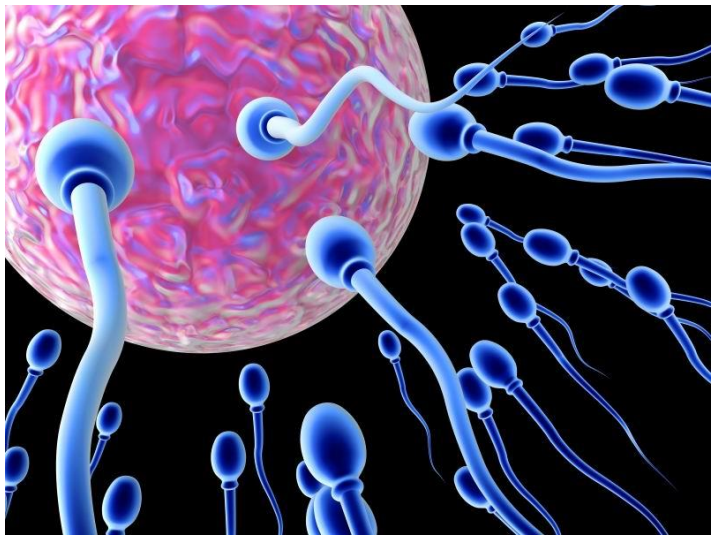
SHMS02A
Physical & Motor Development

Chapter 1

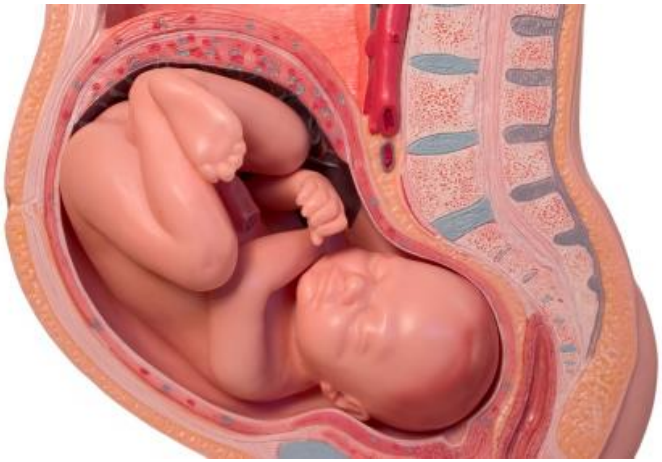


From conception through toddling

Prenatal Development

- Conception-birth
- 9 months
- Life in utero = 4 basic features:

1. Cell division
2. Differentiation
3. Unification
4. Integration



The Study of Prenatal Development

A model for the development of all subsequent periods (e.g., stage-like changes)

Understand how the developing organism can be affected by mother-to-be's health, habits, and lifestyle

