

## The Neonate

Being born means entering a new environment and having to establish couplings. A new relationship has to be achieved. In this, timing is all important since birth must take place when the fetus displays a certain pattern of variables – that is, when it's development allows it to make the transition from one set of couplings to another.

If the presenting state of the child at birth does not show adequate values of those variables, the child's survival will be compromised and special measures may have to be taken to provide additional support.

The transition from a uterine to post-uterine environment.

|                     |                              |
|---------------------|------------------------------|
| uterine environment |                              |
| *                   | placental exchanges          |
| *                   | stimulation (movement,       |
| *                   | rhythms of maternal          |
| *                   | chemicals, sound             |
| *                   | position) mucus              |
| *                   |                              |
| transition period   |                              |
| *                   | a reorganization of the      |
| *                   | system's functioning:        |
| *                   |                              |
| *                   | 1. rhythmic contractions of  |
| *                   | uterus                       |
| *                   | 2. appearance of new forms   |
|                     | of stimuli (sound, cold      |
|                     | light, etc.)                 |
|                     | 3. independent breathing     |
|                     | 4. physiological, bio-       |
|                     | chemical changes as          |
|                     | organs begin functioning     |
|                     | 5. achievement of regulation |
| post-uterine env.   |                              |

New types of exchange processes begin to take place. New types of internal regulation must be achieved as well as new types of coupling with the surround. The achievement of internal regulation is dependent on the achievement of external regulation/couplings (light/dark cycle, defecating, eating)

**New types of information and exchange processes provide the conditions for further development of many systems - especially the nervous system.**

At birth and soon after, the infant has certain reflexes and sensitivities with which he grips and is grabbed by the world.

(note: not inborn, but indicate a particular development state of nervous and muscular systems).

What are these sensitivities?

We don't know them all, and more are being discovered - and then there is the further

question of what role they play in helping the infant achieve regulation.

### What does the baby look like?

Often a rude awakening!

Birth is a difficult battle, for the baby as well as the mother. Lasts between 4 and 24 hours. Emerges splattered with mother's blood and a thick, greasy, white substance called the **vernix** which lets him slip through the birth canal.

No beauty:

Skin may be discolored, wrinkled, loose and ready to scale in creased places such as hands and feet.

Some have extra stores of flesh (lot of fluid) making them look fat. Tides him over till he can eat. As extra padding disappears in first week, leaves skin peeled and cracked.

May have body hair called **lanugo**. Matted with vernix gives him a strange pasted look. Cheeks, ears, shoulders, and back may be furry. Disappears by 4th mo.

Head - may be swollen at top because of pressure against the pelvic outlet during the last hours of labor - often molded like a melon with point at back.

Face may be puffy and bluish; ears may be pressed to his head in bizarre positions; his nose, flattened and skewed to one side; eyes puffy and eyelids swollen; temples and cheeks temporarily bruised if forceps were used.

Bowlegged from womb position, feet may be pigeon-toed from being up beside his head for so long.

Obstetrical treatment - cuts umbilical cord, may suck airways with a bulb-suction; (first breath may draw fluid and mucus further into the lungs, making baby gag, breathing slow, and temperature drop. First gasping cry is vital - fills lungs with air and starts independence.

Color improves as he begins to breath - bursts of rapid, increasingly deeper breaths follow long periods of gasps, chokes, sneezes, and no perceptible breathing.

Generally sleep deeply afterwards. Washed, injected with V-K to prevent internal bleeding, eyes washed with silver nitrate or e-myacin. Sleeps in fetal position.

Color may change over a period of days - may look yellow after third day. Decomposing red blood cells, extras needed in womb, cause a jaundice. The

breakdown, coupled with mild dehydration, yields a chemical called bilirubin, which the infant's immature liver cannot yet get rid of. As baby absorbs milk and cells rehydrate, jaundice washes out.

Baby may lose weight in first three days, but will recover.

Early means of coupling - newborn competencies

General characteristics: (p. 140-141)

The “presenting state” of the newborn – it’s developmental state.

