



**Brazelton Centre UK**

understanding baby behaviour

# Neonatal Behavioural Assessment Scale (NBAS)

## Trainee Workbook

“ If we accept the notion of the newborn as an active participant in early interaction, the careful assessment of an individual infant should help us to understand the infant’s side of the dialogue. ”

Dr. T. Berry Brazelton

[www.brazelton.co.uk](http://www.brazelton.co.uk)

Registered Charity Number 1158765



## Neonatal Behavioural Assessment Scale (NBAS)

Course Day 1



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## NBAS Course Learning Outcomes



After the NBAS course you should be able to:

- Identify, describe and interpret newborn behaviour in the context of the NBAS
- Administer and score the NBAS
- Practice relationship-based care in working with parents
- Use the NBAS in a way that is developmentally sound and culturally appropriate.



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## Our two days together



1. Introduction to baby behaviour
2. What is the NBAS?
3. The NBAS Step-by-Step
4. Videos of NBAS
5. Practicing with dolls
6. Research
7. Scoring form and manual
8. NBAS with baby and family (video)
9. Recommendations for caregiving
10. Implementing the NBAS into Practice
11. Final discussion



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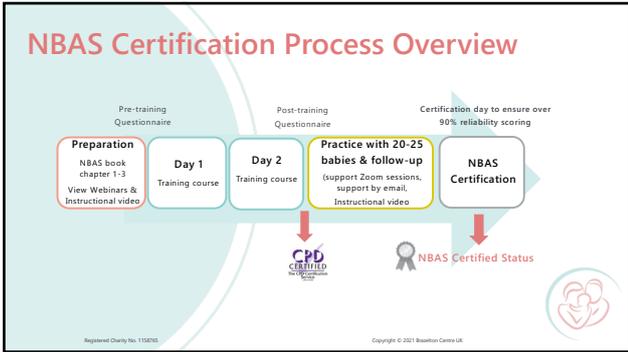
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## Introduction to Baby Behaviour

Course Day 1  
Session 1

CPD CERTIFIED

NBAS Certified Status

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## Learning outcomes

In this session you will learn:

- Principles of the NBAS
- Content of the NBAS
- The main goals of the NBAS

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Dr T. Berry Brazelton



Prof. J. Kevin Nugent



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### Humphrey 3 days old




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### Content of NBAS

- **28 behavioural items** - each scored on a 9-point scale; assesses the infant's behavioural repertoire
- **18 reflex items** - each scored on a 4-point scale - assesses the infant's neurological status, and will identify gross abnormalities, but is not diagnostic
- **7 Supplementary items** - to capture the range of the behaviour of frail, high-risk infants.





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## The NBAS can be used with:

- Pre-term babies (over 35 weeks g.a., medically stable)
- Down's syndrome, congenital malformations, birth trauma, HIE, IUGR
- Maternal anxiety, fear, previous babies with problems
- Postnatally depressed mothers
- Teen mothers



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## Behavioural states and organisation

1. Deep (non-REM) Sleep,
2. Light (REM) Sleep
3. Drowsy
4. Quiet alert
5. Active alert
6. Crying



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## 6 Baby States

 <p><b>1 - Deep sleep</b></p> <ul style="list-style-type: none"> <li>•Regular breathing</li> <li>•Eyes closed and no eye movements</li> <li>•No spontaneous movements except startles</li> </ul>	 <p><b>2 - Light sleep</b></p> <ul style="list-style-type: none"> <li>•Eyes closed</li> <li>•Rapid eye movement often observed under closed lids</li> <li>•Low activity level and sucking movements can occur</li> <li>•Breathing may be irregular</li> </ul>	 <p><b>3 - Drowsy</b></p> <ul style="list-style-type: none"> <li>•Eyes may be open but dull and heavy lidded, closed look, closed or fluttering eyelids</li> <li>•Variable activity level responses often delayed and motor activity at a minimum</li> <li>•Can be waking up or may go back to a deeper sleep state</li> </ul>	 <p><b>4 - Alert</b></p> <ul style="list-style-type: none"> <li>•Bright eyed look and their motor activity will be minimal</li> <li>•Able to focus their attention on visual or auditory stimuli</li> </ul>	 <p><b>5 - Active alert</b></p> <ul style="list-style-type: none"> <li>•Eyes open, considerable motor activity</li> <li>•Brief fussing vocalisations</li> </ul>	 <p><b>6 - Crying</b></p> <ul style="list-style-type: none"> <li>•Intense crying which is difficult to break through</li> <li>•High motor activity</li> </ul>
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## Baby States




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## Sleep states

1. **Deep sleep** – eyes closed/no eye movements, regular breathing, startles, jerky movements
2. **Light sleep** – REM sleep, eyes closed/brief eye opening, some movements, startles, sucking on and off
3. **Drowsy** – semi-dozing, eyes opening, activity level variable, smooth movements




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## Awake states

4. **Alert** – bright-eyed, focuses attention, motor activity minimal
5. **Active and alert** – eyes open, considerable motor activity, brief fussy vocalisations, startles
6. **Crying** – intense crying, difficult to break through, motor activity high




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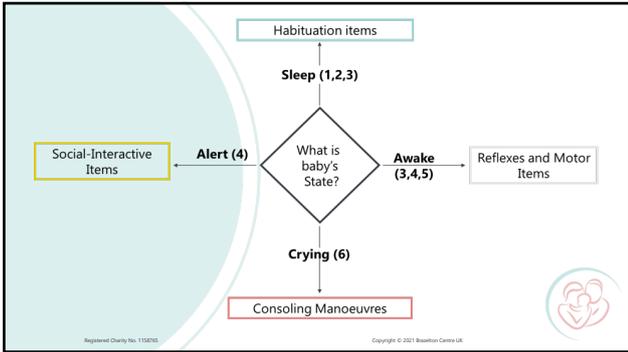
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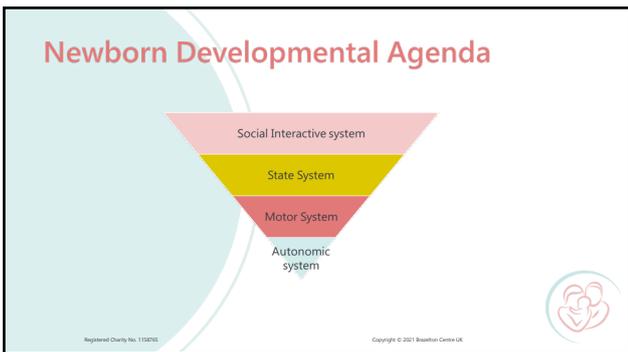
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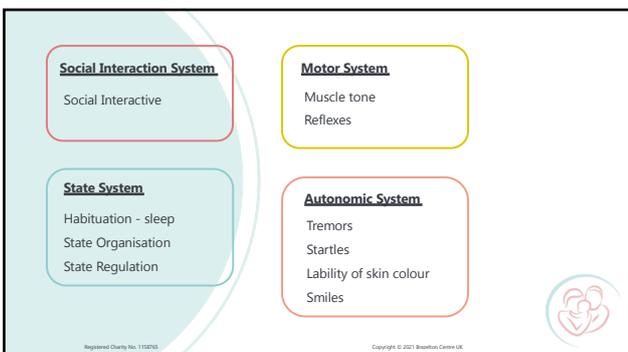
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## Social-interactive items

