

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 – June 2014

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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	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
MDAT	The Malawi Development Assessment Tool
RNDA	The Rapid Neurodevelopmental Assessment

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Credits

This manual 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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Sources

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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}

Objectives

The objective of the neurodevelopment assessment (NDA) component of the follow-up of the INTERGROWTH-21st Project is two-fold:

- (1) To develop a robust, standardized tool to assess neurodevelopment in children at two years of age in a cross-cultural sample with technical and logistical ease of administration.
- (2) To assess a large sample of two-year olds from geographically and culturally diverse regions across the world for cognitive, motor, language and behavioural outcomes using the tool.

The aim of NDA component of the follow-up of the INTERGROWTH-21st Project is:

- I. To build a profile of neurodevelopmental outcomes of samples of children from geographically and culturally diverse populations.
- II. To assess group and individual variability among children born at term and at <37⁺⁰ weeks of gestation.
- III. To assess group and individual variability among children from geographically diverse population groups.
- IV. To determine the prevalence and severity of neurodisability in children across groups.
- V. To determine associations between neurodevelopmental outcomes, intra-uterine growth, and postnatal physical growth and nutrition.
- VI. To determine correlations between various dimensions of neurodevelopment, including visual and hearing impairments and sleep disturbances.

Strategy

The Infant Development Group

In order to develop the NDA component of the follow-up assessment package an Infant Development Group was assembled within the INTERGROWTH-21st Project's Research Team comprising of the e study's PIs and international experts in the fields of child development, neuroscience, pediatric medicine and perinatal medicine.

Challenges

Four key challenges to the development of the NDA component for the purpose of the follow-up assessment of the INTERGROWTH-21st project were identified. These are:

- i. The identification of standardized tools to assess neurodevelopment in children across cultures and across multiple domains of neurodevelopment that can be administered and scored rapidly, by non-specialist personnel and that lack culture-specific items.
- ii. The identification of tools for use in cross-cultural settings that are sensitive enough to detect normal biological variability in healthy children, and subtle differences between children born at different gestational ages, without compromising the feasibility of administering the tool in a field setting.
- iii. The identification of an assessment tool that assesses multiple, if not all, dimensions of child neurodevelopment with a high level of cross-cultural comparability that is suitable for use in low resource settings.

In order to meet these challenges, The Infant Development Group drew up a list of essential and desirable features that the tool should contain for the purpose of the follow-up study and a strategy to identify and/or develop the best candidate among the neurodevelopmental assessment tools for 2 year olds currently available.

Methods

Firstly, the Coordinating Unit of The Infant Development Group at Oxford carried out a systematic search of online databases (PubMed and Embase) for neurodevelopment tools suitable for use in two year olds. Search terms pertaining to the five core concepts, namely cognition, language, motor skills, behaviour and attention were used. The results of this search strategy were refined following discussions with international experts in the fields of infant neurodevelopment, child psychiatry, pediatric medicine, pediatric neurology, neuroscience and developmental psychology. Forty-six potential tools were identified using this methodology.

A list of criteria (see below) to be met by the tools for inclusion as potential candidates in the selection process for a neurodevelopment measure for incorporation into the neurodevelopment package of the INTERGROWTH-21st Project was drawn up. Thirteen tools were found to meet these criteria most reliably.

The 13 candidate tools were reviewed by an expert panel at an Infant Development Meeting, held in the Nuffield Department of Obstetrics & Gynaecology, University of Oxford, Oxford, on 23 March 2012.

Following careful scrutiny, 5 of the 13 tools were selected as the strongest candidates for incorporation into the neurodevelopment package. These were the Bayley Scales of Infant Development, the Rapid Neurodevelopment Assessment, the Malawi Development Assessment Tool, the Griffiths' Mental Development Scale and the Child Behaviour Checklist. As no one tool was found to meet all the criteria set out by the group, the group decided on selecting the core items of the Rapid Neurodevelopment Assessment for the

cognitive, motor and language assessments and buttressing these with items from the Bayley, Malawi and Griffiths scales. All items for the behaviour and attention scales were selected from the Bayley Scales and Child Behaviour Checklist respectively.