Character of “competencies”

1. Often meet a direct survival need - sucking, gagging, crying
2. Involve organization of behavior – intake of nourishment by sucking and swallowing, turning head toward stimulus (orientating response).
3. Selective attention and response to environment – look at sharp contrasts, at eyes or border between hair and forehead.
4. Detection of relation between actions and consequences – put thumb in mouth and get pleasure.

## **Brain Growth**

**Infant states and their regulation.** State regulation provides the context for understanding all the competencies shown by infants. It is within the context of state regulation that they all develop. State control is a major issue for both infant and parents.

Infant must stabilize circulatory, breathing, digestion, elimination, body temperature, and hormone mechanisms.

Process of self-reorganizing leaves little energy initially for eating and digesting. May live on stores of fat for a few days.

Mother's state goes through readjusting too. Often wonder if baby is really theirs, if it is normal, if the medication hurt it, and whether they are capable of nursing it. Wonder if they will ever feel positively toward their baby. First baby means giving up a great deal of independence.

## Infant States

Text: Sleep and distressed  
Brazelton – 6 states

**Sleep**

1. Quiet
2. Active

**Wakefulness**

1. Awake and quiet
2. Awake and active

**Distress**

1. Fussing
2. Crying

**Sleep** – 16 hours on average per day. 6 hours in old age. Distributed equally between day and night (distress for parents). 8 weeks for relatively normal pattern. Social control, planet control.

Quiet sleep – completely still, breathing slow and regular.

Active sleep – stir often, move arms and legs, crinkle up their faces, breathe faster and more irregularly, REM. 50% as opposed to 20% for adults. Irregular mix of quiet and active (adults are regular). Stabilized at 3 months.

**Distressed** – Usually less than 10% of time crying. In first two months, 2% really crying, 10% fussing.

Hunger cries

Upset cries

Pain cries

Rocking, voice simulation, holding closely, swaddling and sucking soothe child.

Changes – state control occurs initially with a lot of parental help. By 5 months infant's state does not change as much, transitions are more predictable.

Reflexes: see page 134

A reflex is not an innate behavior, but is a developmentally accomplished behavior. This is why they are so important as diagnostic resources. They indicate the developmental state of the infant at birth and undergo rapid changes and refinement depending on stimulation and continued development of the CNS.

Some are *permanent* (retained throughout life) and others are *transitory* (disappear as we grow older).

Some reflexes have obvious survival value (choking, gagging, sneezing, sucking, rooting) other do not.

**Table 4.1 Examples of Transitory Newborn Reflexes**

| Reflex     | Description  | Developmental Pattern                            |
|------------|--|--|
| Sucking    | When object brushes against infant's lips, rhythmic sucking occurs.  | Replaced by voluntary sucking by 2 months.       |
| Babkin     | When infant is lying down, pressure on palms of both hands causes head to turn straight ahead, mouth to open, and eyes to close.   | Disappears around 3 months.                      |
| Stepping   | When infant is held above a surface and lowered until feet touch the surface, feet are alternately raised and lowered in a stepping motion.  | Disappears around 3 months.                      |
| Grasping   | Pressure on palm causes fingers to curl with a strong enough grasp to support infant's weight.   | Weakens after 3 months and disappears by 1 year. |
| Tonic Neck | Infant placed on back tends to turn head to one side, extend arm and leg on that side, and flex limbs on the other side (like a fencing position).   | Disappears around 4 months.                      |
| Rooting    | When infant's cheek is stroked lightly, head turns in direction of stroked cheek and mouth opens.  | Disappears around 4 months.                      |
| Moro       | In response to startling stimuli, such as sudden loud noise or rapid lowering of head or body, arms are extended and then brought rapidly together and fingers close in a grasping motion. | Disappears around 5 months.                      |
| Babinski   | When side of foot is stroked from heel toward toes, toes fan out and foot twists inward.   | Disappears around 1 year.                        |

## Sensing and Perceiving the World

### **Techniques for Studying Sensory Systems**

*Eye movements* – can tell us how infants explore environment and what features they find interesting. Can't tell us *what* they see or how they organize what they see.

