

INTERGROWTH-21st

International Fetal and Newborn Growth Standards for the 21st Century

The International Fetal and Newborn Growth Consortium



THE INTERGROWTH-21st NEURODEVELOPMENT ASSESSMENT (INTER-NDA) MANUAL – Feb 2021

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Please read this manual carefully and refer to it throughout the study if any clarification is needed

This Operation Manual was produced by the Infant Development Group of the INTERGROWTH-21st Project. This document reflects the consensus reached by members of the Group and the Scientific Advisory Panel regarding the selection of tests to be included in the INTERGROWTH-21st Neurodevelopment Package to be implemented by all centers taking part in the INTERGROWTH-21st follow-up study.

INTERGROWTH-21st is a large project involving health institutions from eight geographically diverse countries. It is therefore essential that all participating institutions follow a standardized neurodevelopment protocol.

Abbreviations

BSID-III	The Bayley Scales of Infant and Toddler Development – 3 rd edition
CBCL	The Child Behaviour Checklist
CBQ	The Child Behaviour Questionnaire
INTER-NDA	The INTERGROWTH-21 st Neurodevelopment Assessment

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Credits

The original INTER-NDA manual (v.1.2014) was prepared by members of the INTERGROWTH-21st Infant Development Group and reflects the general consensus reached during the Infant Development Group Meeting at Oxford on 23 March 2012. The purpose of this meeting was to select tests to be included in the INTERGROWTH-21st Neurodevelopment Package.

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The revised version (v.2.2021) of the manual was produced by **Michelle Fernandes** in February 2021. Items related to the caregiver reported Child Behaviour Questionnaire (CBQ) were removed from this version as these are not considered part of the INTER-NDA assessment. Other updates include the calculation and interpretation of INTER-NDA scaled domain scores based on the INTER-NDA standards.

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Introduction

Background

Approximately one in ten children suffer from impairments in neurodevelopment, manifested as disturbances in cognition, behaviour, emotional regulation, language development and motor skills.¹

The prevalence of neurodisabilities and cognitive impairments vary widely across geographical locations. While prevalence rates of 2.0-4.5 per 1,000 children have been reported from western countries, much higher rates of neurodisability (ranging from 5.3 to 24.3 per 1,000 children) have been reported from developing countries.²

Research into the epidemiology of the prevalence of neurodisabilities among children has revealed that the prevalence of mild levels of neurodisability is higher than that of severe neurodisability in both western and developing world settings. However, while the prevalence of neurodisability among western children is consistently within the range of 2-5 per 1,000 children; the prevalence rates among children from developing countries are much more variable.²

A number of risk factors for the development of neurodisabilities in children have been identified. These include biological conditions such as poor intra-uterine growth, prenatal exposure to teratogens, drugs and alcohol, low birth weight, neonatal asphyxia, malnutrition, metabolic disorders (for e.g. hypothyroidism), infectious disorders (for e.g. meningitis, encephalitis, HIV infection and malaria), genetic disorders, malignancies (for e.g. astrocytomas) and congenital cardiovascular disease.^{2,3} Other risk factors include environmental influences that can compromise brain development such as exposure to famine, natural disasters, war and conflicts, and situations of child labour, child abuse and neglect.³

There are a number of challenges to investigating the prevalence, epidemiology and patterns of neurodevelopmental disturbances in children. First, there is little information about childhood neurodisability from the developing world despite the wider prevalence of risk factors among this group. In addition, the children most at risk in these settings are unlikely to have been assessed and therefore may not be represented in prevalence estimates.⁴ Second, although severe disorders may be recognized during infancy, it is difficult to diagnose impairments in speech, cognition or behaviour before three to four years of age. Nevertheless, there is increasing evidence that early identification and treatment of childhood neurodisability presents the best opportunity for developmental change and is of prognostic importance.² Third, there are methodological challenges in assessing neurodevelopmental disturbances in children. The wide normal variation in neurodevelopment among children, simultaneous delays in multiple areas of development, and the logistical implications of carrying out long-term surveillance makes the selection of an assessment tool difficult.⁵ Assessments are often based on culture-specific items, and most studies have employed a mixture of parental report and observer rated assessment.⁵

Moreover, assessments can be lengthy, and require specialist training often resulting in a preference towards the use of brief screening measures, focus on certain areas of neurodevelopment pertaining to the hypothesis (whereas overlooking of other areas) and investigations in small samples. These make it easy for subtle disturbances and disturbances in related dimensions to be overlooked. The lack of large scale international studies employing robust and standardized methodologies make the comparability of normal and non-normal neurodevelopment in children across geographical and cultural groups insubstantial in some cases, and impossible in others.^{2,5}

Overview of the INTER-NDA

The INTER-NDA is a comprehensive, rapid assessment of cognition, (fine and gross) motor skills, language, and (positive and negative) behaviour for children aged 22 to 30 months.⁶ Its 37 items (Table 1) are administered in approximately 15 minutes using a combination of psychometric

techniques (direct administration, concurrent observation and caregiver reports) to minimise risks of reporter and recall bias commonly encountered in caregiver interviews⁵ while acknowledging that children might perform differently in artificial testing environments than in familiar settings. Children's performance on the INTER-NDA is scored across a spectrum of abilities, rather than on a pre-defined checklist and, therefore, affords a wider description of a child's faculties.⁶ It has demonstrated strong agreement with the BSID, 3rd edition (BSID-III) (interclass correlation coefficients 0.75 to 0.88, $p < 0.001$ for all domains with little to no bias on Bland Altman analysis); satisfactory internal consistency (Cronbach's alpha 0.56 to 0.81) and good unidimensionality across subscales (Comparative Fit Index = 0.90; Tucker Lewis Index = 0.94)⁷; and good levels of inter-rater ($k = 0.70$; 95% CI: 0.47–0.88) and test re-test reliability ($k = 0.79$; 95% CI: 0.48–0.96).⁶

The INTER-NDA was designed for use across socio-economic groups and populations. Its operation manual, standardisation protocol and forms are freely available at www.inter-nda.com. The kit (Figure 1) consists of common household items encountered across the world. In the INTERGROWTH-21st project study sites, the INTER-NDA was translated into the local languages of the sites (Brazil: Brazilian Portuguese, India: Marathi; Italy: Italian; Kenya: Kiswahili), using the WHO Mental Health Initiative translation guidelines⁸, which included processes of cultural customization, translation and back translation.

The methodology leading to the construction of the INTER-NDA is available via open access at Fernandes M, Stein A, Newton CR, Cheikh-Ismaïl L, Kihara M, Wulff K, de León Quintana E, Aranzeta L, Soria-Frisch A, Acedo J, Ibanez D. The INTERGROWTH-21st Project Neurodevelopment Package: a novel method for the multi-dimensional assessment of neurodevelopment in pre-school age children. PLoS one. 2014 Nov 25;9(11):e113360. Web link: <https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0113360>

The results of the study evaluating the INTER-NDA against the Bayley Scales of Infant Development IIIrd edition is available via open access at Murray E, Fernandes M, Newton CR, Abubakar A, Kennedy SH, Villar J, Stein A. Evaluation of the INTERGROWTH-21st Neurodevelopment Assessment (INTER-NDA) in 2 year-old children. PLoS One. 2018 Feb 28;13(2):e0193406. Web link: <https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0193406>

INTER-NDA norms: International Standards of Child Development at 2 years

The INTER-NDA's normative sample consisted of 1181 children prospectively recruited from early fetal life according to the prescriptive WHO approach from the INTERGROWTH-21st Project Study Sites in Brazil, India, Italy, Kenya and the UK. These children were confirmed to be at low risk of adverse perinatal and postnatal outcomes, and confirmed to have normal growth outcomes as measured on the WHO standards, normal attention and social-emotional reactivity profiles as measured on the Pre-school version of the Child Behaviour Checklist, and normal visual acuity and contrast sensitivity as measured on the Cardiff Tests of Vision^{9,10}. At 22 to 30 months of age, the cohort overlapped with the WHO motor milestone centiles, showed low postnatal morbidity (<10%), and vision outcomes, attentional problems and emotional reactivity scores within the respective normative ranges⁹.