- Face
- Face and voice
- Ball
- Rattle
- Rattle (from the baby's side)
- Voice (from the baby's side)




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## Reflexes and Motor Items

- Used to stimulate a sleepy baby
- Parents see these as skills (*e.g. shows the repertoire, how strong the baby is*)
- Screening tool for major problems
- Can help to organise the baby




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## Reflexes and motor items

- Plantar
- Babinski
- Ankle Clonus
- \*Passive tone in legs
- \*Passive tone in arms
- Rooting
- Sucking
- Glabella
- \*Undress
- Palmar
- \*Pull to sit
- Placing
- Standing
- Walking
- \*Crawl/Prone
- Incurvation
- Spin
- Nystagmus
- Cuddle
- \*Defensive
- \*TNR
- \*Moro




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## Habituation (light, sound and touch)

- Watch how stimulation affects the baby's sleep states
- Use light, rattle, bell, foot probe
- Can baby settle after he/she is disturbed?
- Strategies he/she uses to settle back to sleep



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## Crying

- When baby cries, stand back for a few seconds to watch if he/she uses any strategies to help calm – e.g. hand to mouth, hands together across chest, sucking, changing position, looking at something.
- If baby needs help to calm, proceed with consoling manoeuvres



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## Consoling Manoeuvres

1. Look at baby
2. Look at and talk to baby
3. Look at, talk and put hand on belly
4. Look at, talk, hold arms across chest
5. Look at, talk, pick up and hold calmly
6. Look at, talk, hold and rock calmly
7. Look at, talk, swaddle with hands to mouth, rock calmly
8. Look at, talk, swaddle, rock calmly, give finger to suck or pacifier



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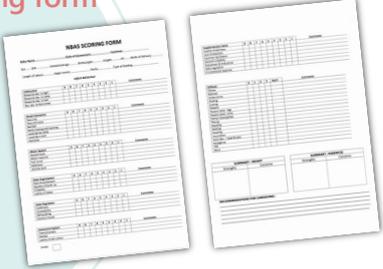
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## Scoring form



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## Scoring the NBAS

Optimal scoring on all items is: 1, 9 or 5

**An individual profile is produced, rather than an overall score.** This was to avoid one overall score which could be misused  
*Note:* The NBAS has nothing to do with predicting IQ.

**Clusters of items are scored:**

- Habituation
- Orientation
- Motor performance
- Range of state
- Regulation of state
- Autonomic regulation
- Reflexes

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## Regulatory behaviours

**Evidenced by:**

- Smooth respiration
- Good, stable colour
- Stable digestion
- Smooth relaxed posture
- Even motor tone
- Smooth movements and efficient strategies: hand clasping, foot bracing, hand to mouth, grasping, sucking, rooting, tucking



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## Regulatory behaviours

### And

- clear, robust sleep state
- rhythmical, robust crying
- effective self-quieting
- reliable consolability
- responsive and focused, animated
- robust, shiny-eyed alertness, cooing, smiling



(Blanchard 2003)



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## Behaviours indicating sensitivity or dysregulation

### Autonomic:

- Tremors
- Startles
- Sneezing
- Yawning
- Hiccupping
- Mottling of the skin
- Other skin colour changes

### Motor:

- increased or decrease in muscle tone
- jerky movements,
- extensor patterns of movement



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## Behaviours indicating sensitivity or dysregulation

### State:

- Shut down
- Fussing
- Inconsolable crying
- Rapid state changes
- Panicked alertness

### Social Interaction:

- Gaze aversion
- Floating eye movement
- Brief or very brief following



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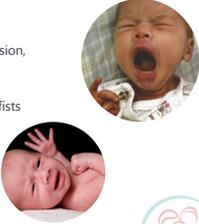
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## Stress/time out signals

- Looking away, shutting eyes, staring with no facial expression, frown, grimace
- Spitting up, hiccupping, yawning, sneezing
- Holding hands up defensively, finger splaying, clenching fists
- Arching back, squirming, changing position
- Changes in skin colour, sucking pattern or state




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## Recognising signs of stress




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## Shutdown



- Inappropriate stimulation can cause a baby to go back to sleep or at least disengage

Nugent, 2006



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## Self-regulation and facilitation

Important to **recognise infant's efforts to respond and self-regulate:**

- Shows dislikes: turning away, yawning, sneezing, hand movements
- Shows likes: bright, focused look, smiling
- Ability to self-soothe: suck on fingers/hand, look, listen

And to offer **examiner-facilitation-based on infant's own efforts at self-regulation**



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## What do we know about the baby after the NBAS?

After scoring, we have a **Behavioural profile of the baby:**

- How does the baby manage the tasks and handling
- Is the baby easily overstimulated?
- Does the baby have any self-soothing strategies?
- Does the baby manage to protect his sleep?
- How does the baby manage state changes?
- How does the baby manage crying?
- Is the baby available for social interaction?



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## How do I feel?



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## Step by Step

### Neonatal Behavioral Assessment Scale

(based on page 14 in the NBAS book)

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## State

- Observe baby's state for 2 minutes while you describe states and the NBAS to the parents.
- The baby's state will determine how you proceed with the NBAS items.



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## Habituation Package

(states 1, 2, 3)

- Response Decrement to Light
- Response Decrement to Sound- Rattle
- Response Decrement to Sound- Bell
- Uncover
- Tactile Stimulation of the Foot



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## Motor Oral Package

(states 3, 4, 5)

- Plantar Grasp
- Babinski Response
- Ankle Clonus




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## Motor Oral Package continued...

(states 3, 4, 5)

- Passive Tone in Legs
- Passive Tone in Arms
- Rooting Response
- Sucking Reflex
- Glabella Response




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## Truncal Package

(states 3,4,5)

- Undress
- Palmar Grasp
- Pull to Sit
- Placing Reflex
- Standing Reflex
- Walking Reflex




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## Truncal Package continued

(states 3,4,5)

- Crawling Reflex
- Incurvation
- Tonic Deviation of Head and Eyes
- Nystagmus
- Cuddliness




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## Vestibular Package

(states 3, 4, 5)

- Defensive Movement
- Tonic Neck Reflex
- Moro Reflex




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## Social Interaction Package

(state 4)

**Tracking items -**

- Animate Visual (face)
- Animate visual and auditory (face and voice)
- Inanimate visual (ball)
- Inanimate visual and auditory (rattle)




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**Social Interaction Package**  
(state 4)

**Locating items -**

- Animate auditory (voice 4 times)
- Inanimate auditory (rattle 4 times)




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**Consoling**  
(state 6)

**Consolability (p.62)**

- Examiner helps baby calm from state 6 to state 4 or lower
- Face alone; face and voice; hand on belly; hand on belly and restraining one or both arms; picking up and holding; holding and rocking; dressing(wrapping); holding in arms and rocking; pacifier or finger to suck in addition to dressing, holding and rocking; not consolable




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**Self quietening (p.63)**  
(state 6 or 5)

**From state 6,5 to state 4 or lower**

- What efforts does the baby make to calm themselves from a state 5 or 6 to state 4 or lower




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### Items to count

- States
- Tremors
- Startles
- Smiles
- Hand to mouth
- Irritability




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### Summary items

- Alertness
- General Tone
- Motor Maturity
- Activity
- Peak of Excitement
- Rapidity of Build-up
- Labiality of skin colour