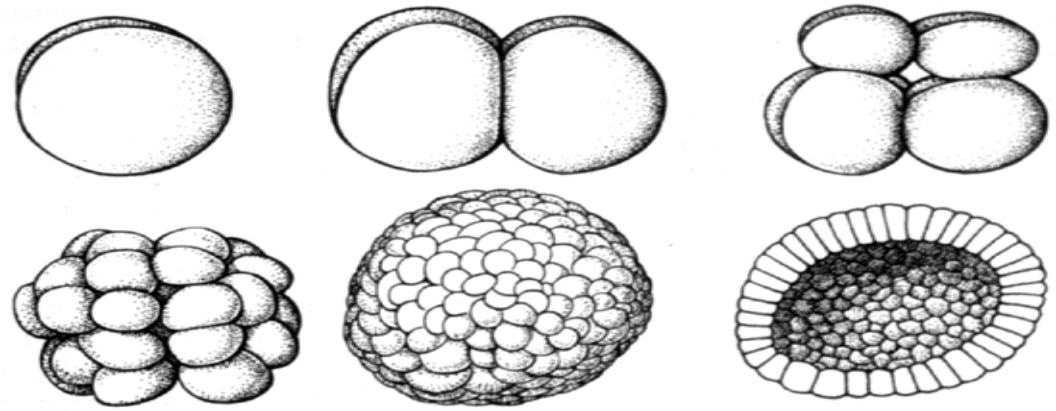
Prenatal Development

- Germinal Period
- Embryonic Period
- Fetal Period

Germinal period: 2 weeks

– *Conception – Implantation of f*ertilized egg

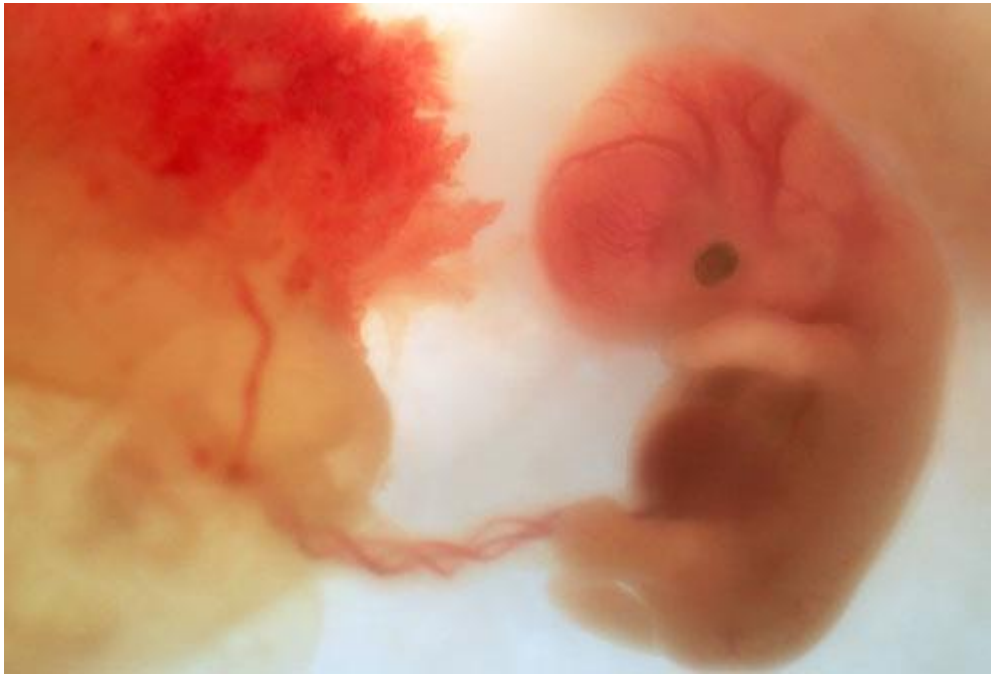
– Cell division



Embryonic Stage

- Stage from 2-9 wks after conception
  - Organs begin to form and function
    - Develops heart, nervous system, stomach, esophagus, ovaries or testes
    - Develop eyes, ears, nose, jaw, mouth lips
    - By end have tiny arms w/ elbows, hands, fingers
    - Legs have knees, ankles, toes

EMBRYONIC STAGE



- The zygote (sex cell)=
  - result from the fusion of the sperm and egg.
- The zygote has to then divide into many copies of the cell that will eventually lead to the formation of the human.
- These cells are all the same with no difference.
- Mitosis
  - is the process by which new cells are generated.
- Meiosis is the process by which gametes/sex cells are generated for reproduction.

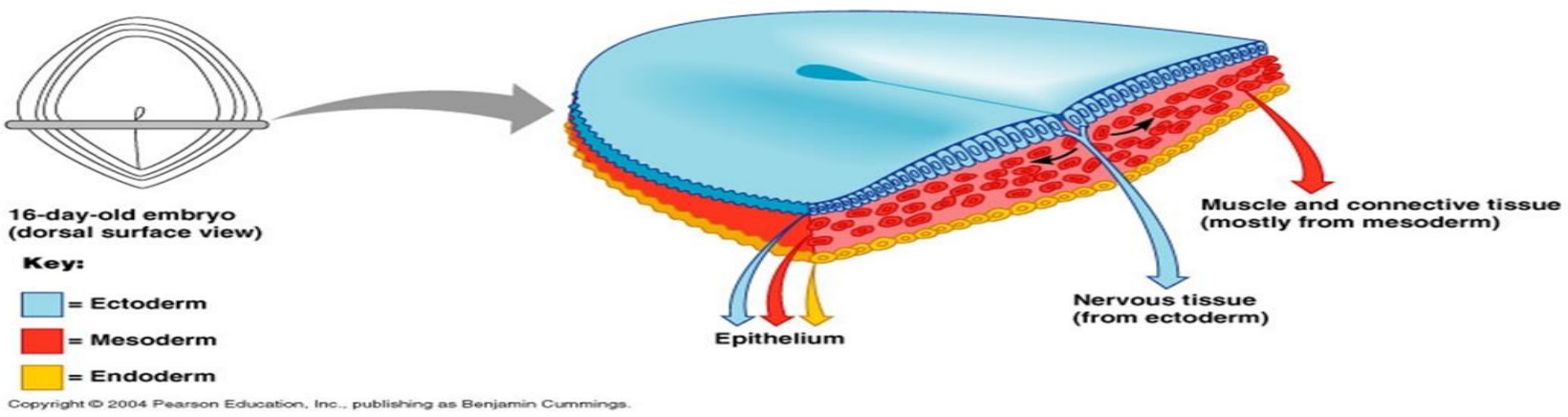
Fetal Stage

- 7 month period of prenatal development, spanning 9 weeks from conception to birth
  - Begins to look distinctly human
  - Organs grow and start to function
    - By 3 months: can kick, make fist, turn head, open mouth, swallow, frown
    - In 6th month: eyelids open, has tastebuds, well-developed grasp, can breathe regularly as long as 24 hrs. at a time
      - Could potentially survive premature birth by end of 6th month
    - Organ systems typically functional by end of 7th month
    - 8th & 9th month: respond to light & touch, hear outside sounds
      - Can also learn – respond differently to sound of mother (faster heartbeat) and stranger (slower heartbeat)