Scaled INTER-NDA domain scores are presented as centiles, and were constructed according to the prescriptive WHO approach excluding children born preterm and those with significant postnatal/neurological morbidity⁹. For all domains, except negative behavior, higher scores reflect better outcomes and the threshold for normality was defined as $\geq 10^{\text{th}}$ centile. For the INTER-NDA's cognitive, fine motor, gross motor, language and positive behaviour domains these are ≥ 38.5 , ≥ 25.7 , ≥ 51.7 , ≥ 17.8 , and ≥ 51.4 , respectively. The threshold for normality for the INTER-NDA's negative behaviour domain is ≤ 50.0 , i.e. $\leq 90^{\text{th}}$ centile⁹.

The characteristics of the normative sample used to construct the INTER-NDA norms, the INTER-NDA norms and the methodology leading up to its construction are available via open access at Fernandes M, Villar J, Stein A, Urias ES, Garza C, Victora CG, Barros FC, Bertino E, Purwar M, Carvalho M, Giuliani F. INTERGROWTH-21st Project international INTER-NDA standards for child development at 2 years of age: an international prospective population-based study. BMJ open. 2020 Jun 1;10(6):e035258. Web link: <https://bmjopen.bmj.com/content/bmjopen/10/6/e035258.full.pdf>

INTER-NDA tool specifications:

1. Age range: 22-24 months
2. Domains assessed: cognition, gross motor, fine motor, language, positive and negative behaviour
3. Method of assessment: Direct assessment, caregiver reports, observer reports
4. Administration time: Approximately 15 minutes
5. Standardization protocol: Available at www.inter-nda.com
6. Manual: Available at www.inter-nda.com
7. Target populations: suitable for use across high, low- and middle-income populations
8. Professional capability of assessors: None, suitable for use by non-specialists
9. Thresholds for delay: For all domains except negative behaviour, <3rd centile is the cut-off for high risk of severe delay and 3rd to 10th centile is the scaled score range for high risk of mild-to-moderate delay. For negative behaviour, the ≥97th centile is the cut-off for high risk of severe delay and 90th to 97th centile is the scaled score range for high risk of mild-to-moderate delay.



Figure 1 Items included in INTER-NDA kit

	No. of items	Item lists
Cognitive	13	1,2,4,5,6,7,8,11,12,13,14,16,18
Fine motor	4	9,10,15,20
Gross motor	3	19,21,22
Overall Language	12	3,5,8,17,23,24,25,26,27,28,29,30
Positive Behaviour	5	31,32,33,34,35
Negative Behaviour	2	36,37

Table 1. Characteristics and distribution of items of the INTER-NDA.

INTER-NDA: Instructions for Administration

Step 1: Explain procedure to the mother & obtain consent.

Step 2: Administer the INTER-NDA items in sequence (Appendix 1), as per the instruction manual below. There are 5 possible outcomes for each item, and one must be selected for each item. No more than one option must be selected for each item. If the administration/observation of that item was not possible, select the 5th outcome as the outcome for that option, i.e. "Unable to assess". Please score each item after administration, please do not score items in groups based on recall.

Step 3: After you complete item 30, report items 31 to 37 based on your observation of the child's behaviour during the assessment.

Post-test tasks:

1. Wipe all toys down with a disinfectant wipe.
2. Replace all kit items into appropriate boxes.
3. Check expiry date on the raisins.

INTER-NDA Instruction Manual

1. Builds a tower of 5 cubes in ≤ 3 trials (after demonstration)

Domain:	Cognition	
Trials:	3	
Demonstration:	Yes	
Apparatus:	5 cubes	

Method:

Place all 5 cubes on the nursery table in front of the child. Stack the 5 cubes saying "Look at my tower". Break down your tower, place 1 cube in front of the child and hand the child one block at a time (or place a block next to the child) saying; "Now you make a big tower". Keep handing the child one cube at a time until the child makes a tower of 5 cubes or until the tower collapses before it reaches the height of 5 cubes. If the child is unable to make a tower of 5 cubes or if the tower collapses before it reaches the height of 5 cubes, make the tower again and say, "Look at my tower", then break your tower and repeat the process above handing the child one cube at the time. Encourage the child to continue building the tower (offering and/or saying, "Here is another cube", "Make your tower as big as you can" or "Put another cube on top of the tower"). If the child's tower falls, demonstrate again and encourage the child to build the tower again. Repeat till a maximum of 3 trials. Note the largest number of cubes in the tower the child has built in all 3 trials. If the child is able to build a tower of 5 cubes in one or two trials, do not repeat the test again.

Response:

- (1) The child builds a tower of 5 cubes in ≤ 3 trials
- (2) The child builds a tower of 3-4 cubes in ≤ 3 trials
- (3) The child builds a tower of 2 cubes in ≤ 3 trials
- (4) The child does not attempt to build the tower in any of the trials or is incapable of stacking more than 1 cube
- (5) Unable to assess the child

2. Names four colours when asked to do so

<i>Domain:</i>	<i>Language (Expressive)</i>
<i>Trials:</i>	1
<i>Demonstration:</i>	No
<i>Apparatus:</i>	4 cubes



Method:

Take 4 cubes of different colours and place them in a well-spaced line on the table in front of the child. Direct the child's attention to the cubes and ask him or her to name each colour. You may prompt the child by saying, "Can you tell me what colour this cube is?" or "What colour is this one?"

Response:

- (1) The child names 4 colours
- (2) The child names 3 colours
- (3) The child names 1 or 2 colours
- (4) The child does not name any colour, does not attempt to do so or looks confused
- (5) Unable to assess the child

3. Matches 3 cubes of same colours when requested to do so (after demonstration of 1 colour)

<i>Domain:</i>	<i>Cognition</i>
<i>Trials:</i>	1
<i>Demonstration:</i>	Yes (1 colour)
<i>Apparatus:</i>	12 cubes (4 colour groups with 3 cubes of each colour)



Method:

Take 4 cubes of different colours and place them in a well-spaced line on the table in front of the child. Name each colour as you place the respective cube on the table. Place 2 cubes of each colour in a pile next to the child. Pointing to the red cube say, "Red" and then pick up another red cube from the pile. Place it beside the red cube you have pointed to and say, "Look! They are both red, they are the same colour". Then point to the yellow (or green/blue) cubes and say, "This one is a yellow (or green/blue) cube. Now you find me a cube of the same colour" or say "This one is a yellow (or green/blue) cube. Now you find me a matching cube" – gesture towards the pile of cubes when you say "now you find me a matching cube". If the child matches the cube (whether correctly or incorrectly), move to the next cube (colour) and repeat the process. After you attempt the item with all 3 coloured cubes, note the number of correct matches the child has made. The child need match only one pair of cubes. You may prompt the child from one colour to the next by pointing to the next colour cube and saying "Can you find me a cube of this colour?". If a child stacks the matching colours one on top of the other, rather than placing them side-by-side on the table, the child is considered to have matched the colour. If the child picks up the cube in one hand, finds the matching colour with the other hand and holds both together, the child is considered to have matched the colour.