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### Supplementary items

Summary scores

- Quality of Alertness
- Cost of Attention
- Examiner Facilitation
- General Irritability
- Robustness and Endurance
- State Regulation
- Examiner's Emotional Response




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## Behavioural Profile

- See page 77-78 and Chapter 8.1
- Summarise strengths and challenges
- May use case study approach or developmental agenda approach (i.e. The 4 systems: autonomic, motor, state and social interactive)
- Provide Recommendations for Caregiving



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## Worksheet and scoring form

Neonatal Behavioural Assessment Scale (NBAS)

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## Learning Outcomes

This session:

- How to use the Worksheet
- Keys to successful scoring

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## NBAS Worksheet

NEONATAL BEHAVIOURAL ASSESSMENT SCALE (NBAS) WORKSHEET

**Stimulation items**

Stimulus	Pattern
Light	
Sound	
Touch	
Temperature and position in capsule	
Feeding	

When 2, 3, 4

**Social interaction items**

Face	Alert (A)
Eye/eyebrow	Alert (A), S
Mouth	Alert (A), S, M
Body (arms)	Alert (A), S, M
Body (legs)	Alert (A), S, M

When 2, 3, 4

**Conditioning measurements**

State
• Head on body
• Mouth on body
• Position of hand
• Position of feet

**Reflexes and Motor Items**

Plantar
Babinski
Grasp (dorsi)
*Passive tone in legs
*Passive tone in arms
Rooting
Sucking not elicited
Gabapentin administered

**State Changes**

• Alert
• Fidgety
• Mild to full
• Sleeping
• Waking
• Head/eye
• Intermittent
• Quiet
• Irritable
• Crying
• Inactive
• Very

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## Habituation

Example 1

Presentation	Baby's response
1	Startle
2	Delayed movement
3	No response
4	Arm movements
5	Facial grimace
6	Slight eye blink
7	Slight eye blink

Slight eye blink counts as a non-response. Successful shutdown *after* 5<sup>th</sup> presentation



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## Habituation

Example 2

Presentation	Baby's response
1	No response
1	No response
Gently arouse baby	
1	No response
1	Arm movements
2	Facial grimace
3	Slight eye blink
4	Slight eye blink

This baby shutdown *after* 2<sup>nd</sup> presentation. The first presentation that counts is that which brings a response.



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## NBAS worksheet

Duration	Onset	Support
1-2 sec	startle	startle
2-3 sec	startle	startle
3-4 sec	startle	startle

Intensity (0-10)	Reaction
0	startle
1	startle
2	startle
3	startle
4	startle
5	startle
6	startle
7	startle
8	startle
9	startle
10	startle

Microstates	Signs of state
awake	eyes open
asleep	eyes closed

State	Number of states
awake	1-2
asleep	1-2

State	Number of states
awake	1-2
asleep	1-2

State	Number of states
awake	1-2
asleep	1-2

State	Number of states
awake	1-2
asleep	1-2

State	Number of states
awake	1-2
asleep	1-2

State	Number of states
awake	1-2
asleep	1-2

State	Number of states
awake	1-2
asleep	1-2



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- Be sure to read the descriptions above and below the one you select
- In general the first part of the description is the more important than the second.
- When deciding between two descriptions opt for the one that gives the baby credit for best performance



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### Scoring specific items

**Alertness (State 4):**

Scores 7-9 describe the infant who engages in five of the six orientation items

Scores of 5 and 6 are for a baby who maintains alertness for at least four orientation items for a moderate amount of time with each one



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### Scoring specific items

**For optimal scores in Pull-to-Sit (State 3,4,5):**

- Arms remain moderately flexed at the elbow
- Head is actively raised during the item
- Head remains in an upright position when seated even if oscillating slightly



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## Scoring specific items

**Cuddliness (States 4, 5):**

- Must be administered in both vertical and horizontal
- Administered only in states 4 or 5
- Only cuddle once in each position
- Only score inconsistency between vertical and horizontal if there is a clear cut difference in the baby's cuddliness



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## Scoring specific items

**Consolability (State 6):**

- Consolability manoeuvres are administered twice during the exam.
- Successful consoling is when the baby goes from State 6 to State 4 or lower for 15 seconds or more.
- Only the best performance is scored.
- This item can still be scored if consolability is administered once.



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## Scoring specific items

**Labiality of Skin Colour (All states):**

- The mid-point is the healthy colour range
- The pale cyanotic infant is described in 1-3
- The infant who changes colour to red rapidly with no return to the healthy baseline is described in 7-9



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## Scoring specific items

General Irritability (Supplementary item): score descriptions 1-4 are for the infant who is difficult to console

In State Regulation (Supplementary item): a prolonged period of alertness is an alert period of 15 seconds.

For Ankle Clonus, Nystagmus and TNR, scores of 0,1,2 are considered normal

Nystagmus should be score N/A if eyes are closed



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## Scoring specific items

**Motor maturity (States 4, 5):**

- First decide if the infant's movements are predominately jerky or smooth
- If jerkiness is present the score cannot be higher than 5
- Do not confuse free-wheeling uncontrolled movements for smooth unrestricted movements.
- Observe for arcs of movement during Uncover and Place in supine, Defensive movements and Hand-to-Mouth movements.



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## Scoring specific items

**Reflexes:**

- Asymmetries are recorded on the score sheet. Take care that the asymmetry was not influenced by inappropriate handling or positioning.
- Some reflexes may not be present in the newborn period, and others may be influenced by examiner handling (see Manual, page 74)



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## Behavioural Profile

### Becoming a good observer of newborn behaviour requires:

- Being able to see and identify different responses of the baby and able to "put it all together" to create an integrated profile of the newborn's behaviour.
- Being able to understand who this baby is and what they are trying to tell us about their experience in this new world.
- Recognising how well they tolerate different levels of stimulation.



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## Possible examples - behavioural profile

	Strengths	Areas to Support
Autonomic System	<ul style="list-style-type: none"> <li>• breathing is smooth</li> <li>• maintains healthy colour</li> </ul>	<ul style="list-style-type: none"> <li>• colour changes with slow recovery</li> <li>• many tremors and startles</li> </ul>
Motor System	<ul style="list-style-type: none"> <li>• Keeps body relaxed</li> <li>• Smooth movements</li> <li>• Brings head to midline in Pull-to-sit</li> </ul>	<ul style="list-style-type: none"> <li>• constant movement</li> <li>• jittery movements</li> </ul>
State System	<ul style="list-style-type: none"> <li>• Sleep, wake and crying are robust and clear</li> </ul>	<ul style="list-style-type: none"> <li>• Easily upset and difficult to console</li> <li>• Difficulty maintaining sleep state</li> </ul>
Social-Interactive System	<ul style="list-style-type: none"> <li>• Interacts with examiner and objects</li> <li>• Looks away when interaction is too intense</li> </ul>	<ul style="list-style-type: none"> <li>• No stable alert state</li> <li>• Constant averting of eyes.</li> </ul>



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**Practice phase of the NBAS**  
Log Book and Certification

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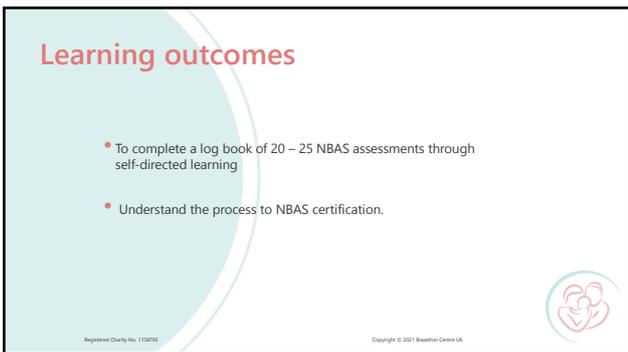
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**Learning outcomes**

- To complete a log book of 20 – 25 NBAS assessments through self-directed learning
- Understand the process to NBAS certification.