List of Criteria

Essential Criteria

- I. The tool should be suitable for assessing neurodevelopment in children at 24 months of age.
- II. The tool should characterize neurodevelopmental outcomes in children across a spectrum ranging from normal to mild, moderate and severe disturbances; and not merely measure severe neurodevelopmental delay.
- III. The tool should have high levels of reliability and validity in international settings.
- IV. The tool should be suitable for use in the developing world and in low-resource settings, and should not contain items that are culture-specific. If devised and tested in low resource, developing world settings the tool should be appropriate for use in high-income settings in the developing world and in the developed world.
- V. The tool should assess multiple domains of neurodevelopment namely motor development, cognition, language and social-emotional development.
- VI. The duration of assessment for each individual child should not exceed 25 minutes per child.
- VII. It should be easy to train midwives and health care workers to administer the tool and no specialist training in psychiatry, psychology or related disciplines should be necessary.

Desirable Criteria

- I. The tool should yield scores on infant neurodevelopment rather than characterizing neurodevelopment using cut-offs as these are likely to vary in culturally diverse contexts.
- II. The tool should include a combination of methodologies for assessing infant neurodevelopment including direct tests, parent reports and/or observation.

The INTERGROWTH-21st Neurodevelopment Assessment (INTER-NDA)

The INTER-NDA was developed as per the recommendations of the expert panel and The Infant Development Group to meet the needs of the follow-up study of the FGLS component of the INTERGROWTH-21st Project. The INTER-NDA consists of three components – an administered cognition, language and motor scale (Part A), a behavioural scale (Part B) based on observer report and a maternally reported child behaviour questionnaire consisting of 16 items on attention and emotional reactivity (Part C) (Figure 1).

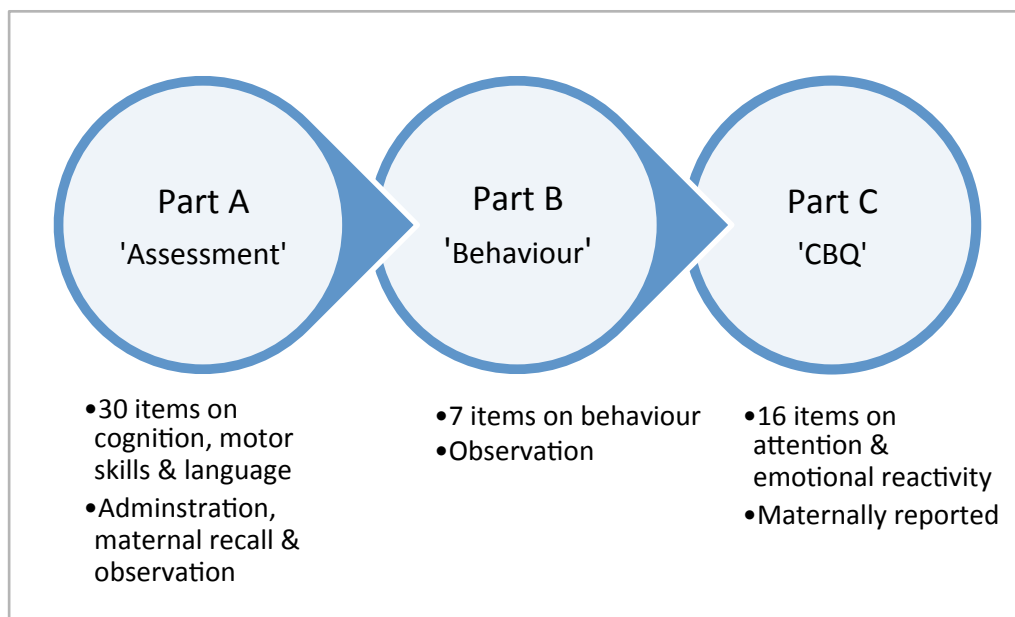


Figure 1. Schematic depiction of the three components of the INTER-NDA.