Response:

- (1) The child matches 3 colours
- (2) The child matches 2 colours
- (3) The child matches 1 colour
- (4) The child does not match any colour, does not attempt to match any colour or looks confused
- (5) Unable to assess the child

4. Hands the examiner one cube when asked to do so (Examiner says “Please give me one cube” & keeps palm open for 5 seconds after child has handed over 1 cube)

<i>Domain:</i>	<i>Cognition</i>
<i>Trials:</i>	<i>1</i>
<i>Demonstration:</i>	<i>No</i>
<i>Apparatus:</i>	<i>3 cubes</i>


Method:

Place three or more cubes on the table in front of the child. Hold out your hand and say, “Hand me one cube” or “Please give me one cube”. Do not pull your hand back until the child indicates that he/she has completed the task or until 5 seconds have elapsed with no response. If the child places one cube in your palm, do not withdraw your palm but keep it outstretched and open with the solitary cube on it for 5 seconds and then pull it away.

Response:

- (1) The child hands only one block within 5 seconds
- (2) The child hands only one block in more than 5 seconds
- (3) The child hands two or more blocks
- (4) The child does not hand any block or does not attempt the task, or looks confused
- (5) Unable to assess

5. Puts the spoon in the cup when asked to do so

<i>Domain:</i>	<i>Cognition</i>	
<i>Trials:</i>	<i>5</i>	
<i>Demonstration:</i>	<i>No</i>	
<i>Apparatus:</i>	<i>5 objects, including spoon and cup</i>	

Method:

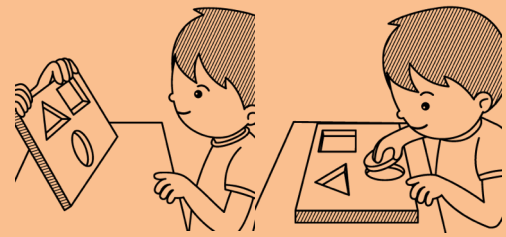
Place five objects (cup/glass, spoon, comb, shoe, toothbrush etc.; first make sure that these objects are known to the child by asking the mother if the child is familiar with them) on the table in a horizontal line, equidistant from each other, with a visible space in between them. Ensure that the handles of the object face the child. Ask the child to “Put the spoon in the cup”. Take care not to gesture towards the objects named with your eyes or indicate them by the position of your hand. If no response, repeat up to five times. Replace each object before embarking on another trial.

Response:

- (1) The child puts the spoon in the cup in ≤ 3 trials
- (2) The child puts the spoon in the cup in 4-5 trials
- (3) The child takes the spoon or the cup but does not complete the 2 step action
- (4) The child makes no attempt to initiate the action or looks confused
- (5) Unable to assess

6. Matches shapes on board (after demonstration)

Domain:	Cognition
Trials:	5
Demonstration:	Partial (removal only)
Apparatus:	Board puzzle with 3 pieces



Method:

Place the pieces correctly in the board, holding it in your lap or under the table so that the child does not see you insert them. Place the board on the table, directly in front of the child, with the circle piece closest to him/her. Remove the pieces one by one and place them between the lower border of the board and the child beginning with the square, followed by the circle and then the triangle. Gesture toward the board and ask the child to put the piece in. Be careful not to point towards any specific shape on the board with your fingers or eyes. If no response, repeat the test a maximum of five times. Consider the response after the best demonstration.

Response:

- (1) The child matches all the shapes in ≤ 3 trials
- (2) The child matches all the shapes with repeated demonstration i.e. 4-5 trials
- (3) The child matches one or two shapes in 4-5 trials
- (4) The child makes no attempt to initiate the action or looks confused
- (5) Unable to assess

7. Matches shapes on rotated board (do not demonstrate)

Domain:	Cognition
Trials:	5
Demonstration:	Partial (removal only)
Apparatus:	Board puzzle with 3 pieces



Method:


Place the pieces correctly in the board, holding it in your lap or under the table so that the child does not see you insert them. Place the board on the table, directly in front of the child, with the circle piece closest to him/her. Remove the pieces one by one and place them between the lower border of the board and the child beginning with the square, followed by the circle and then the triangle. Then say, "Watch what I do".

Leaving the board on the table surface, slowly and deliberately rotate the board 180°. Then say, "Now you put them back". Be careful not to point towards any specific shape on the board with your fingers or eyes. If no response, repeat the test a maximum of five times. Consider the response after the best demonstration.

Response:

- (1) The child matches all the shapes in ≤ 3 trials
- (2) The child matches all the shapes with repeated demonstration i.e. 4-5 trials
- (3) The child matches one or two shapes in 4-5 trials
- (4) The child makes no attempt to initiate the action or looks confused
- (5) Unable to assess

8. Points correctly when asked, "Where is the door/entrance to the room?"	
<i>Domain:</i>	<i>Cognition</i>
<i>Trials:</i>	<i>5</i>
<i>Demonstration:</i>	<i>No</i>
<i>Apparatus:</i>	<i>None</i>
Method: The examiner asks the child, "Where is the door/entrance to the room?". If no response, repeat up to five times.	
Response: <ol style="list-style-type: none"> (1) The child identifies door correctly in ≤ 3 trials (2) The child identifies door correctly in 4-5 trials (3) The child attempts, but does not identify door (4) The child does not make an attempt to identify the door or looks confused (5) Unable to assess 	

9. Puts a raisin precisely inside a small opening in a bottle (after 1 demonstration; test both hands)	
<i>Domain:</i>	<i>Fine Motor</i>
<i>Trials:</i>	<i>1 (test both hands)</i>
<i>Demonstration:</i>	<i>Yes</i>
<i>Apparatus:</i>	<i>Raisin, yellow rectangular bottle</i>
	
Method: Sit the child on the nursery chair. Place a raisin and an opened container with a 1 inch diameter mouth on the nursery table in front of the child. Pick up the raisin with your index finger and thumb using a pincer grasp and drop the raisin slowly and purposefully into the opening of the container. Place a raisin next to the child's right hand and say to the child, "Now you put the raisin into the container". If successful, place a raisin next to the child's left hand and say to the child, "Now you put the raisin into the container but with that hand" and point to the child's left hand. It may be necessary for you or the mother to hold one of the child's hands when assessing the other hand.	
Response: <ol style="list-style-type: none"> (1) The child releases the raisin into bottle with each hand precisely (2) The child releases the raisin with either hand in a clumsy manner or the raisin falls out of bottle when either hand is assessed (3) The child makes an attempt but his/her release is unsuccessful with one or more hands (4) The child does not make an attempt to pick up the raisin or drop it into the container, or the child looks confused (5) Unable to assess 	

10. Drinks water from cup/sippy cup when placed in front of child

Domain:	Fine Motor
Trials:	1
Demonstration:	No
Apparatus:	Cup, sippy cup (or child's own juice/milk/water bottle taken from the mother)
Concurrent observation:	This item may be scored without administering it specifically, if the child spontaneously demonstrates the action during the course of the assessment



Method:

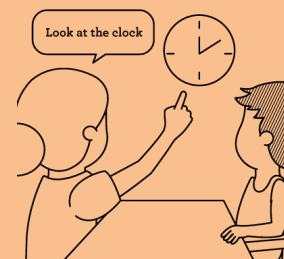
Put a glass/sippy cup with water (or the child's own sippy cup or glass with juice, milk, water or another liquid that the mother may have brought along with the child) on the nursery table in front of the child. Observe if the child picks up the cup, sippy cup or bottle and drinks from it spontaneously. Do not prompt the child verbally or by gesturing towards the cup. If unable to assess, ask the mother if the child is able to drink from a cup or sippy cup without spilling.