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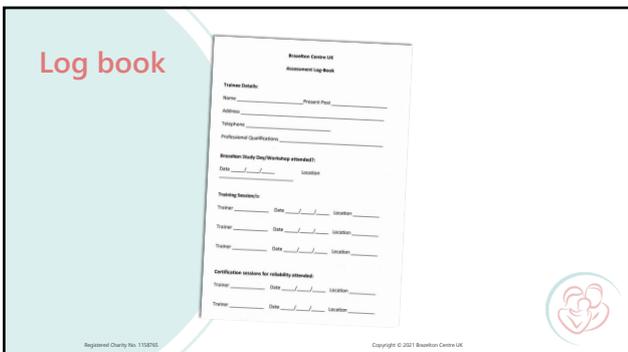
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**Log book**

Breastbeat Centre UK  
Assessment Log Book

**Trainee Details:**  
Name \_\_\_\_\_ Postal Code \_\_\_\_\_  
Address \_\_\_\_\_  
Telephone \_\_\_\_\_

**Professional Qualifications:**  
Breastbeat Study Day/Workshop attended(s):  
Date \_\_\_\_\_ Location \_\_\_\_\_

**Training Sessions/1:**  
Trainer \_\_\_\_\_ Date \_\_\_\_\_ Location \_\_\_\_\_  
Trainer \_\_\_\_\_ Date \_\_\_\_\_ Location \_\_\_\_\_  
Trainer \_\_\_\_\_ Date \_\_\_\_\_ Location \_\_\_\_\_

**Certification sessions for reliability awarded:**  
Trainer \_\_\_\_\_ Date \_\_\_\_\_ Location \_\_\_\_\_  
Trainer \_\_\_\_\_ Date \_\_\_\_\_ Location \_\_\_\_\_

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## Log book

1. The style of your log book is your decision.
2. Title page with your details
3. Add the worksheet and scoring form for each NBAS you undertake.
4. Your log book will be reviewed as part of the certification process.



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## Self-directed practice

- Complete your first assessment as soon as after the NBAS training.
- Work in pairs if this is an option.
- Develop your skill in providing appropriate support for the baby in order to draw out 'their best performance'.
- Join the monthly follow up meetings
- Complete 20 – 25 assessments



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## Strategies for successful self-directed practice

- Initially remembering all the items can be a challenge
- You could have a prompt sheet, but work towards discarding this as it distracts from keen observation of the baby.
- Practice the NBAS in smaller stages. After mastering the various stages progress to carrying out a full assessment.



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## Factors that contribute to successful self-directed practice

- Experience and confidence when handling babies
- Learning to be a good observer of baby behaviour
- Recognising baby states
- Mastery of soothing techniques



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## Factors that contribute to successful self-directed practice

- Understanding infants strategies for self-soothing
- Remaining confident when presented with a crying infant
- Recognising signs of stress
- Application of appropriate clinical reasoning



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## Preparing for certification

- Comfortable handling newborns
- Able to administer and score the NBAS
- Able to elicit baby's best performance
- Can memorise the sequence of NBAS items
- Transitions from item to item are smooth, the exam flows.
- Able to examine a baby in under 30 minutes
- Have completed 20 – 25 assessments



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## Certification session

- Initial discussion
- Trainee administers an NBAS and completes scoring form
- Trainee to achieve 90% agreement with the examiner.



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## Certification session

- A one-point difference is permissible on the 28 nine point behavioural items
- A difference of more than two points on more than two items is considered unreliable.
- There must be 100% agreement scoring the reflexes
- Examiner certification last three years and must be renewed if the examiner wishes to use the NBAS in a research setting.



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## The NBAS Certificate





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## Things to consider

- Which strategies do you think will suit you best, so that you can complete the 20-25 NBAS assessments?
- What skills do you need to develop to be a good observer of baby behaviour?



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### Research Uses of the NBAS

Professor J. Kevin Nugent, Brazelton Institute, Boston

- Primarily a research tool
- Strong theoretical basis – developmental agenda of the newborn
- Offers a window on the neurological integrity of the central nervous system of the newborn.
- Provides a baseline or starting point against which to measure future change or continuity.



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### Individual differences

- The scale was designed to address individual differences
- In any study researchers need to identify and control for key variables, such as maternal age, ethnicity, gestational age at birth and mode of delivery in the sample of infants they are studying.
- For example, in a study of the effects of cocaine-exposure, Morrow et al. (2001) controlled for prenatal exposure to alcohol, tobacco, and marijuana, maternal age, education, employment, parity, antenatal care visits, sex of infant and age at assessment.



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### Methodological challenges

- No norms for newborn behaviour
- Reliability and validity
- Data reduction and possible ways of combining or grouping the data items



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### Test-retest and inter-rater reliability

- The neonatal period is marked by rapid changes
- Change and adaptation characterise this time, rather than stability.
- The question of test-retest reliability is thus not an entirely appropriate one.
- Inter-rater reliability is critical and the need for training and checks on agreement are paramount if the NBAS is used as a research instrument.



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### Timing and serial observations

- Optimal timing and conditions is also critical in reducing avoidable variability.
- Single assessments are less likely to capture the full range of an infant's behaviour and so more than one is recommended, depending on the research design and study requirements.



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### Scoring

- The NBAS contains 28 individual behavioural items scored on a nine point scale
- 16 reflexes are scored on a four point scale
- However, for analytic purposes and depending on the research question different strategies have been adopted.
- No one scoring system captures the full richness of behavior of the newborn



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## Data reduction

- Some studies have undertaken an item by item analysis (e.g. Hernandez et al. 2011)
- Others have used the conceptually derived four clusters 1) interactive processes 2) motoric processes 3) state organisation and control and 4) physiological (**Sostek, 1985**)
- The empirically based seven-cluster scoring developed by **Lester et al, (1982, 1984)**. This has become the most commonly used data reduction approach



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## Seven clusters

- Habituation
- Orientation
- Motor
- Range of state
- Regulation of state
- Autonomic stability
- Reflexes



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## Research with the NBAS: prenatal influences

- A study of prenatal cocaine use on the neurodevelopmental outcomes of infants from a rural public health population was carried out by **Eyler et al, 1998**.
- The amount and timing of cocaine use was found to be significant and for the third trimester was found to be negatively related to orientation, alertness and cost of attention scores.
- Poorer state regulation, attention and responsiveness among cocaine-exposed neonates raised concerns about later development for the researchers and about the effect such infants may have on caregivers, who as continuing drug users are likely to be compromised in their parenting abilities.



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### Prenatal Influences: Cocaine-exposure

- A study by **Morrow et al. (2001)** of 334 full-term - 187 cocaine exposed & 147 non-cocaine exposed African American neonates
- Multivariate analyses showed a modest effect of prenatal cocaine exposure on neurobehavioral functioning after controlling for prenatal exposure to alcohol, tobacco, and marijuana, maternal age, education, employment, parity, antenatal care visits, sex of infant and age at assessment.