Part A of the INTER-NDA consists of 30 items, distributed as follows:

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

	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
Receptive Language	2	5,8
Expressive Language	10	3, 17,23,24,25,26,27,28,29,30
Overall score	30	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17, 18,19,20,21,22,23,24,25,26,27,28,29,30

Part B consists of 7 items relating to the child's behaviour, which are to be scored based on the researcher's observation of the child during the follow-up appointment. The observer comments on how often he/she observed each of the 7 behaviours in the child using a 3 point Likert scale ranging from "never observed" and "observed some of the time" to "observed most of the time".

Part C consists of a 16-item maternally reported questionnaire comprised of the 'Attention' and 'Emotional Reactivity' subscales of the CBCL. Mothers/caregivers are asked to rate the general behaviour of the child. The completion time is one to two minutes.

Each item of the INTER-NDA and its outcome options are presented in the Appendix on page 33.

Conceptual Basis of Constituent Items

The constituent items for Part A of the INTER-NDA conceptually overlap with items from the 24-month versions of the Bayley Scales of Infant Development III, the Rapid Neurodevelopment Assessment Tool, The Griffiths Mental Development Scale Locomotor Subscale, the Malawi Development Assessment Tool and the Child Behaviour Checklist.

The constituent items for Part B of the INTER-NDA conceptually overlap with the Behaviour Observation Inventory of the Bayley Scales.

The constituent items for Part C of the INTER-NDA represent the 'Attention' and 'Emotional Reactivity' subscales of the pre-school CBCL.

Data Recording Systems

All INTER-NDA Part A and B data is recorded on a tablet application, called the 'NeuroApp', The operation manual of the INTER-NDA has been integrated into this tablet application, providing easier user access to pictures and examples of each item in the assessment.

Attention data is entered on a second tablet application, called the 'CBQ'.

INTER-NDA: Instructions for Administration

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

Step 2: Give the mother a hard copy of the Child Behaviour Questionnaire and ask her to complete it. Alternatively, you may ask the mother to record the results directly on the CBQ tablet application.

Step 3: Load the NeuroApp on the tablet and enter the child's FGLS number, date of birth and the researcher code. A neurodevelopment home page for the child will pop up. Access the 'neurodevelopment' window for the child's neurodevelopment home page. If another assessment from the package (such as the vision or sleep assessment) has been completed already, the child will have a customized neurodevelopment home page already ready and there is no need to create a new one for the same child. On clicking on the "neurodevelopment" tab in the child's 'neurodevelopment home page', you will be taken to a window where Part A of the INTER-NDA will be presented. Only upon completion of Part A will you be able to access Part B. Therefore, Part A must be completed before Part B for all assessments.

Step 3: On accessing Part A, administer the items as per the instruction manual below. Help on the administration of certain items can be accessed by clicking on the tags, "Picture", "Examples" and "Other options". There are 5 possible outcomes for each item, and one must be selected for each item. No more than one option is allowed to 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". After you complete all 30 items:

- Enter any additional information about the child (for e.g. child was crying during the assessment) in to the text box. It is not mandatory to enter information into the text box but in case of difficult and/or unsuccessful assessments it is recommended to provide details of the child and the assessment.
- Click "Finish". You will then be taken to a window where Part B of the assessment is displayed.

If you do not select one outcome for every item, you will not be permitted to "Finish" and therefore "Save" the assessment. If you do click "Finish" after an incomplete assessment, an error message will appear and the incomplete items will be highlighted. You will be prompted to select one outcome for each of the incomplete items after which you may "Finish" Part A of the assessment.

Step 4: After finishing Part A, you will be automatically presented with a window where the items of Part B are displayed. Please complete these according to the instruction manual below. Please click "Finish" to complete the assessment. Please ensure every item in Part B has one outcome selected. If you do click "Finish" after an incomplete assessment, an error message will appear and the incomplete items will be highlighted. You will be prompted to select one outcome for each of the incomplete items after which you may "Finish" Part B of assessment.


Step 5: After completing Part B by clicking “Finish”, you will be taken back to the ‘neurodevelopment homepage’ of the child. If you have already completed the sleep and vision assessments, the “Send” tab becomes live. By clicking “Send” you can upload the data from the assessment to the INTERGROWTH-21st Project’s data server immediately. If the sleep and vision assessments are incomplete, you will not be allowed to upload the data to the server unless you complete them. You will be prompted to do so. If you were unable to assess the child for vision and sleep please indicate the same in the respective windows. After this, the “Send” function on the child’s ‘neurodevelopment home page’ will become live and you will be able to upload the data to the INTERGROWTH-21st Project’s data server.