Response:

- (1) The child drinks from the cup spontaneously in a well-co-ordinated manner without spilling
- (2) The child drinks from the cup clumsily and spills
- (3) The child attempts to drink from the cup but is unsuccessful (i.e. cannot grasp or lift cup)
- (4) The child does not make an attempt to pick up the cup or lift it to his/her mouth, or the child looks confused
- (5) Unable to assess

11. Looks towards an object located across the room when pointed at by the examiner

Domain:	Cognition
Trials:	5
Demonstration:	No
Apparatus:	Room objects



Method:

Point to any object in the room with which the child is likely to be familiar, for e.g., a ball, fan, doll, flower, tree, shoe and say, "Oh! Look! There is a ball/fan/doll". Observe the child's response, i.e. the child may follow your finger with his/her eyes, he /she may point to the object, he/she may vocalize or show the object to the parent in the room. If the child does not respond, repeat up to five times.

Response:

- (1) The child looks or points at object, or vocalises about the object, in ≤ 3 trials
- (2) The child looks or points at object in 4-5 trials
- (3) The child looks or points at the wrong object, or attempts to but cannot identify the object
- (4) The child makes no attempt to identify the object or looks confused
- (5) Unable to assess

12. Pretends to drink from the cup when a toy cup is placed in front of him/her

<i>Domain:</i>	<i>Cognition</i>
<i>Trials:</i>	<i>2</i>
<i>Demonstration:</i>	<i>Yes (1 demonstration if initial response is not spontaneous)</i>
<i>Apparatus:</i>	<i>Cup</i>
<i>Other options for apparatus:</i>	<i>Comb, toothbrush</i>


Method:

Offer a cup to the child. Observe if the child demonstrates spontaneous self-symbolic play, i.e. pretends to drink from the cup (or tries to make his/her mother drink from the cup, or offers the examiner a drink). If the child does not play with the cup spontaneously, say to the child "Do you want to have a drink?". If the child looks into the cup and says "Its empty", you can say to the child, "Yes it is, but let's pretend shall we?". If the child still does not drink from the cup, demonstrate drinking from the cup by lifting it to your lips and say, "Mmmm". What a nice cup of tea!". Then place the cup back on the table and say, "You have a drink" and observe the response of the child. You may use a comb or a toothbrush in place of a cup. In such a situation, please demonstrate accordingly.

Response:

- (1) The child pretends to drink from the cup spontaneously
- (2) The child pretends to drink from the cup after 1 demonstration
- (3) The child makes a partial attempt to drink from the cup after 1 demonstration, i.e. the child plays with the cup but does not drink from it
- (4) The child makes no attempt to play with the cup even after demonstration
- (5) Unable to assess

13. Able to make a cup of tea with the toy tea set when requested by examiner (Examiner says "Can you make a cup of tea?")

<i>Domain:</i>	<i>Cognition</i>	
<i>Trials:</i>	<i>2</i>	
<i>Demonstration:</i>	<i>Yes (1 demonstration if initial response is not spontaneous)</i>	
<i>Apparatus:</i>	<i>Tea pot, 2 cups and 2 spoons</i>	

Method:

Place the teapot, 2 cups and 2 spoons in front of the child and say, "Look at these. Can you make a cup of tea?". Observe if the child picks up an object and begins to initiate play. If the child does not initiate play, model for the child by saying, "I think I am going to make myself a cup of tea" and then demonstrating pouring a cup of tea from the teapot. Then push the objects towards the child and ask, "Can you make a cup of tea?". Observe the response of the child.

Response:

- (1) The child makes a cup of tea (with the pouring motion) spontaneously upon request (or without request)
- (2) The child makes a cup of tea (with the pouring motion) after 1 demonstration
- (3) The child makes a partial attempt to make a cup of tea after the demonstration – he/she may pick up the teapot or cup, and then set it down; or play with the spoon; or open and close the teapot without the pouring motion
- (4) The child makes no attempt to make a cup of tea even after demonstration
- (5) Unable to assess

14. Feeds doll when requested to (Examiner says “Can you give the dolly some tea?”)

<i>Domain:</i>	<i>Cognition</i>
<i>Trials:</i>	<i>2</i>
<i>Demonstration:</i>	<i>Yes (1 demonstration if initial response is not spontaneous)</i>
<i>Apparatus:</i>	<i>Tea pot, 2 cups and 2 spoons, doll</i>

**Method:**

Place a doll on the table in front of the child next to the tea pot, 2 cups and 2 spoons. Say, “Can you please give dolly some tea?” or “Dolly is very thirsty. Could you give her some tea please?”. Observe if the child picks up an object and begins to feed the doll or offer the doll the cup. If the child does not initiate play, model for the child by saying, “Dolly is feeling very thirsty. I am going to give dolly some tea” and then demonstrating by pouring a cup of tea from the teapot and giving the doll some tea to drink, taking the cup right up to the doll’s lips. Then push the tea pot and cup towards the child and ask, “Can you give dolly some tea?”. Observe the response of the child.

Response:

- (1) The child feeds the doll spontaneously upon request (or without request)
- (2) The child feeds the doll after 1 demonstration
- (3) The child makes a partial attempt to feed the doll after the demonstration – he/she may pick up the teapot or cup, and then set it down; or play with the doll without feeding her; or open and close the teapot without feeding the doll
- (4) The child makes no attempt to feed the doll even after demonstration
- (5) Unable to assess

15. Imitates straight horizontal scribble (after demonstration)

<i>Domain:</i>	<i>Fine Motor</i>
<i>Trials:</i>	<i>5</i>
<i>Demonstration:</i>	<i>Yes</i>
<i>Apparatus:</i>	<i>Crayon, piece of white paper</i>


**Method:**

Place the paper on the table in front of the child. Place one crayon on the paper, preferably a brightly coloured crayon such as a red, green, blue or black crayon. Take the crayon and draw a straight horizontal line moving from your right to left rapidly while saying, “See? It goes zip! Now you do it!”. Hand the child the crayon and allow the child time to make the stroke. You may hold the paper to prevent it from moving about on the table as the child draws on it. The child’s line should be approximately 30 degrees of your line and should be relatively straight. If the child is not able to draw the line, demonstrate and repeat the item up to 5 times.

