

4. Prenatal Development & Premature Birth

Friday, 28 April 2017 3:12 PM

Aims

- Introduce the stages of prenatal development from conception to birth
- Discuss the developmental consequences of preterm birth and interventions that influence developmental outcome

Outcomes

- To describe the changes that occur during each stage of prenatal birth
- Explain the limit of viability for preterm birth
- Understand the rationale behind interventions that are used with preterm infants

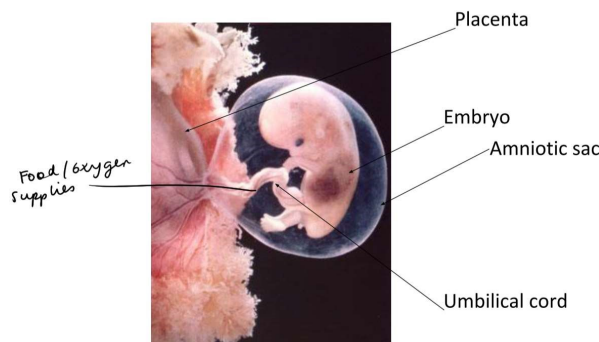
1. Fertilization

2. The Germinal Period: First 14 days

- Zygote travels towards uterus
 - Divides and forms blastocyst
 - 16 to 64 cells

3. The Embryonic Period: 3rd to 8th week

- Blastocyst implants in the uterine wall
- Layers of cells differentiate to become:
 - Ectoderm (outer layer)
 - Nervous system, skin, hair
 - Mesoderm (middle layer)
 - Muscles, bones, circulatory system
 - Endoderm (inner layer)
 - Digestive system, lungs, urinary tract and other vital organs



- 3 weeks
 - Neural tube: brain
 - Closing neural tube (folic acid prevents neural tube defects)
- 4 weeks
 - Most important organs develop
 - 24 days in, heart beats
 - Tail split to form the feet
- 6 weeks
 - Brain: filling neurons
 - Head growing rapidly, taking 1/2 volume
 - Cartilage
- 8 weeks
 - Internal organs
 - Sex determination almost complete
 - birth of all organs
 - Not at risk anymore

4. Foetal Period: The last 7 months

- Period of rapid growth and refinement of organ systems
- Foetus more responsive
- Behaviour becomes increasingly regular and integrated
- Becomes viable between 22-28 weeks (50% chance of surviving outside)

12 weeks - 2nd Trimester

- Starts moving around
- Body catches up growth rate
- Size increases a lot

6 months

- Foetus capable of responding to light
- Able to hear sound
- The mother's voice and heartbeat are best heard

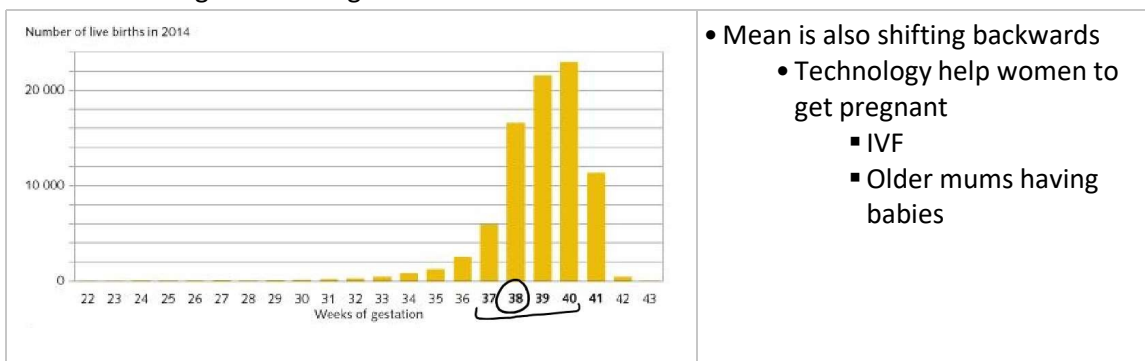
7 months - 3rd Trimester

- Foetus begins putting on weight in the form of fat beneath skin
- Able to survive outside
- Lung development: surfactin produced
- 30-32 weeks: the surfactin keeps the lung breathing

Preterm birth

- Born 36 weeks or earlier
- Low birth weight: <2500 grams

Distribution of gestational age



Preterm birth in Australia (Tracey, 2007)

- 7% of all birth is born in less than 37 weeks
- Certain groups at higher risks
 - Indigenous mothers: lack of access to doctors and midwives to monitor
 - Young mothers (less than 20 years)
 - Older mothers (older than 40 years)
 - Multiple births and first time mothers

Limit of viability (Tyson, 2008)

- The age at which infants have a 50% chance of surviving their first year
- Limit is 24 weeks, 23 weeks don't survive

Predicting outcome (Tyson, 2008)

- Consider:

1. Birth weight	3. Multiple or singleton
2. Gender	4. Steroids

- 23 weeks - better survival if: heavy, girl, singleton and steroid (80% chance of survival)

What is NICU like?