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### Prenatal Influences: Cocaine exposure

- A meta-analysis by **Held, Riggs and Dorman (1999)** suggested that the magnitude of the effects of maternal cocaine use during pregnancy were relatively small, with the largest reliable differences arising in relation to motor performance and abnormal reflexes, more marked at 3-4 weeks of age, and small, but significant differences with orientation and autonomic responses.



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### Prenatal effects: Marijuana effects (Jamaica study)

- **Dreher and Nugent, (1994)** examined exposed (n=31) and nonexposed neonates (n=25) at 3 days and 1 month old, using the Brazelton Neonatal Assessment Scale, including supplementary items to capture possible subtle effects.
- There were no significant differences between exposed and nonexposed neonates on day 3.
- At 1 month, the exposed neonates showed better physiological stability and required less examiner facilitation to reach organized states. The neonates of heavy-marijuana-using mothers had better scores on autonomic stability, quality of alertness, irritability, and self-regulation and were judged to be more rewarding for caregivers.



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### Prenatal influences: Exposure to alcohol

- Prenatal exposure to alcohol was the subject of a study by **Oberlander et al (2010)**.
- Heavy prenatal alcohol exposure was defined as maternal consumption of at least 14 drinks per week or at least 1 incident of binge drinking per month
- Results: few differences except that lower heart rate and no change or reduced cortisol levels and lower levels of behavioural arousal on the NBAS.



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### Prenatal Influences: Exposure to tobacco

- **Nugent et al. (1991)** in a study of 188 Irish women during pregnancy found a significant relationship between cigarette smoking and lower heart rate variability and poorer performance on autonomic and state organization, as measured by the NBAS.
- **Mansi et al., (2007)** found that newborns from smoking mothers showed significant lower scores in various NBAS items and a strong correlation was observed between infant irritability in newborns, as well as with the number of daily smoked cigarettes and maternal nicotine daily intake. Among infants from nonsmoking mothers, paternal smoking was significantly correlated infant irritability.



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### Prenatal Effects: A longitudinal study on the effects of maternal smoking

- In a study by **Hernandez et al. (2011)**, results showed that after adjusting for socio-demographic and obstetric factors, newborns (n=282) whose mothers smoked showed significantly lower scores in the state regulation cluster and in some items of the state organization cluster than the newborns of non-smoking mothers
- Exposure to secondhand smoke was also related to lower motor system cluster scores as well as some supplementary items.



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### Pesticides and polychlorinated biphenyls (PCB)

- **Sagiv, Nugent and Brazelton (2008)** examined the association between prenatal organo-chlorine exposure and measures of attention and used individual NBAS items to characterize young infants' attention skills.
- 542 infants born to mothers residing near a PCB-contaminated harbor, were assessed by an NBAS examination at 1-2 weeks.
- Consistent inverse associations between cord blood levels and measures of alertness, quality of alert responsiveness, cost of attention, self-quieting and motor maturity were found.



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### Prematurity and low birthweight

- **Sternquist and Svenningsen, 1990** conducted a study of infants born weighing between 500 and 900 g at 24-30 weeks gestation using the NBAS.
- Results found that compared with a control group of infants born at term, significant group differences were found for 8 of 27 NBAS items
- The NBAS showed abnormal responses in most ELBW infants with intracranial haemorrhage, especially those with grades III or IV.
- The authors emphasized that in spite of these differences at term the ELBW infants had a varied behavioral repertoire, with repeated, but short, periods of alertness and high performance.



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### VLBW and the NBAS

- **Wolf et al. (2002)** found that at term age VLBW preterm infants differed from term infants on all the clusters and supplementary items of the NBAS and showed more signs of stress, followed by continuing problems with self-regulation



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### LBW 5 year follow-up in Japan study

- In a study by **Ohgi et al. (2002)**, 209 low birthweight and/or preterm infants were assessed with the NBAS sequentially at 36-38 weeks, 40-42 weeks and 44-46 weeks.
- Lower motor cluster scores at all NBAS time points and later NBAS scores on orientation and range of states on later NBAS scores were related to later disability classification, with the reflexes cluster as the best predictor of severe disability at five years.



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### Long-term outcome for SGA and ELBW preterms

Two year follow-up

- A study of 120 preterm infants aimed to examine associations between neurological maturation, mother-infant relationships, and cognitive development and to investigate the interaction of birth weight and intrauterine growth restriction and effect on longer term developmental outcomes (**Feldman and Eidelman, 2006**)
- Cognitive outcomes at two years were predicted by SGA status and neonatal state organization.
- SGA preterm infants who are also ELBW are double risk of developmental and cognitive delays and difficulties in the mother-infant relationship that continue through infancy.



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### NBAS and term infants: effects of hyperbilirubinemia

- **Mansi et al., 2003** reported short term effects of jaundice on lability of states self-quieting and autonomic responses.



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### Gender differences on the NBAS

- A recent study by **Boatella-Costa et al (2007)** on 188 full term newborns (88 boys and 100 girls) showed differences in some areas of behaviour:
- Girls had higher scores on orientation items, alertness and state regulation
- Boys scored higher on irritability.
- While such differences are unlikely to have clinical significance, such relationships should be further investigated in other populations, taking into account a wide range of other factors that could be contributing to such a finding.



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### Effects of obstetric medication

- Sequential use of the scale for multiple examinations has marked the studies which aimed to look at initial effects, recovery and adjustment after birth (**Lieberman et al, 1979; Rosenblatt, Redshaw and Notarianni, 1980; Avar and Nimrod, 1985; Kuhnert, Kennard and Linn, 1988; Seposki et al, 1992**).
- The significance of the relatively short term effects of maternal analgesia reported has been debated and the role of clinical and individual factors discussed.
- Indeed the multiplicity of factors involved necessitate complex and large-scale research projects and multivariate analysis techniques if the issue of confounding is to be addressed and the risks and benefits fully understood.



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### Postpartum depression and the NBAS

- Infants born to depressed mother (n=44) and non-depressed (n=43) mothers were examined on the NBAS (**Hernandez-Reif et al. 2006**)
- The newborns of depressed mothers received lower scores on orientation to a face and voice and on the alertness items, and scored less than optimally on the cuddliness and hand-to-mouth activity items.
- It is suggested that the infants of depressed mothers are more aroused and less attentive.



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### Cultural differences

- **Coll et al. (1977)** - Puerto Rican babies had better orienting and following, were easier to console, and more capable of controlling their physiological response to stress than 30 black and 30 white newborns born in Florida (used four cluster scoring system).
- **Loo et al. (2005)** - A comparison of 40 Chinese and 62 Japanese healthy, full-term neonates in Chengdu and Nagasaki showed that Japanese newborns habituated more readily to stimuli, and were less irritable than newborns in the Chinese sample.
- **Keefner et al. (1982)** compared 24 Gusii (Kenya) and US newborns during their first 10 days of life. The Gusii scored better on motor maturity and had fewer tremors and startles. There were few significant differences between the Gusii and American samples.