Response:

- (1) The child imitates a straight scribble in ≤ 3 trials without difficulty
- (2) The child imitates a straight scribble in 4-5 trials and experiences some difficulty
- (3) The child attempts by holding the crayon and scribbling a little bit
- (4) The child does not or cannot hold the crayon, or the child looks confused
- (5) Unable to assess
- (6)

16. Identifies glitter bracelet under correct washcloth (Test both sides)

<i>Domain:</i>	<i>Cognition</i>	
<i>Trials:</i>	5	
<i>Demonstration:</i>	No	
<i>Apparatus:</i>	Glitter bracelet, 2 wash cloths	

Method:

Place the bracelet and the 2 washcloths on the table in a horizontal row within the child's reach. Show the bracelet to the child and say, "Look at this colourful bracelet. I am going to hide it. Look, I'm hiding it here". Be sure the child is watching. Place the bracelet under the washcloth to the child's left. Then, with the child still watching, immediately uncover the bracelet and place it under the washcloth to the child's right. Say, "Look! I am hiding it again". Then ask the child, "Can you show me where the bracelet is?".

A second administration should be conducted hiding the bracelet under the washcloth to the child's right first and then hiding it again under the washcloth to the child's left.

Presentation on both left and right sides constitutes one trial. If the child is not successful on either the right or the left, present both sides again as the next trial.

If the child attempts to grab the bracelet or the washcloth, the mother or an assistant may be asked to hold the child's hands momentarily while you place and displace the bracelet.

Response:

- (1) The child finds the bracelet correctly in ≤ 2 trials on both sides
- (2) The child finds the bracelet correctly in 3 trials or on one side only
- (3) The child finds the bracelet correctly in 4-5 trials or on one side only
- (4) The child does not find bracelet or does not attempt to find the bracelet, or the child looks confused
- (5) Unable to assess

17. Correctly identifies object groups using plurals

<i>Domain:</i>	<i>Language (Expressive)</i>
<i>Trials:</i>	1
<i>Demonstration:</i>	No
<i>Apparatus:</i>	None, objects in the room e.g. flowers, cubes, shoes, crayons, socks, girls, boys, clouds, stars
<i>Concurrent observation:</i>	<i>This item may be scored without administering it specifically, if the child spontaneously uses plurals during the course of the assessment</i>


Method:

Direct the child's attention to the objects. Point to the objects and ask the child, "What are these?" or say, "Tell me what these are" or "What do you call these?". Point to 5 objects and record how many of these the child responds to with plurals. If the child does not respond to 5 out of 5 point to 3 more objects. Record the total number of plurals the child uses.


Response:

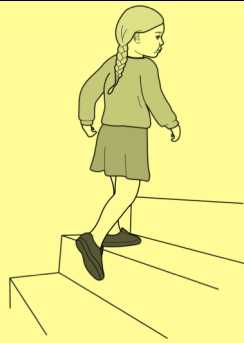
- (1) The child uses 5 plurals
- (2) The child uses 3-4 plurals
- (3) The child uses 1-2 plurals
- (4) The child does not use any plurals
- (5) Unable to assess the child

18. Asks for toilet by gesture or verbally (maternal recall)	
Domain:	Cognition
Trials:	1
Demonstration:	N/A
Method: Ask the mother if the child is toilet trained, or if he/she indicates the need to pass urine/motions either verbally or by gesturing.	
Response: (1) Always for urine and motions (2) Occasionally for urine and motions (3) Only for motions/bowel movements (4) Never (5) Unable to assess	

19. Runs (maternal recall)		
Domain:	Gross Motor	
Trials:	None	
Demonstration:	If necessary	
Concurrent observation:	<i>This item may be scored without administering it specifically, if the child spontaneously runs during the course of the assessment</i>	
Method: Ask the mother whether the child is able to run. Ask the mother for a specific instance when this occurred and demonstrate if necessary.		
Response: <ul style="list-style-type: none">(1) Mother reports that the child is able to run steadily(2) Mother reports that the child attempts to run, but is a little unsteady(3) Mother reports that the child cannot run yet but walks independently(4) Mother reports that the child cannot run or walk independently yet, but that the child walks with support(5) Unable to assess		

20. Throws a ball very near (after demonstration; test both hands)	
Domain:	Fine Motor
Trials:	1 (test both hands)
Demonstration:	Yes
Method: Demonstrate to the child how to throw a tennis ball. Then gives the ball to the child and asks him/her to throw it. Observe the child throwing the ball. Observe if the child throws the ball using his/her wrist with flexion of the elbow and his/her trunk straight or leaning slightly forward. Test both the child's arms by asking him/her to throw the ball first with one arm and then with the other.	
Response: (1) The child throws the ball with both arms with a good release (2) The child throws the ball with both arms with an unsteady release (3) The child attempts to throw the ball but is unable to with both or one hand (4) The child does not attempt to throw the ball with either hand (5) Unable to assess	

21. Kicks ball (maternal recall)		
Domain:	Gross Motor	
Trials:	N/A	
Demonstration:	N/A	
Method: Ask the mother whether the child is able to run towards a ball and kick it with his/her knee flexed. Ask the mother for a specific instance when this occurred and demonstrate if necessary.		
Response: <ul style="list-style-type: none">(1) The mother reports that the child is able to run after a ball and kick it with knees flexed(2) The mother reports that the child is able to run after a ball and attempts to kick it but is unsuccessful(3) The mother report that the child walks after the ball and touches it with his/her foot(4) The mother reports that the child has never attempted to kick a ball(5) Unable to assess		

22. Climbs upstairs alone, 2 feet/stair or in adult fashion (maternal recall)		
Domain:	Gross Motor	
Trials:	N/A	
Demonstration:	N/A	

Method:
Ask the mother whether the child is able to climb up a staircase by himself or herself. Clarify whether the child holds an adult's hand, the railing or crawls up the staircase – these qualify as climbing up stairs with help. Clarify whether the child is unsteady or tumbles over while climbing upstairs. Ask the mother for a specific instance when this occurred and demonstrate if necessary.

Response:

- (1) The child climbs stairs alone in a steady manner
- (2) The child climbs stairs alone but in an unsteady manner
- (3) The child needs help to climb the stairs (either by holding an adult's hand or a railing; or crawling up stairs)
- (4) The child does not attempt to climb stairs or is not able to climb the stairs even with help
- (5) Unable to assess

23. Uses 2-4 syllable babble such as dada, mama but not specifically to anything or any person	
Domain:	Language (Expressive)
Trials:	N/A
Demonstration:	No
Apparatus:	None
Concurrent observation:	<i>This item is assessed during the course of the assessment</i>
Method: During the testing listen for consonant-vowel combinations that the child produces. These may consist of 2, 3 or 4 syllables e.g. mama, gagaga, dadamama, If you do not notice these sounds through incidental observation, play with the child and repeat different sounds such as mama, papa, dada, gagaga, babababa and observe if the child mimics the sounds.	
Response: <ol style="list-style-type: none"> (1) The child babbles with 2-4 syllables spontaneously in at least 1 instance during assessment (2) The child mimics a 2-4 syllable babble (3) The child babbles or mimics a 1 syllable babble e.g. ba, ma, da (4) The child does not babble at all (5) Unable to assess the child 	

24. Use two words together

<i>Domain:</i>	<i>Language (Expressive)</i>
<i>Trials:</i>	<i>N/A</i>
<i>Demonstration:</i>	<i>No</i>
<i>Apparatus:</i>	<i>None</i>
<i>Concurrent observation:</i>	<i>This item is assessed during the course of the assessment</i>

Method:

During the testing listen for any words that the child uses spontaneously and appropriately applied to a specific object or situation e.g. green cup, mummy cup, red chair. If you do not note these sounds through incidental observation play with the child and present them with familiar objects such as a doll a cup or a spoon.