Embryonic period: 2nd – 8th week

- *Implantation – embryo is recognizable as a human fetus*
- *Cell differentiation*
- *The zygote cell that has divided into many cells form a disk with 3 layers.*
- *Here the cells become different or specific according to their location in the disk to form an organized human*

- Ectoderm (outer layer) - Nervous system & skin
- Mesoderm (middle layer) - bone, muscles, lymph glands, heart, blood vessels
- Endoderm (inner layer) - Digestion, breathing organs



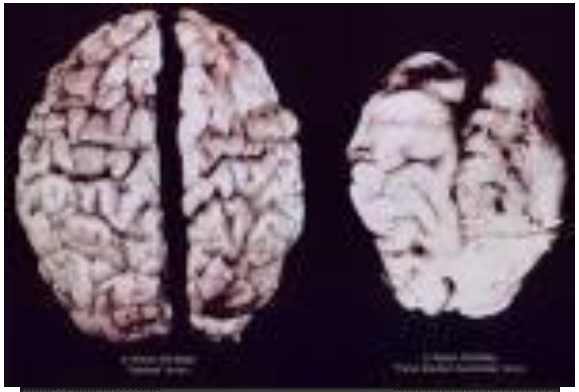
Teratogens

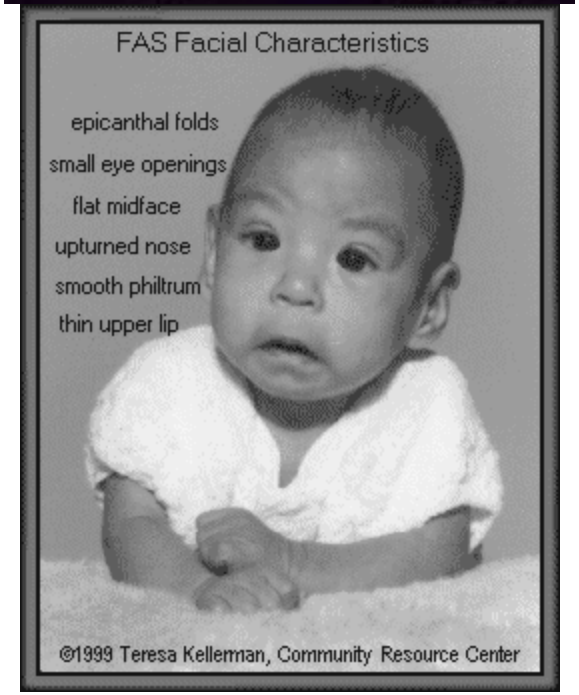
- Disease
  - Can be born with AIDS or experience physical defects from other diseases like rubella
- Drugs (i.e. heroine, cocaine, crack)
  - Can be born addicted
  - “Crack babies”
    - premature, underweight, tense, fussy, delayed physical growth & motor development, behavior & learning problems

- Smoking/nicotine
  - Can cause respiratory problems, irritability, social/attention problems, greater risk for nicotine addiction later in life, can harm brain development
  - Can cause reduction of nutrients that can lead to premature and underweight birth, which can cause cognitive and behavioral problems