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### Use of the NBAS as a measure of intervention effects

- A study by **Ohgi et al (2002)** compared Kangaroo Care (KC) for healthy low birthweight infants to standard care with intervention groups of 26 and 27 infants respectively and looked at outcomes at one year. Kangaroo care was initiated in the intervention group by three days and continued daily for approximately two weeks. The infants were assessed using the NBAS at 40 weeks post-menstrual age, with the KC infants having higher scores for orientation, state regulation and the supplementary items.
- Another study by **Feldman and Eidelman (2003)** found that KC for preterm infants showed a neurodevelopmental profile that was more mature, particularly in habituation and orientation.



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### NBAS and later behaviour

- A Swedish study by **Lundquist-Persson (2001)** found that there was a relationship between infants who were classified in terms of their self-regulation skills as a newborn and three Griffiths sub-scales (person al-social; hearing and speech and hand-eye co-ordination) at two years.
- Low self regulation abilities in the neonate were found to be related to developmental status at scores at two years as reflected in lower scores.



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### Six year follow up (Spanish study)

- **Canals et al (2010)** looked at associations between the NBAS scores of healthy full term newborns (n=80) at 3 days and 4 weeks and data on behavior at six years of age, using the Connors Teacher's Rating Scale and the Child Behavior Checklist at six and NBAS assessments.
- Orientation at 3 days and habituation at 4 weeks were the best predictors of later psychological problems and at 3 days lower orientation scores and higher motor and habituation scores predicted children with externalizing problems at six years.



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### NBAS as an intervention

- A meta-analysis, undertaken by **Das Eiden and Reifman (1996)** with pooled data from 688 families, showed that NBAS based interventions have a small-moderate beneficial effect on the quality of later parenting.



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### Conclusions

- As a newborn outcome measure following adverse and other events, as a possible method of predicting longer term infant and child outcomes, the assessment has huge potential, though we do need to be rigorous in providing the evidence base.
- At the same time, well-designed cross-sectional and short term follow-up studies are valuable in testing out new ideas or investigating possible adverse effects of specific exposures.
- Training to reliability is the critical first step.



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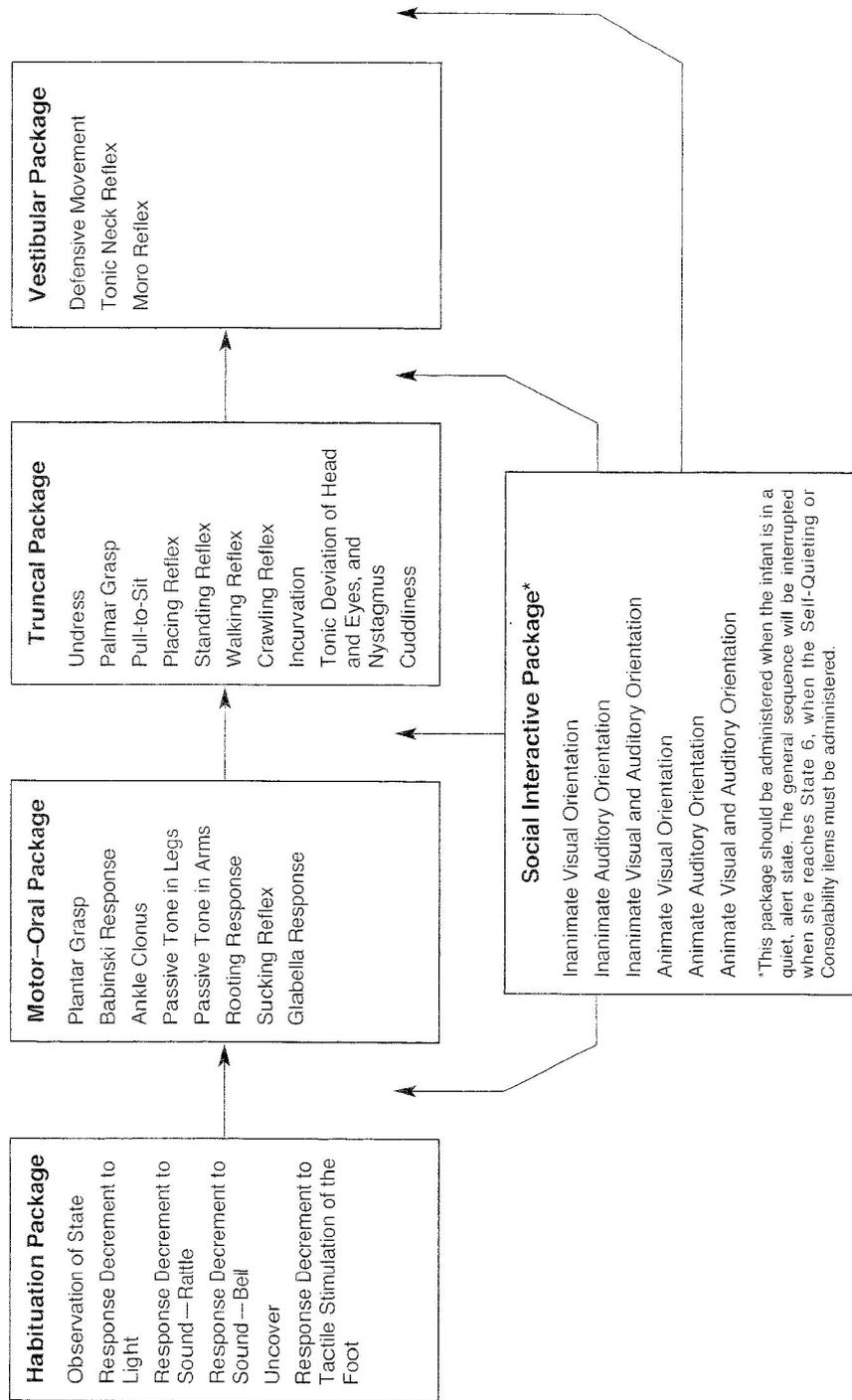


Fig. 2.1 Modal sequence of administration of the NBAS.

## Newborn Behavioral Observations (NBO) Systems

# A M O R

### Autonomic

- Autonomic/Physiological Responses (colour change, tremors, startles)

### Motor

- Tone (legs and arms)
- Rooting and sucking
- Hand grasp
- Pull-to-sit (shoulder and neck tone)
- Crawl