Response:

- (1) The child uses two words together appropriately
- (2) The child uses two words together, but the use is inappropriate
- (3) The child uses one word appropriately, but not two word combinations
- (4) The child does not use words during the assessment
- (5) Unable to assess the child

25. Indicates by gesture to say no

<i>Domain:</i>	<i>Language (Expressive)</i>
<i>Trials:</i>	<i>N/A</i>
<i>Demonstration:</i>	<i>No</i>
<i>Apparatus:</i>	<i>None</i>
<i>Concurrent observation:</i>	<i>This item is assessed during the course of the assessment</i>

Method:

During the testing observe if the child uses the word "No" spontaneously and appropriately applied to a specific question or situation. Definite shaking of the head or shrugging of the shoulders (but not just turning away from the situation or withdrawing) to communicate refusal is also observed. If you do not note this behaviour through incidental observation play, ask the child a question for which the likely answer is to be no, for example, "Do you want mummy to go out of the room?". If still not observed, ask the mother if child indicates refusal at home either verbally or by gesturing.

Response:

- (1) The child indicates refusal verbally or via gesture all the time
- (2) The child indicates refusal verbally or via gesture some of the time
- (3) The child attempts to indicate refusal verbally or via gesture, but the communication is an incomplete indication
- (4) The child does not attempt to convey refusal by saying no, verbally or via gesture
- (5) Unable to assess the child

26. Use of a pronoun e.g. me, my, she, he, it, I	
Domain:	Language (Expressive)
Trials:	N/A
Demonstration:	No
Apparatus:	None
Concurrent observation:	<i>This item is assessed during the course of the assessment</i>
Method: During the testing observe if the child uses pronouns (i.e. me, my, mine, you, she, he, it) spontaneously and appropriately applied to a specific object or situation. If you do not note these pronouns during incidental testing, try and elicit them by setting up play situations and prompting the child into using them. Examples of these situations would be: <ol style="list-style-type: none"> 1. Have the doll fall over. Say, "Uh oh, what happened to dolly?" 2. Build a tower, knock it down and say, "Uh oh what happened?" or "Who knocked over the tower?" 3. Point to the child's shoes and say, "What pretty shoes! Whose shoes are they?" 	
Response: <ol style="list-style-type: none"> (1) The child uses at least one pronoun in a correct context (2) The child uses at least one pronoun but incorrectly (3) The child uses proper names instead of pronouns (4) The child uses neither proper names or pronouns (5) Unable to assess the child 	

27. How many words does the child use during the assessment other than mama/dada	
Domain:	Language (Expressive)
Trials:	N/A
Demonstration:	No
Apparatus:	None
Concurrent observation:	<i>This item is assessed during the course of the assessment</i>
Method: During the testing observe how many nouns and adjectives the child uses spontaneously and appropriately to describe a specific object or situation (other than mama, dada, papa). These can include proper nouns. Words need to be directed at some particular person, place, event or object.	
Response: <ol style="list-style-type: none"> (1) The child uses ≥ 8 words during the assessment (2) The child uses 6-7 words during the assessment (3) The child uses 4-5 words during the assessment (4) The child uses ≤ 3 words during the assessment (5) Unable to assess the child 	

28. How many sentences of 3 words or more does the child use during the assessment?	
<i>Domain:</i>	<i>Language (Expressive)</i>
<i>Trials:</i>	<i>N/A</i>
<i>Demonstration:</i>	<i>No</i>
<i>Apparatus:</i>	<i>None</i>
<i>Concurrent observation:</i>	<i>This item is assessed during the course of the assessment</i>
Method: During the testing observe how many sentences of 3 words (including nouns, adjectives, pronouns, articles and adverbs) the child uses spontaneously and appropriately to describe a specific object or situation. The sentences may include proper nouns. The sentences need to be directed at some particular person, place, event, opinion or object.	
Response: (1) The child uses ≥ 2 sentences of 3 words or more during the assessment (2) The child uses 1 sentence of 3 words during the assessment (3) The child uses 1 or more two word utterance during the assessment (4) The child uses no sentences, or two word utterances during the assessment (5) Unable to assess the child	

29. In how many instances does the child follow on a topic of conversation providing new information?	
<i>Domain:</i>	<i>Language (Expressive)</i>
<i>Trials:</i>	<i>N/A</i>
<i>Demonstration:</i>	<i>No</i>
<i>Apparatus:</i>	<i>None</i>
<i>Concurrent observation</i>	<i>This item may be assessed during the course of the assessment</i>
Method: During the testing observe how many instances the child follows up on a topic of conversation or a prior utterance by making a comment that adds new information to the topic. This is known as a contingent utterance. Examples include: <ol style="list-style-type: none"> 1. Show the child a doll and say 'Here's a doll'. The child responds, "Pretty doll" 2. Show the child a doll and say "Baby is sleepy". The child responds, "Sleepy time, go night night" 3. Give the child a car and say, "Look a car!". The child responds, "Car green" or "Vroom vroom". 	
Response: (1) The child makes at least one contingent utterance, using ≥ 2 words, proving correct information (2) The child makes at least one contingent utterance using single words, providing correct information (3) The child uses any number of words, but provides incorrect information (4) The child does not follow up on conversations (5) Unable to assess the child	

30. Combines word and gesture when asked (DO NOT demonstrate)	
Domain:	Language (Expressive)
Trials:	N/A
Demonstration:	No
Apparatus:	None
Concurrent observation:	<i>This item may be assessed during the course of the assessment</i>
Cautionary Note:	<i>Do not use, "Bye bye" in the middle of an assessment</i>
Method: During the testing observe the child to see if he or she spontaneously uses a gesture and a word (or words) together to express himself/herself. Examples would include: <ol style="list-style-type: none"> 1. The child saying, "Go" and pointing to the door 2. The child saying, "Juice" and pointing to his/her sippy cup If the child does not spontaneously use a word and gesture together, try to elicit one by saying (and not gesturing): <ol style="list-style-type: none"> 1. "Pat-a-cake" and seeing if the child repeats the words and pats his/her hands 2. "Clap clap" and seeing if the child repeats the words and claps his/her hands 3. "Flying kiss" or "Air kiss" and seeing if the child repeats the word "Kiss" and blows an air kiss 4. "Bye bye" and seeing if the child says "bye bye" and waves 	
Response: <ol style="list-style-type: none"> (1) The child combines a complete word and gesture appropriately (2) The child combines a complete word and gesture inappropriately (3) The child combines a word and gesture incompletely and inappropriately (4) The child does not combine a word and gesture at all (5) Unable to assess the child 	

Observer Reported Behaviour Items

Items 31 to 37 must to be completed based on your observation of the child's behaviour during the administration of items 1 to 30. You will comment on how whether you observed the following 7 behaviours in the child most of the time, some of the time or never during the assessment:

Behaviour	Example of behaviour
31. Positive affect	Smiling Laughing Making sounds that are perceived as expression of excitement, happiness or pleasure Hugging mother Kissing mother
32. Exploration	Curiosity about environment, objects and persons Exploring environment, touching objects Asking for information about objects in the environment Attracted towards objects placed away from the child Noticing details about environment and asking questions about them
33. Ease of engagement	Easy to attract the child's attention to the doll or tea set Easy to make the child involved in the puzzle task Easy to make the child involved in the tower task
34. Cooperativeness	Willingness of the child to respond to requests without fussing Child hands objects to examiner when asked Child performs tasks (such as building a tower, playing with the doll) when requested
35. Adaptability to change	Comfortably plays with new toys Not distressed by new persons and environments Not distressed by new stimuli e.g. new games, new tasks
36. Distractibility	Poor attention to tasks Easily distracted Leaves tasks incomplete
37. Negative affect	Fussing Pouting Whining Crying Frowning Shouting angrily Aggressive behaviour Tantrums

Calculation of INTER-NDA Scaled Domain Scores

Raw mean INTER-NDA domain scores are calculated as shown in Table 2⁹. As INTER-NDA items numbered 1 to 30 are scored on a five-point scale, and items 31 to 37 are scored on a three-point scale, raw domain scores are converted to standardised scaled scores (range 0-100) as shown in Table 3⁹.

INTER-NDA domain	Number of items contributing to domain	Constituent item numbers	Method of domain estimation	Interpretation of score
Cognitive	13	1,2,4,5,6,7,8,11,12,13,14,16,18	Mean of constituent item scores	Higher score reflects better performance
Fine motor	4	9,10,15,20	Mean of constituent item scores	Higher score reflects better performance
Gross motor	3	19,21,22	Mean of constituent item scores	Higher score reflects better performance
Language	12	3,5,8,17,23,24,25,26,27,28,29,30	Mean of constituent item scores	Higher score reflects better performance
Positive behaviour	5	31,32,33,34,35	Mean of constituent item scores	Higher score reflects better performance
Negative behaviour	2	36,37	Mean of constituent item scores	Lower score reflects better performance

Table 2 The INTERGROWTH-21st Neurodevelopment Assessment (INTER-NDA) raw domain score calculation and interpretation.

Domain	Min - Max	Scaling formula
Cognitive, fine motor, gross motor and language	1 – 4	$((x - 1) / 3) * 100$
Positive and negative behaviour	1 – 3	$((x - 1) / 2) * 100$

Domain conversion table (selected values) for cognitive, motor (fine and gross), and language domains	
Raw mean score	Scaled mean score
1.00	0.0
1.25	8.3
1.50	16.7
1.75	25.0
2.00	33.3
2.25	41.7
2.50	50.0
2.75	58.3
3.00	66.7
3.25	75.0
3.50	83.3
3.75	91.7
4.00	100.0

Domain conversion table (selected values) for positive and negative	
Raw mean score	Scaled mean score
1.0	0.0
1.2	10.0
1.4	20.0

1.6	30.0
1.8	40.0
2.0	50.0
2.2	60.0
2.4	70.0
2.6	80.0
2.8	90.0
3.0	100.0

Table 3 Formulae and tables for the conversion of raw scores to standardised (scaled) scores (range 0-100)

Interpretation of INTER-NDA Scaled Domain Scores

The centile thresholds for the INTER-NDA's normative sample are presented in Table 4. For all domains, except negative behavior, higher scores reflect better outcomes and the threshold for normality was defined as $\geq 10^{\text{th}}$ centile, with risk of severe and mild-to-moderate delay defined as scores $< 3^{\text{rd}}$ and 3^{rd} to 10^{th} centile respectively. For the INTER-NDA's cognitive, fine motor, gross motor, language and positive behaviour domains these are ≥ 38.5 , ≥ 25.7 , ≥ 51.7 , ≥ 17.8 , and ≥ 51.4 , respectively. The threshold for normality for the INTER-NDA's negative behaviour domain is ≤ 50.0 , i.e. $\geq 90^{\text{th}}$ centile. The risk of severe and mild-to-moderate delay in this domain is defined as scores $\geq 97^{\text{th}}$ and 97^{th} to 90^{th} centile respectively.

INTER-NDA domain	Pooled Centiles for children included in the normative INTER-NDA sample (n=1181)						
	c3	c10	c25	c50	c75	c90	c97
Cognitive	27.4	38.5	62.2	79.5	88.8	92.6	99.6
Fine motor	17.5	25.7	74.2	91.4	100.0	100.0	100.0
Gross motor	31.1	51.7	66.7	81.6	100.0	100.0	100.0
Language	12.1	17.8	45.7	71.7	88.5	95.1	100.0
Positive behaviour	37.8	51.4	70.0	90.0	100.0	100.0	100.0
Negative behaviour	0.0	0.0	0.0	25.0	25.0	50.0	76.5

Table 4 INTER-NDA centile thresholds

To facilitate the easy and rapid implementation of these standards in clinical, community and research settings for the identification of children at risk who would benefit from routine and urgent further assessment and specialist referral, respectively, the INTER-NDA neurodevelopmental chart can be printed or downloaded (Figure 2).



Figure 2 INTER-NDA chart

Conclusion

Measuring neurodevelopmental milestones during early childhood at scale and comparing outcomes across populations are essential prerequisites for achieving the United Nations Sustainable Development Goal (UN SDG) 4.2 (“ensure that all girls and boys have access to quality early child development, care and pre-primary education so that they are ready for primary education”). The INTER-NDA and the international INTER-NDA standards contribute an important component to the care of young children: a unique tool for use across all health-care systems (Table 5) to measure neurodevelopmental milestones and associated behaviours in two year-olds uniformly and at scale, and to identify children at risk of neurodevelopmental delays who would benefit from specialist referral and further investigation. The INTER-NDA standards, complete the INTERGROWTH-21st Project fetal growth and newborn size standards, and the WHO Child Growth Standards, and its hoped, will (i) contribute to the attainment of the early child development components of the UN SDGs and the WHO survive, thrive, and transform goals of the Global Strategy on Women’s, Children’s and Adolescents’ Health; and (ii) provide a methodological template for the extension of the construction of child developmental standards to younger and older age groups.

INTER-NDA Website	www.inter-nda.com
INTERGROWTH-21st Project Website	www.intergrowth21.org.uk
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For the complete list of items in the INTER-NDA kit (which may be locally sourced), please contact:	Michelle.fernandes@wrh.ox.ac.uk

Key Publications:

The INTERGROWTH-21st Project Neurodevelopment Package: a novel method for the multi-dimensional assessment of neurodevelopment in pre-school age children. Fernandes M, Stein A, Newton CR, Cheikh-Ismaïl L, Kihara M, Wulff K, de León Quintana E, Aranzeta L, Soria-Frisch A, Acedo J, Ibanez D. et al PloS one. 2014 Nov 25;9(11):e113360.