Colder	Brighter
Sudden changes is not good	Need to eat
Sucking reflex	Problem for preterm babies
No skin-skin mother contact	Lots of tests: blood, toe sensors, monitors

Interventions (**Feldman & Eidelman, 2003**)

Adapting the neonatal intensive care unit (NICU) environment

- Containment and lighting (86% US NICU)
- Kangaroo care (98% US NICU)
 - Skin-skin contact
 - Accelerates development of regulatory processes
 - Sleep development, better feeding, earlier discharge
- Tactile - kinaesthetic stimulation (massage, 38% US NICU) (**Tiffany**)
 - Benefits: stimulates growth, decreases stress behaviours, earlier discharge

5. Perceptual Development

Sunday, 18 June 2017 12:24 PM

Aims

- To explore infant's perceptual capabilities and how they change with age
- To use examples of perceptual narrowing to illustrate how experience shapes the way infants experience the world

Outcomes

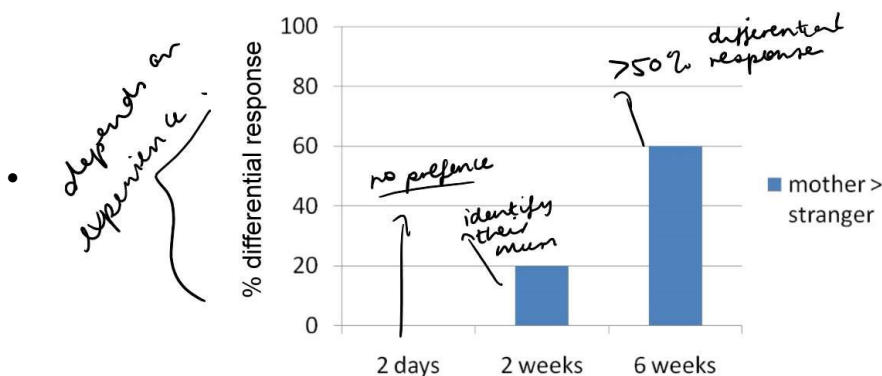
- Describe the perceptual capabilities of young infants
- Use examples of perceptual narrowing to explain how development is shaped by experience

Audition

- Foetuses can hear in the womb and learn
 - Newborns show preference to their mother's voice
 - The **Cat in the Hat study (DeCasper & Spence, 1986)**
 - Read Dr Seuss repetitively
 - Recognize voice and the particularly story
 - 24 weeks gestation development
 - Hear heart beat and blood flow

Olfaction

- One of the first sense to develop
- Newborns are attracted to the smell of breast milk at birth
- They learn to recognise to the smell of their mother's breast milk



Taste

- Taste receptors develop prenatally, they learn about the flavours they are exposed to
 - Via amniotic fluid
 - Via breast milk
- **Carrot juice study (Mennella et al., 2001)**
 - Adaptive learning mechanism
 - By testing the baby's reaction to carrots, babies are less likely to show negative affect than those who have not experienced it
- **Neonatal facial expressions (Ganchrow et al., 1983)**
 - Response to sweet: licking, soft expression
 - Response to bitter: scrunch face, open mouth

Touch

- Newborns show reflexive reactions to touch
 - Rooting reflex: stroke side of cheek, they will turn that way and open mouth
 - Important role in establishing relationship with caregivers
 - E.g. massage and infants of depressed mothers

Vision

- Only one that undergoes prenatal
- Visual acuity is poor at birth but improves rapidly
- Snellen fractional system

Age	Meters - adult
Newborns	6/120-240
3 months	6/30
12 months	Acuity is adult like

- Infants prefer to look at
 - Patterned over plain
 - Complex over simple
 - Red objects over other colours
 - Face over non-face stimuli
 - Concentrated on the upper half of the visual field
 - Top: tend to move, much contrast, heavy
- Perceptual narrowing
 - Infants outperforms adults at many perceptual discrimination tasks
 - Face perception
 - Speech perception
 - Inter-modal perception
 - Monkey species
 - Other race effect
 - Language
 - Every species in the world

1. Face perception

- Young infants able to discriminate face from every species and race of the world
- More experience: lose ability to discriminate other face
- Visual paired-comparison task
- They often look longer at the more novel thing
- If they can't tell them apart, they look at them both equally

2. Other-species effect (Pascalis, de Haan, & Nelson, 2002)

- Test on monkey and human discrimination task

and any other race we don't experience

Group	Monkey face task	Human face task
1. 6-month olds	novelty <i>preferences</i>	novelty
2. 9-month olds	null	novelty
3. Adults	null	novelty

} I can't tell the difference

- By 9 months, infants have lost the ability to discriminate between monkey faces

3. Other race effect (Kelly et al., 2007)

- Caucasian and infants tested with Chinese, Middle Eastern and Caucasian faces

	Chinese	Middle East	Caucasian
3 month olds	novelty	novelty	novelty
6 month olds	null	novelty	novelty
9 month olds	null	null	novelty

only discriminate in own-races.

- Same was done with Chinese infants

4. Speech perception

- Young infants can discriminate phonemes from every language in the world
- With continued exposure to their native language, they lose the ability to discriminate sounds from other languages

➤ Conditioned head turn procedure (CHT)

- **Werker and Tees (1984)**

- Discriminating phonemic contrasts
- English speaking infants are as good as native Indian adults at discriminating Thompson contrasts
- Longitudinal data
 - Gradual loss

Inter-sensory Perception

- Young infants can discriminate between different languages from visual input alone
 - As they gain experience with how their own language looks, they lose this ability
- Habituation/dishabituation procedure

English/French discrimination

Age group	Monolingual household	Bilingual household
4 month olds	Increased looking	Increased looking
6 month olds	Increased looking	Increased looking
8 month olds	Did not increase looking	Increased looking

- Looking time decreased as they grow older

Summary

- Perceptual development is an experience-dependent process
- With experience, the brain tunes and becomes an expert in processing the specific environment it has been born into
- Gradually tuning to those that it needs and getting rid of those that it doesn't need