*Preferential looking technique* – Babies prefer to look at new stimuli. However, if there is no preferential looking, can't tell if baby is simply not interested.

*Visual Evoked Potentials* – brain waves characteristic of seeing new patterns, generally higher estimates. Change in brain's electrical activity doesn't mean baby can make meaningful use of difference detected.

*Habituation* – a decrease in attention that occurs when the same stimulus is presented repeatedly. Based on the orienting response – a change in heart rate and slight dilation of pupils. Again, negative responses do not tell us the baby can't distinguish.

*Instrumental conditioning* – infants can be trained to respond to stimuli through sucking. Suggests what they find reinforcing, or what they like repeated.

### **Infant Associative Learning**

How infants learn that certain events go together.

*Classical conditioning* – when a new stimulus comes to elicit a previously established response. Infant responses can be conditioned, such as

turning their heads to right or left depending on hearing a tone or a buzzer.  
Does not become well established until around 3 months of age, probably with development of CNS.

*Operant or instrumental conditioning* – a type of learning in which behaviors are influenced by their consequences. Reinforcement.

This is easier than classical conditioning. Infants are able to notice and respond to contingencies - the relation between actions and consequences.

Infant sucking patterns can be modified (increase or decrease) by mother's voice. Papousek conditioned babies to perform sequences of head turns.

### **Imitative learning**

Meltzoff and Moore's study of tongues at 2 days. Controversial.  
Imitation to learn new behaviors really gets going in second year.

### **Infant Motor Skills**

Dramatic physical growth provides the context for the development of motor skills. During first year baby triples in weight and grows 10 in. in length. Bones become harder and rigid, muscle mass and strength increase. Body proportions change – head is initially large and trunk long. Arms and legs grow. Motor skills must develop in relation to an ever changing body.

#### *Principles of motor-skill development*

Differentiation – From global, poorly defined motor skills to a set of precise skills, each adapted to a different function. Response to hand placed over mouth.

Cephalocaudal development – progression from head downwards.

Proximodistal development – control progresses from center of body to extremities. Head under control before arms, and hands.

Joint role of maturation and experience.

#### Reaching and Grasping

These behaviors appear early

Locomotion - newborn - reflex walking

**8 weeks – chin up if lying on stomach - head up briefly if held standing**

**2-4 mo. - raise chest with arm support**

- 4½ mo. - sit erect with support - no crawling
- 2-5 mo. - hands used together and baby can roll over completely.**
- 5-8 mo. – sits without support.**
- 5-10 mo – stands holding on**
- 6 mo. - initial movements in forward mobility
- 8 mo. - crawling - fluidity and coordination - sit up, stand supported by adult
- 6-10 mo. - pull up on table to stand**
- 7-13 mo. – walks holding onto furniture**
- 10-14 mo. – Stands alone**
- Fragile, unsteady, leg bowed and spread apart, weight on inner part of feet. Stomach thrust forward, arms extended.
- 11-14 mo. – walks well**
- 14-22 mo. – walks up stairs.**

### **Sensory Systems in the Newborn**

Vision: Poor visual acuity, ability to change focus is limited, and very nearsighted. Most visual capacities are present from birth in rudimentary form, but child is legally blind.

Pupil contracts in intense light.

Blink appears at 2 mo.

Tracking occurs as jerky eye and head movements, improves rapidly in a few months.

2 months – smooth pursuit for slowly moving objects.

2-4 month – ability to follow more rapidly moving objects

*Acuity* apprx. 20/660 at birth, 20/300 at 2 weeks, 20/100 in 5<sup>th</sup> or 6<sup>th</sup> month. Limitation is probably due to neural processing – lens is well developed. By 1-3 months babies prefer clear picture if testing with sucking and projector (bring image into focus). Experience is necessary to see pattern.