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<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0193406>

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Appendix I

The INTERGROWTH-21 st Neurodevelopment Assessment (INTER-NDA)						
No.	Item					
1	Builds a tower of 5 cubes (<i>trials=3, demonstration=3</i>)	5 cubes	3-4 cubes	2 cubes	No attempt	Unable to assess
2	Names 4 colours when asked to do so (<i>trials=1, demonstration=0</i>)	Names 4 colours	Names 3 colours	Names 1 or 2 colours	Does not name any colour	Unable to assess
3	Matches 3 cubes of same colours when requested to do so (<i>trials=1, demonstration=1 of one colour</i>)	Matches 3 colours	Matches 2 colours	Matches 1 colour	Does not match any colour	Unable to assess
4	Hands the examiner one cube when asked to do so (Examiner says “Please give me one cube” & keeps palm open for 5 seconds after child has handed over 1 cube) (<i>trials=1, demonstration=0</i>)	Hands only one block within 5 seconds	Hands only one block in more than 5 seconds	Hands two or more blocks	Does not hand any block / No attempt	Unable to assess
5	Puts the spoon in the cup when asked to do so (<i>trials=5, demonstration=0</i>)	Puts the spoon in cup in ≤3 trials	Puts the spoon in cup in 4-5 trials	Takes the spoon or the cup but does not complete action	No attempt	Unable to assess
6	Matches shapes on board (<i>trials=5, demonstration=partial – removal only</i>)	All shapes in ≤3 trials	All shapes with repeated demonstration i.e. 4-5 trials	One or two shapes in 4-5 trials	No attempt	Unable to assess
7	Matches shapes on rotated board (<i>trials=5, demonstration =partial – removal only</i>)	All shapes in ≤3 trials	All shapes with repeated demonstration i.e. 4-5 trials	One or two shapes in 4-5 trials	No attempt	Unable to assess
8	Points correctly when asked “Where is the door/entrance to the room?” (<i>trials=5, demonstration=0</i>)	Identifies door correctly in ≤3 trials	Identifies door correctly in 4-5 trials	Attempts, but does not identify door	No attempt	Unable to assess
9	Puts a raisin precisely inside a small opening in a bottle (<i>trials=1, demonstration=1; test both hands</i>)	Precise release of raisin into bottle with each hand	Clumsy release, raisin falls out of bottle with one or more hand	Attempts but unsuccessful release with one or more hand	No attempt	Unable to assess
10	Drinks water from cup/bottle/sippy cup when placed in front of child (<i>trials=1, maternal recall if observation not possible</i>)	Drinks water from cup/sippy cup without spilling	Drinks clumsily & spills	Attempts but unsuccessful	No attempt	Unable to assess

11	Looks towards an object located across the room when pointed at by the examiner (<i>trials=5</i>)	Looks or points at object in ≤ 3 trials	Looks or points at object in 4-5 trials	Looks at the wrong object, or attempts but cannot identify object	No attempt	Unable to assess
12	Pretends to drink from a toy cup when placed in front of him/her (<i>trials=2, demonstration=1 if not spontaneous on first attempt</i>)	Spontaneously	After 1 demonstration	Partial attempt after 1 demonstration	No attempt	Unable to assess
13	Able to make a cup of tea with the toy tea set when requested by examiner (Examiner says "Can you make a cup of tea?") (<i>trials=2, demonstration=1 if not spontaneous on first attempt</i>)	Spontaneously, with pouring motion	After 1 demonstration	Partial attempt after 1 demonstration	No attempt	Unable to assess
14	Feeds doll when requested to (Examiner says "Can you give the dolly some tea?") (<i>trials=2, demonstration=1 if not spontaneous on first attempt</i>)	Spontaneously	After 1 demonstration	Partial attempt after 1 demonstration	No attempt	Unable to assess
15	Imitates straight horizontal scribble (<i>trials=5, demonstration=5</i>)	≤ 3 trials	4-5 trials; with difficulty	Attempts (hold crayon)	Cannot hold crayon	Unable to assess
16	Identifies glitter bracelet under correct washcloth (<i>trials=5, demonstration=0, test both sides</i>)	Finds bracelet correctly in ≤ 2 trials on both sides	Find bracelet correctly in 3 trials or on one side only	Find bracelet correctly in 4-5 trials or on one side only	Does not find bracelet or no attempt	Unable to assess
17	Correctly identifies object groups using plurals (<i>concurrent observation</i>)	Uses 5 plurals	Uses 3-4 plurals	Uses 1-2 plurals	Does not use any plurals	Unable to assess
18	Asks for toilet by gesture or verbally (<i>maternal recall</i>)	Always	Occasionally	Partial (only for bowel movement)	Never	Unable to assess
19	Runs (<i>maternal recall</i>)	Runs steadily	Attempts	Walks only	Walks with support	Unable to assess
20	Throws a ball very near (<i>trials=1, demonstration=1, test both hands</i>)	Good release	Unsteady release	Attempts	No attempt	Unable to assess
21	Kicks ball (<i>maternal recall</i>)	Kicks ball with knee flexed	Runs after ball & attempts kicking it	Walks and touches ball with foot	No attempt	Unable to assess
22	Climbs upstairs holding rail, 2 feet/stair or in adult fashion (<i>maternal recall</i>)	Climbs stairs alone steadily	Climb stairs alone unsteadily	Climbs stairs with help (uses railing, holds adult's hand)	No attempt	Unable to assess
23	Uses 2-4 syllable babble such as dada, mama but not specifically to anything or any person (<i>concurrent observation</i>)	Spontaneously	Mimics	1 syllable babble e.g. ba, ma, da	None	Unable to assess
24	Use two words together (<i>concurrent observation</i>)	Two words, appropriate use	Two words, inappropriate use	One word, appropriate use	No attempt	Unable to assess

25	Indicates by gesture to say no (<i>maternal recall if not observed during assessment</i>)	Indicates verbally or by definite gesture all the time	Indicates verbally or by definite gesture some of the time	Attempts, but incomplete indication	No attempt	Unable to assess
26	Use of a pronoun e.g. me, my, she, he, it, I (<i>concurrent observation</i>)	≥1 pronoun in correct context	≥1 pronoun, incorrect use	Use of proper names, but not pronouns	No use	Unable to assess
27	How many words does the child use during the assessment other than mama/dada (<i>concurrent observation</i>)	≥8 words	6-7 words	4-5 words	≤3 words	Unable to assess
28	How many sentences of 3 words or more does the child use during the assessment? (<i>concurrent observation</i>)	≥2	1	≥1 two word utterance	None	Unable to assess
29	In how many instances does the child follow on a topic of conversation providing new information? (<i>concurrent observation</i>)	At least one, using ≥ 2 words, proving correct information	At least one, uses single words, provides correct information	Uses any number of words, provides incorrect information	Does not follow up on conversations	Unable to assess
30	Combines word and gesture when asked (<i>trials=3, Do Not demonstrate, use different example if mother says child does not know the one you are asking</i>)	Combines word and gesture completely and appropriately	Combines word and gesture completely but inappropriately	Combines word and gesture incompletely and inappropriately	None	Unable to assess
What is the child's native (first) language?						
What is the language in which the assessment is being conducted?						
Does the child speak/understand any languages other than his/her native (first) language?						
How often were the following behaviours in the child during the assessment?						
31	Positive Affect	Never or rarely		Some of the time		Most of the time
32	Exploration	Never or rarely		Some of the time		Most of the time
33	Ease of engagement	Never or rarely		Some of the time		Most of the time
34	Cooperativeness	Never or rarely		Some of the time		Most of the time
35	Adaptability to change	Never or rarely		Some of the time		Most of the time
36	Distractibility	Never or rarely		Some of the time		Most of the time

37	Negative affect	Never or rarely	Some of the time	Most of the time
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