Teratogens

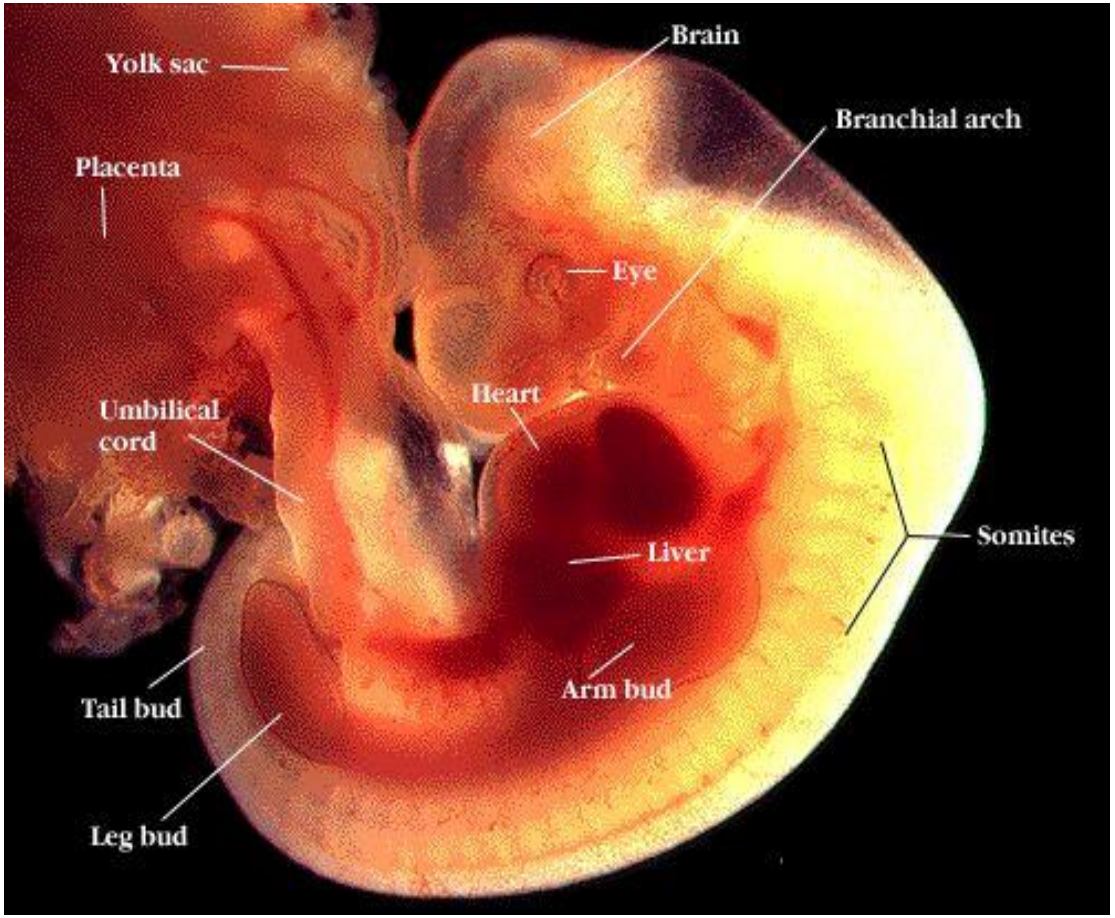
- Alcohol
  - Can kill fetal brain cells – depresses fetal nervous system, putting at risk for birth defects & mental retardation
  - Fetal Alcohol Syndrome (FAS)
    - Characterized by mental retardation, possible physical malformations
- Behavioral and psychological problems also linked to mothers experiencing significant stress, depression, or flu in first 6 months
- Fortunately, vast majority of infants (>90% in western nations) are born without mental or physical problems





EMBRYONIC PERIOD

- *28 days*
- *5mm in length*
- *Primitive heart*
- *Simple kidneys*
- *A liver*
- *A digestive tract*
- *Simple eyes, ears, nose*



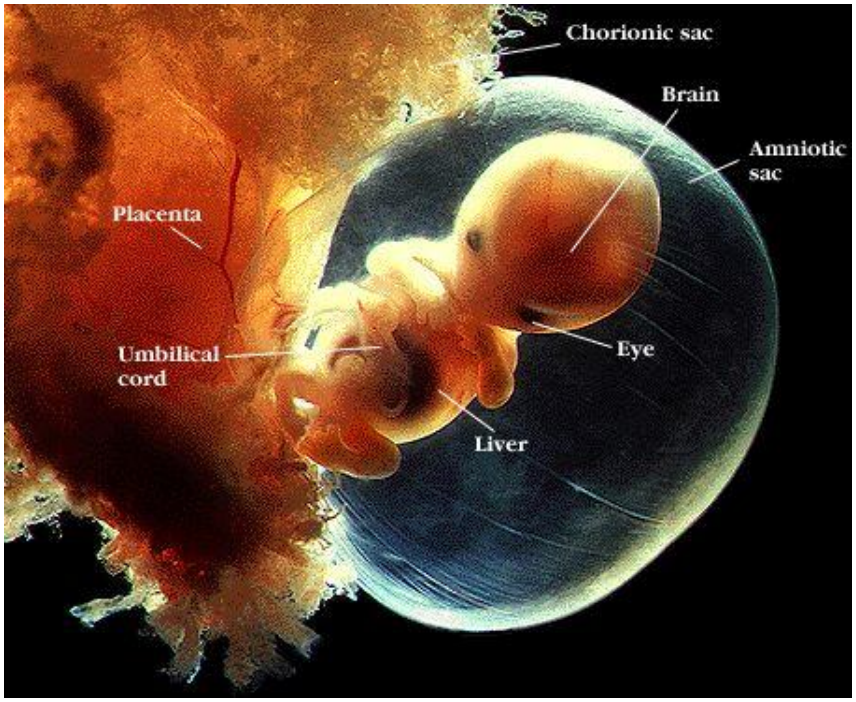
From 4 to 6 weeks…
Look at the difference!