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

Part A

1. Builds a tower of 5 cubes in ≤ 3 trials (after demonstration)		
<i>Domain:</i>	<i>Cognition</i>	
<i>Trials:</i>	3	
<i>Demonstration:</i>	Yes	
<i>Apparatus:</i>	5 cubes	
<p>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.</p>		
<p>Response:</p> <ol style="list-style-type: none"> (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>	<i>1</i>
<i>Demonstration:</i>	<i>No</i>
<i>Apparatus:</i>	<i>4 cubes</i>



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



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

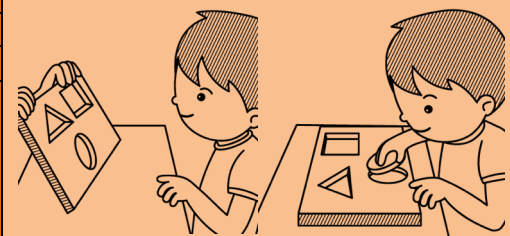
<i>Domain:</i>	<i>Cognition</i>
<i>Trials:</i>	<i>5</i>
<i>Demonstration:</i>	<i>No</i>
<i>Apparatus:</i>	<i>5 objects, including spoon and cup</i>



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)

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

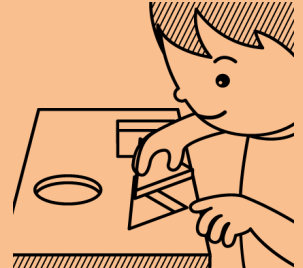
Method:

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)

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

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:

- (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:

- (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

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

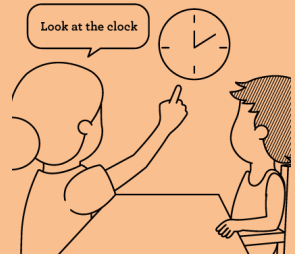
Method:

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

<i>Domain:</i>	<i>Cognition</i>	
<i>Trials:</i>	<i>5</i>	
<i>Demonstration:</i>	<i>No</i>	
<i>Apparatus:</i>	<i>Room objects</i>	

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>	2	
<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>	5	
<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

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

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

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 trails 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>	<i>1</i>
<i>Demonstration:</i>	<i>No</i>
<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:*

This item may be scored without administering it specifically, if the child spontaneously runs during the course of the assessment

**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:

- (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)

<i>Domain:</i>	<i>Fine Motor</i>
<i>Trials:</i>	<i>1 (test both hands)</i>
<i>Demonstration:</i>	<i>Yes</i>


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)

<i>Domain:</i>	<i>Gross Motor</i>	
<i>Trials:</i>	<i>N/A</i>	
<i>Demonstration:</i>	<i>N/A</i>	

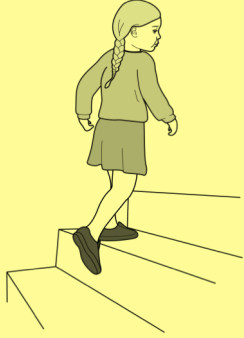
Method:

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:

- (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)

<i>Domain:</i>	<i>Gross Motor</i>	
<i>Trials:</i>	<i>N/A</i>	
<i>Demonstration:</i>	<i>N/A</i>	

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

<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 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:

- (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

<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 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:

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:

- (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

<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 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:

- (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:

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, providing 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)

<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>
<i>Cautionary Note:</i>	<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:

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):

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 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:

- (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

Part B

Part B is to be completed based on your observation of the child's behaviour during the course of Part A. 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
Positive affect	Smiling Laughing Making sounds that are perceived as expression of excitement, happiness or pleasure Hugging mother Kissing mother
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
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
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
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
Distractibility	Poor attention to tasks Easily distracted Leaves tasks incomplete
Negative affect	Fussing Pouting Whining Crying Frowning Shouting angrily Aggressive behaviour Tantrums

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