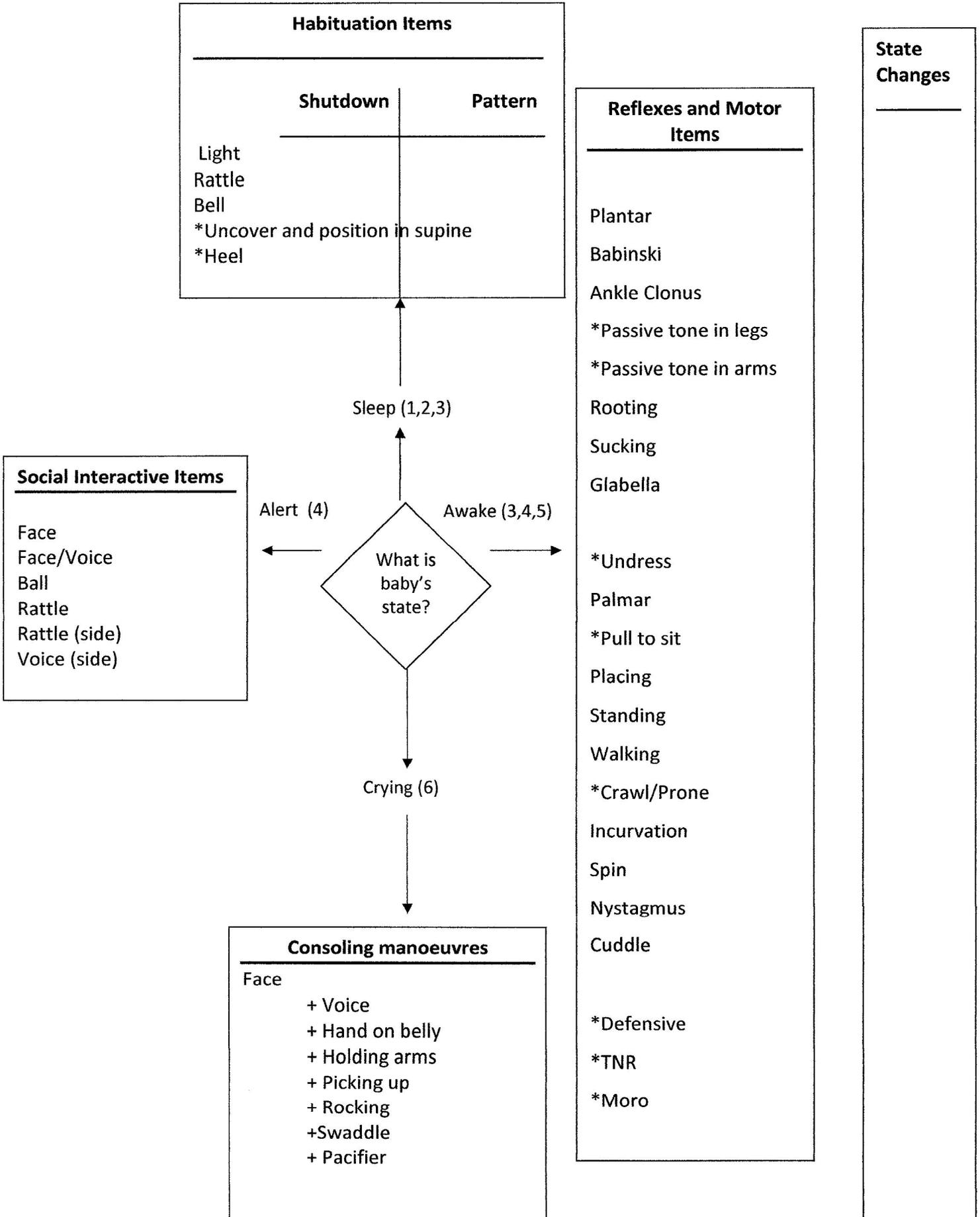
### Organisation (of states)

- Habituation to light/sound (asleep)
- Crying and Soothability
- State Organisation – smoothness of state transitions

### Responsivity (to environment)

- Responses to face and voice (social availability)
- Response to face
- Response to voice (voice recognition)
- Response to sounds
- Response to inanimate stimulus

# NEONATAL BEHAVIORAL ASSESSMENT SCALE (NBAS) WORKSHEET



<b>Alertness</b>		
<i>Duration</i>	<i>Delay</i>	<i>Support</i>
brief	always	moderate
moderate	sometimes	minimal
Sustained	never	none

<b>Activity Level 4,5)</b>	
<i>Spontaneous</i>	<i>Elicited</i>
none	none
slight	slight
moderate	moderate
much	much

<b>Motor Maturity (4,5)</b>	
<i>Movements</i>	<i>Degrees of arcs</i>
smooth	45° to 90°
jerky	45° or less

<b>Tone (4,5)</b>
hypotonic
average
hypertonic

<b>Consolability (6)</b>
1.
2.

<b>1<sup>st</sup> cry (6)</b>

<b>Smiles (all states)</b>

<b>Self Quiet (6, 5-4 or lower)</b>	
<i>Action</i>	<i>Number of times</i>
brief attempt (< 5 secs)	
success (5 secs)	
Sustained success (15 secs)	

<b>Hand to Mouth (all states)</b>	
<i>Action</i>	<i>Number of times</i>
swipe	
hold	
insert (3+ sec)	
	(15 sec)

<b>Tremors (all states)</b>	
<i>States</i>	<i>Number of tremors</i>
1,2,3	
4	
5,6	

<b>Startles (awake)</b>
<i>Number of startles</i>

<b>Colour Changes (all states)</b>			
<i>Colour</i>	<i>Degree of change</i>	<i>Onset</i>	<i>Recovery</i>
pale	extremities	early	slow
blue	whole body	with increased stimulation	quick
red			

# NBAS SCORING FORM

Baby Name.....Date of Assessment..... Examiner.....

Sex..... dob..... Gestational age..... Birthweight..... ..Height.....HC..... Mode of delivery.....

Length of Labour.....Apgar scores..... ..Parity..... ..Type of feeding.....

## *Infant Behaviour*

Habituation	9	8	7	6	5	4	3	2	1	Comments
Response dec. to light										
Response dec. to rattle										
Response dec. to bell										
Res. dec. to foot probe										

Social-Interactive	9	8	7	6	5	4	3	2	1	Comments
Animate visual										
Animate visual & auditory										
Inanimate visual										
Inanimate visual & auditory										
Inanimate auditory										
Animate auditory										
Alertness										

Motor System	9	8	7	6	5	4	3	2	1	Comments
General tone										
Motor maturity										
Pull- to-sit										
Defensive										
Activity level										

State Organisation	9	8	7	6	5	4	3	2	1	Comments
Peak of excitement										
Rapidity of build- up										
Irritability										
Lability of states										

State Regulation	9	8	7	6	5	4	3	2	1	Comments
Cuddliness										
Consolability										
Self-quieting										
Hand-to-mouth										

Autonomic System	9	8	7	6	5	4	3	2	1	Comments
Tremulousness										
Startles										
Lability of skin colour										

Smiles

Supplementary Items	9	8	7	6	5	4	3	2	1	Comments
Quality of alertness										
Cost of attention										
Examiner facilitation										
General irritability										
Robustness & endurance										
State regulation										
E's emotional response										

Reflexes	0	1	2	3	Asym	Comments
Plantar						
Babinski						
Ankle clonus						
Rooting						
Sucking						
Glabella						
Passive resist - legs						
Passive resist - arms						
Palmar (hand grasp)						
Placing						
Standing						
Walking						
Crawling						
Incurvation						
Tonic dev. – head & eyes						
Nystagmus						
TNR						
Moro						

SUMMARY : INFANT	
Strengths	Concerns

SUMMARY : PARENT(S)	
Strengths	Concerns

**RECOMMENDATIONS FOR CAREGIVING:-**

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## **NEONATAL BEHAVIOURAL ASSESSMENT SCALE INFORMATION FOR TRAINEES**

Considerations when administering the Neonatal Behavioural Assessment Scale developed by Dr. T.B. Brazelton. Remember that you gain information about the parent as well as about the baby, but the NBAS is not an assessment of parent-baby interaction.