Embryonic period (Cont)

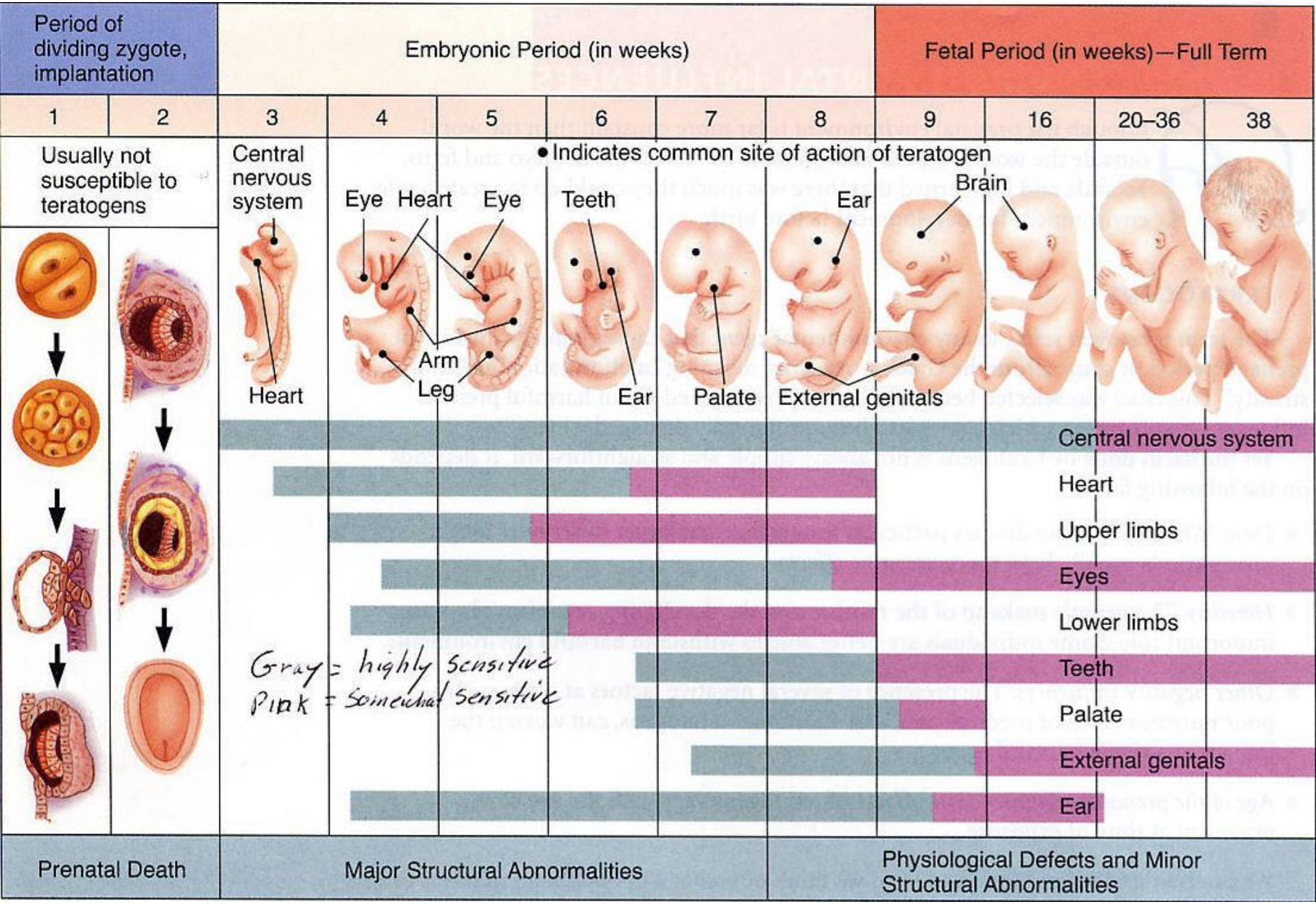
- Vulnerable to viral diseases
  - Rubella
  - German measles

FETAL PERIOD: 8TH WEEK - BIRTH

- End of 2nd month
- 2.54cm in length
- 18.7 grams



- **Fetus:** has all essential features for recognition as a human
- Rapid, uniform, progressive growth
- Unification & integration of organs

