_R&S_30.pdf

World Health Organization. (2006). Concept note: World report on disability and rehabilitation. Retrieved from http://www.who.int/disabilities/publications/dar_word_report_concept_note.pdf