- Form rapport with parents and baby
  - Note the environment
  - Be attentive to parent's and baby's reactions
  - Keep smooth flow of exam items and give recommendations for caregiving.
1. Describe to the parent's briefly what you are going to do. (e.g. Observing how the baby manages handling, looking at faces and objects, sleeping, crying). Explain that the baby may cry and the examiner will wait briefly to see if the baby makes attempts at self-consoling, but then carry out the consoling steps. Explain that you will stop doing the NBAS when the baby lets us know. The NBAS takes no longer than 30 minutes, unless feeding or changing needs to take place.
  2. Prepare the assessment room in advance. If the NBAS is done at home, make sure the room is not too bright, noisy or cool
  3. Consider lighting, noise, temperature and privacy.
    - Remember that a room that is too bright will affect a young baby's performance.
    - Provide comfortable seating for the parents.
    - Consider whether they will sit and will they be able to see, etc. Chairs positioned beside each other are helpful so the parents can see the baby's responses when you hold the baby.
  4. Find out the mother and baby's history beforehand verbally or from her notes. It is a chance to establish a rapport with the parents whilst getting a brief history.
    - Date, time and type of delivery
    - Complications
    - Apgar scores
    - Gestational age, weight and type of feeding
    - Position in family- first child etc
    - Any previous miscarriages or neonatal deaths etc
    - Mother's age (if relevant)
    - Any concerns
  5. Prepare yourself in advance by washing your hands etc.
  6. Demonstrate that you are aware of the baby's responses throughout the assessment, as your behaviour will serve as a model for the parents. You may find

that describing what you see as you go along is a good way to interact with both parents and baby.

- Guard against rushing through the items in order to complete the assessment. An uncompleted exam still gives valid information.
  - On the other hand, do not proceed too slowly as you may exhaust the baby by making the assessment prolonged, and therefore you will not get the baby's "best" performance.
  - Show that you are able to pace yourself and the baby appropriately.
7. Ensure that the exam flows smoothly from one item to another. Use the truncal package as the central part. Ensure that you cluster items appropriately both for ease of administration, and to avoid over-handling the baby.
  8. Describe quietly to the parents the item you are about to do, then describe the baby's response. Speak in a quiet voice so as not to stimulate the baby. Although you should not engage in lengthy conversations with the parents during the exam, you need to be alert to their feelings throughout it, and be able to respond appropriately if they become anxious, overwhelmed or concerned.
  9. When handling the baby, you need to demonstrate that you are competent and aware of safety issues. For example, in which position will you elicit the moro? Is the baby in safe hands?
  10. Avoid making too many comments about how beautiful, wonderful, clever the baby is. When overdone, these comments detract from the overall professionalism of the exam, and may not address the way the mother feels about the baby. You must allow the mother/father a chance to voice their concerns.
  11. Do not write anything down or appear to be scoring during the course of the exam. You may have a list of items nearby to remind you, but it is best to avoid this if possible.
  12. Provide a summary for the parents at the end of the assessment by interpreting the developmental course of the baby's behaviour and reaction to the items, in particular any implications for caregiving. Ask the parents how they feel about the NBAS. Give them a chance to express their thoughts, observations or comments.

List of categories for summary: State range and control  
Autonomic response  
Motor and orientation responses



## **Brazelton NBAS for Parents**

### **Brazelton Neonatal Behavioural Assessment Scale (NBAS)**

(Developed by Dr. T. Berry Brazelton, Boston, USA)

#### ***What is it?***

An assessment of 28 behavioural responses to stimuli (face, voice, red ball, rattle, bell, light) and 18 reflex items which can be scored in babies from birth to two months old. The NBAS takes 20-30 minutes to do in a quiet, warm room with the mother/father/family when the baby is half-way between feeds.

It is an interactive assessment focusing on the baby's strengths. We can look at

how your baby responds to light and sound when asleep, (habituation) and faces and objects (orientation). We can also look at your baby's physical activity/reflexes (motor performance) and how your baby is able to regulate his/her states (from sleeping through to crying).

#### ***Why do we do it?***

To share with parents, doctors, nurses, researchers and other practitioners the wonderful abilities of newborn babies, and your baby in particular. To look at what your baby likes and dislikes and how we can understand his/her signals. To understand the baby's style and temperament in order to develop ways to handle and look after your baby. The NBAS is used in research studies worldwide.

#### ***Who does it?***

The NBAS can be done by practitioners or researchers who have had extensive experience with newborns and have been trained and reached reliability in the assessment. Parents can often join in the assessment with their own baby. Parents generally find this very interesting, fun and informative!

#### ***When will it be done?***

If you are interested, your health visitor or practitioner may be trained so that they can do the NBAS, or you can ring our Centre directly. Sometimes we ask parents if we can assess their baby as we are training staff or researchers. First we describe the assessment and discuss it with you. It is entirely your own decision and will be treated confidentially.

If you want any further information, please see our website [www.brazelton.co.uk](http://www.brazelton.co.uk) or email [info@brazelton.co.uk](mailto:info@brazelton.co.uk).

The NBAS is a behavioural assessment, and does not replace any other assessments or tests your baby may need, such as hearing, jaundice, or other medical tests.



# Brazelton Centre UK

## Assessment Log-Book

2019



**Brazelton Centre UK**

**Assessment Log-Book**

**Trainee Details:**

Name \_\_\_\_\_ Present Post \_\_\_\_\_

Address \_\_\_\_\_

Telephone \_\_\_\_\_

Professional Qualifications \_\_\_\_\_

**Brazelton Study Day/Workshop attended?:**

Date \_\_\_\_/\_\_\_\_/\_\_\_\_ Location \_\_\_\_\_

**Training Session/s:**

Trainer \_\_\_\_\_ Date \_\_\_\_/\_\_\_\_/\_\_\_\_ Location \_\_\_\_\_

Trainer \_\_\_\_\_ Date \_\_\_\_/\_\_\_\_/\_\_\_\_ Location \_\_\_\_\_

Trainer \_\_\_\_\_ Date \_\_\_\_/\_\_\_\_/\_\_\_\_ Location \_\_\_\_\_

**Certification sessions for reliability attended:**

Trainer \_\_\_\_\_ Date \_\_\_\_/\_\_\_\_/\_\_\_\_ Location \_\_\_\_\_

Trainer \_\_\_\_\_ Date \_\_\_\_/\_\_\_\_/\_\_\_\_ Location \_\_\_\_\_



**Neonatal Behavioural Assessment Summary**

Name of infant \_\_\_\_\_ Others present \_\_\_\_\_

Carried out on \_\_\_\_\_ (date) at \_\_\_\_\_ (location)

Duration of assessment \_\_\_\_\_ (mins)

**Infant Details**

Date of birth \_\_\_\_/\_\_\_\_/\_\_\_\_ Age at assessment \_\_\_\_\_ (weeks/days)

Birthweight \_\_\_\_\_ Gestation at birth \_\_\_\_\_ (weeks)

Current method of feeding \_\_\_\_\_ Time since last feed \_\_\_\_\_ (hrs/mins)

**Description of basic features of the assessment**

**Give a short description of the infant**

**Review strengths and weaknesses**

**Maternal/parental issues or concerns**



**Please continue overleaf if necessary**

# Errata – NBAS manual (2011) Page 81

This information is for re-coding when you are analysing NBAS scoring data

## **Peak of Excitement**

Raw Score= recode

9 or 1 = 1

8 or 2 = 2

3 = 3

7 or 4 = 4

6 or 5 = 5

## **Rapidity of Build-up** (as in the 1995 manual edition)

Raw score

9 or 1 = 1

8 or 2 = 2

7 or 3 = 3

4 = 4

5 = 5

6 = 6

## **Lability of State**

Raw Score

9 or 1 = 1

8 or 7 = 2

5 or 6 = 3

4 or 3 = 4

2 = 5



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