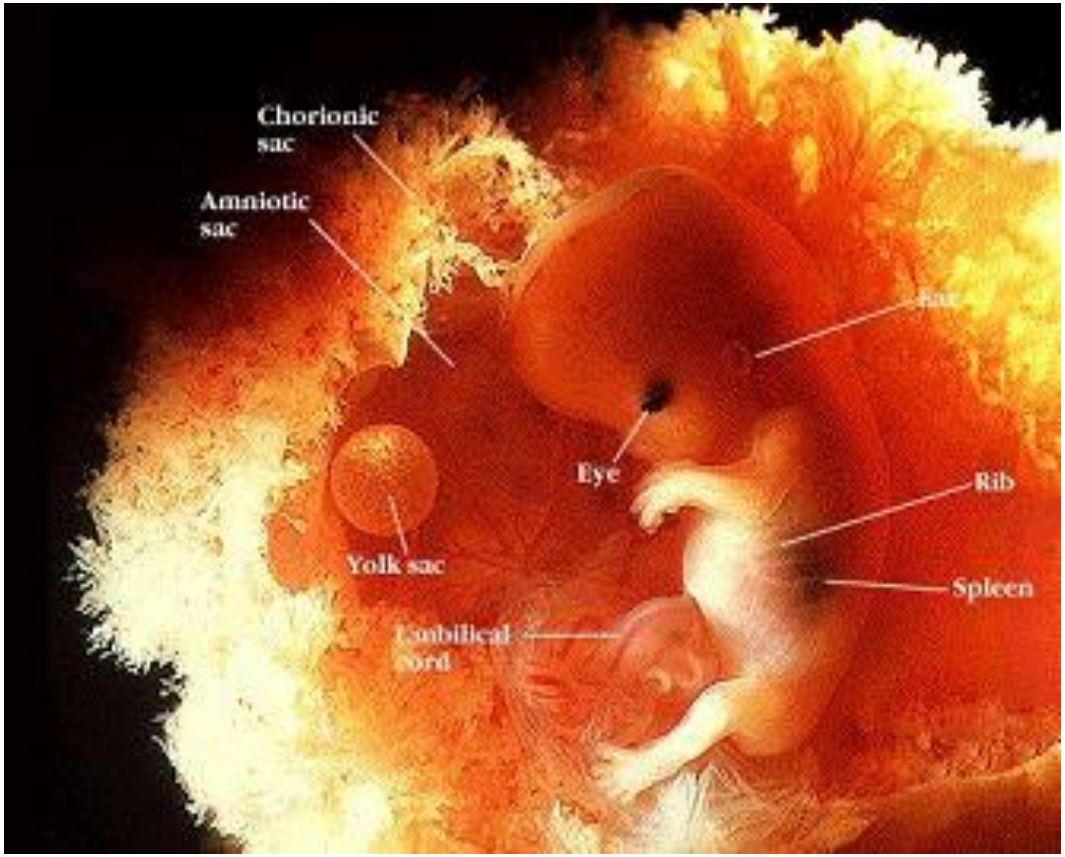

Period of dividing zygote, implantation
Embryonic Period (in weeks)
Fetal Period (in weeks)—Full Term
1
2
3
4
5
6
7
8
9
16
20–36
38
Usually not susceptible to teratogens
• Indicates common site of action of teratogen
Central nervous system
Eye
Heart
Eye
Teeth
Ear
Brain
Arm
Leg
Heart
Ear
Palate
External genitals
Central nervous system
Heart
Upper limbs
Eyes
Lower limbs
Teeth
Palate
External genitals
Ear
Gray = highly sensitive
Pink = somewhat sensitive
Prenatal Death
Major Structural Abnormalities
Physiological Defects and Minor Structural Abnormalities