*Accommodation* (focus) occurs in newborns, but does not reach adult level until 4 months. Initially difficult, after first month eye can focus at about 8 inches. At 4 mo. near and far focusing is possible, and infant can track an adult (can track a light within a few days). Eye muscles not fully developed in newborn.

*Infants spontaneously look.* Actively search for things to look at. Selective attention. Prefer more complex stimuli and areas of high contrast, such as the edges of an object. Do not scan an entire object, but fixate on edges. They prefer curved lines over straight lines, can discriminate fine print from gray surfaces, and are especially interested in faces, perhaps because of their stimulus characteristics (high contrast)

1 mo. old – focus on border areas of high contrast or faces. May look to side at new object.

2 mo. – more pronounced, more accurate.

Continues to improve up to 7 years.

*Saccadic eye movement* are present from birth. Movements we use to shift gaze to a new objects. Initially more of them when shifting gaze, and infants use them to track objects instead of continuous pursuit eye movements. Latter present often at 2 mo. For slow-moving objects, becomes perfected for fast objects around 4 months. Like sucking, a brain mechanism seems to control periodicities out of which more complex activities are built.

*Eye and head movements* are coordinated from the beginning. In first few months baby can fix on stationary object while he is moving. At 16 weeks – compensatory head movements like adult, but ability to keep eyes on target lags considerably

*Color* - 2 mo. old infants can discriminate on basis of color. Perhaps by 3 or 4 months infant color perception same as adult. Visual Evoked Potentials show color recognition at 2 weeks.

Hearing: The fetus at 26-28 weeks reacts to sounds. Note experiment that read a story to fetus 6 weeks before birth.

Infants show a startle reaction to sounds, and turn their heads in the direction of a sound (localization). This disappears at about 6 weeks and reappears at 3 or 4 months, at which time infants will also search with their eyes for a source. “the temporary disappearance of the head-turning response probably represents a maturational transition from a reflexive response controlled by subcortical areas of the brain to a voluntary attempt to locate the sound source. By 4 months, they will reach in the correct direction toward the source of a sound in the dark; by 6 months they show a marked increase in their responsiveness to sounds that are accompanied by interesting sights and are able to pinpoint the location of sound more precisely, an ability that continues to improve into their second year.” (Hilgard, p. 74).

A sound has to be 10 to 20 decibels higher for an infant to hear it than an adult.

Sensitivity determined by monitoring eye blinks, heart rate changes, and changes in brain electrical activity.

Discrimination studies and habituation.

Decelerating heart rate indicates increased attention. Present

one sound over a series of trials until heart rate is normal, and then change the sound. If the infant can tell the difference, heart rate will decrease.

Infants between 5 and 8 mo. are good at detecting small changes in pitch and loudness. Even at 1 mo. infant can distinguish one note on musical scale from the next.

Infants are very sensitive to the differences in phonetic speech sounds. At 1 month can discriminate between /ba/ and /pa/. Also demonstrate categorical perception (presenting similar speech sounds approximating the end result - people hear the end result).

### Smell and Taste:

Can discriminate differences in taste shortly after birth. Prefer sweets to salty, bitter, sour or bland. Whether they can distinguish the rest from each other is open to question. Facial expressions change with taste.

Young infants are very sensitive to odors. Will turn heads toward a sweet smell, lowering of heart and respiration rates. Turn heads away from ammonia or rotten eggs, with acceleration of heart rate and respiration. Recognizes mother's milk. Prefer the smell of a lactating breast to bottled milk (note relation between amniotic fluid and breast milk in smell).

## **The Organization of Infant Sensory Behavior**

Scanning occurs in an orderly way.

### Development of Perceptual abilities

Depth and Distance Perception

Visual cliff - 6-7 months for fear, 2 months for difference.

Size and shape constancy

Perception of faces

1 mo. look at face, scan outer edges.

2 mo. scan within face at internal features

3 mo. recognize photographs of mother, preference for looking at mother rather than stranger.

5 mo. can remember and distinguish between faces of strangers.