1 Description of the Cognitive Development Measures

In this section, we briefly describe the novel assessments used to measure child cognitive development across a number of domains. Coffey and Spelke (2023) provides further details on the assessments and presents evidence for the validity of each test.

1.1 Executive function assessments

Executive function captures the set of "cognitive skills responsible for formulating goals, planning how to achieve them, and carrying out these plans effectively" (Anderson and Reidy, 2012). For the younger age groups (14-22 months old, 30-36 months old and 3-4 years old), the surveyors administered the executive function games using toys and cups. In these games, the surveyors tested the child's working memory, object permanence, attention switching, and mental simulation/rotation by hiding toys under the cups, moving the cups, and asking the child to identify the location of the toy. Older age groups (5-6 years old and 7-8 years old) completed a Simon task on a computer (Simon and Wolf, 1963).

1.2 Language skill assessments

For 14-22 months old and 30-36 months old, language skills were assessed through caregiver reports on a version of the MacArthur-Bates Communicative Development Inventories Words & Gestures (MB-CDI-WG) adapted to our context through piloting. Surveyors assessed the vocabulary of 3-4 years old, 5-6 years old or 7-8 years old by asking them to point ot the image corresponding to a given word on a laminated card for 3-4 year olds (Figure D.1) and on a computer screen for children above 4 years old. For 7-8 year olds, surveyors also tested their ability to identify letters or words, and their ability to read simple sentences. These assessments were carried in the primary language spoken to the child in their home according to the caregiver.

Figure D.1: 3-year old playing Vocabulary game

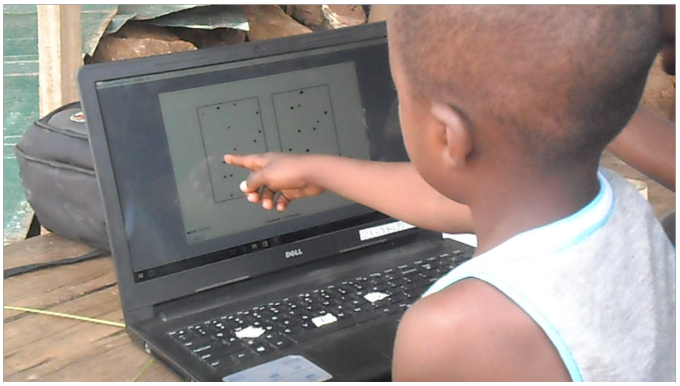
Note: A surveyor testing a 3-year old's vocabulary during piloting using laminated cards. The surveyor says a word in the child's primary language and asks the child to point to the picture of this word.

1.3 Math & numeracy assessments

For 14-22 months, 30-36 months old, 3-4 year olds and 5-6 years old, we tested their approximate number sense (ANS) aptitude through the Panamath game (Figure D.2). Research has shown that

ANS aptitude at early ages is predictive of mathematical ability later on in life (Libertus et. al., 2011). Surveyors used laminated cards for children under 4 years old and computers for children above 4 years old. For 30-36 months old, 3-4 year olds and 5-6 years old, surveyors also tested the child's ability to identify Arabic numbers and correctly count the numbers of objects in a given picture. For children over 3 years old, we tested addition and subtraction skills as well.

Figure D.2: 5-year old playing Panamath game



Notes: A surveyor playing the Panamath game with a 5-year old during piloting. This game measures the child's approximate number system aptitude. The child is asked which box has more dots or which dots has more dots of a particular color.

1.4 Social cognition assessments

To measure social cognition, we tested the child's ability to interpret the gaze and emotion of faces. In these tests, the child had to correctly interpret the gaze or emotion of the faces shown to them on the computer or laminated cards. The gaze-related tests were conducted with children over 30 months old, while the emotion-related tests were conducted with children over 3 years old.

1.5 Spatial reasoning assessments

The spatial reasoning tests measured the child's ability to concerns skills think about and manipulate objects in space. The spatial reasoning assessments asked 30-36 month-olds to identify the block that matched the shape of a given hole. Children above 3 years old were tesed on their ability to read maps. They were shown a laminated map that charted the shapes on a large mat places on the floor (Figure D.3). The surveyor pointed to the map and asked the child to place an object on the corresponding spot on the mat. All children above 3 years old were tested on their understanding of geometry as well.

Figure D.3: 5-year old playing Reading Maps game

Notes: A five-year old placing an object on the indicated spot during the Reading Maps game in piloting.

References

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