Motor Behaviour Before Birth
6 Weeks

- reflex response of mouth

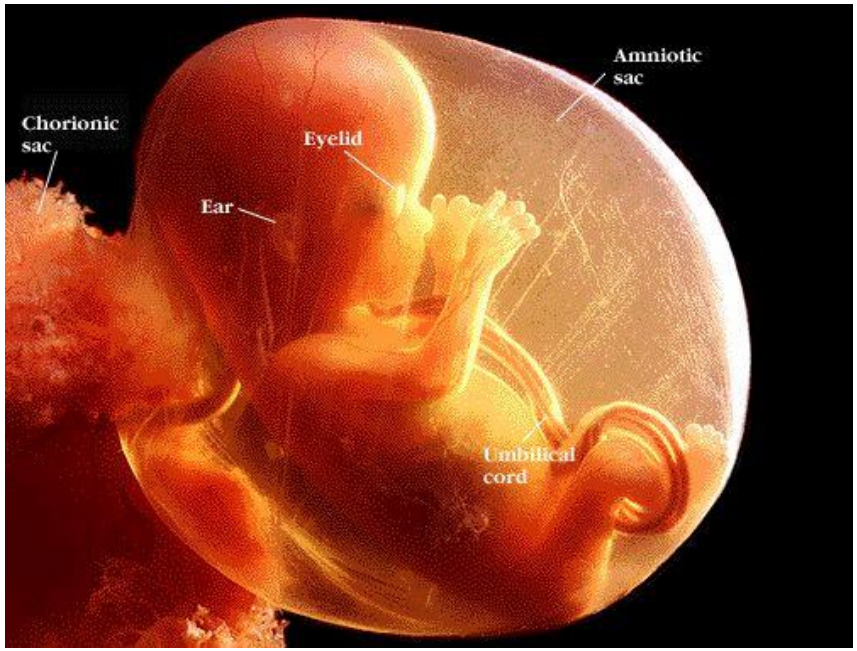
Motor Behaviour Before Birth
3 Months

- Movements of head, arms, legs, shoulders, elbows, fingers, toes



Motor Behaviour Before Birth
4 Months

- activity = increased



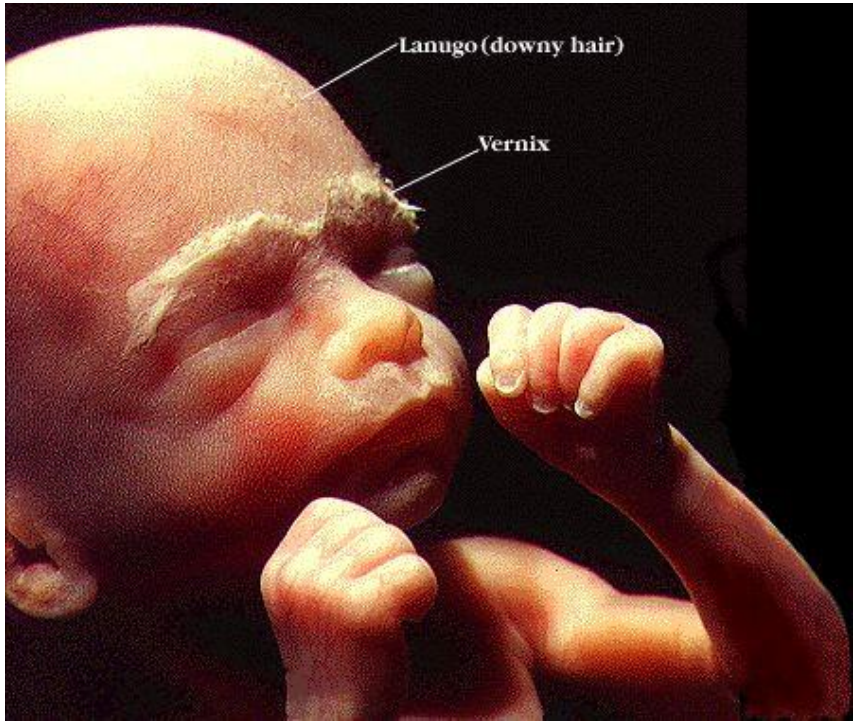
Motor Behaviour Before Birth
4 1/2 Months

- strength = increased →

  sharp kicks & pushes

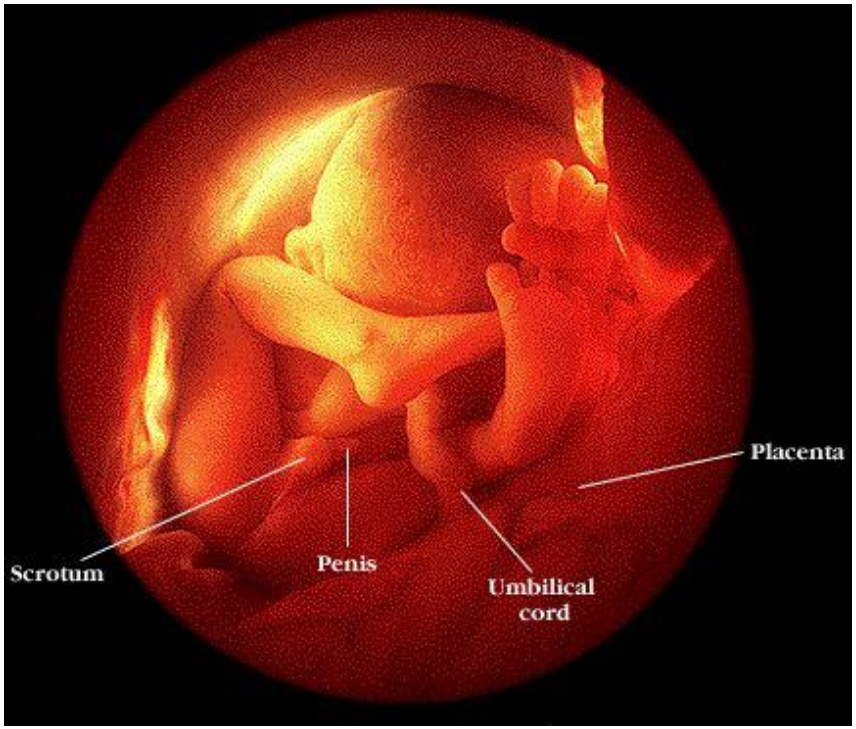
Motor Behaviour Before Birth
5 Months

- Up & down, side to side, completely around (somersault) movements



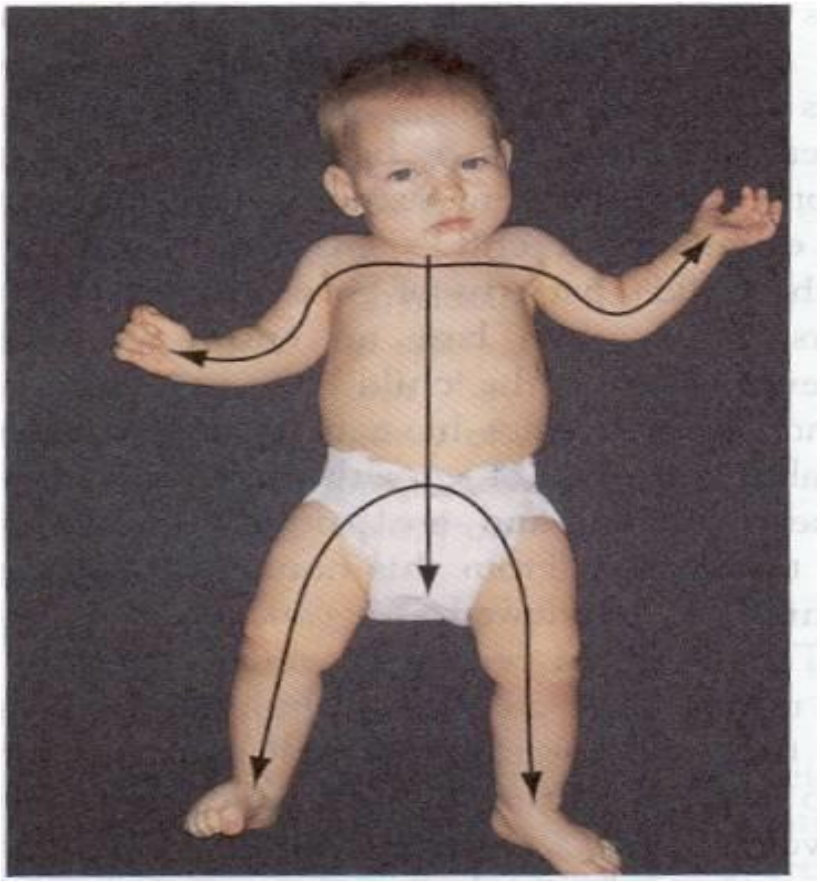
Motor Behaviour Before Birth
8-9 Months

- Considerable weight gain makes space confined (completely stops moving at 2weeks before birth)



Developmental Direction & Integration Growth Pattern

- Cephalocaudal
  - Head – feet
- Proximodistal
  - Midline – fingertips



Which develops control first??

Head

Legs

Hands

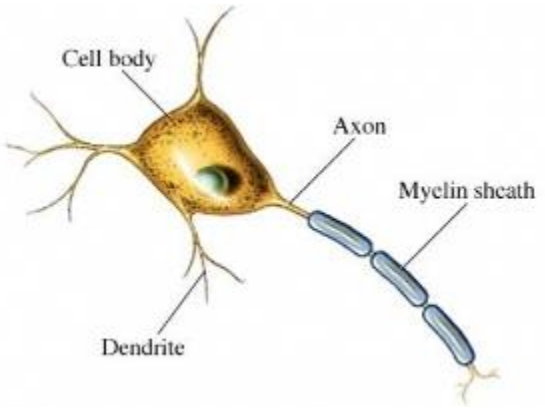
Trunk

Developmental Direction & Integration

- Movement becomes more rhythmical & synchronous = sign of maturation & integration within the nervous system
- Myelinization = NB aspect of neurological maturation

Myelinization

- Fatty substance that coats the nerve
- Serves as insulation
- Allows for :
  - increased speed
  - increased strength
  - more precise movements



Prenatal Movement Education

- Movement Ed should start during prenatal environment
- Establish a utero environment conducive to development
- Fetus is subject to internal & external stimuli

Prenatal Movement Education

- Prenatal development can be adversely affected by:
  - Unhealthy living habits of mother (smoking, alcohol, drugs)
  - Excessive stress
  - Excessive physical activity
  - Fear
  - Rage
  - Emotional distress

Reflexes

- Involuntary response to a stimulus that is specific, purposeful and adaptive

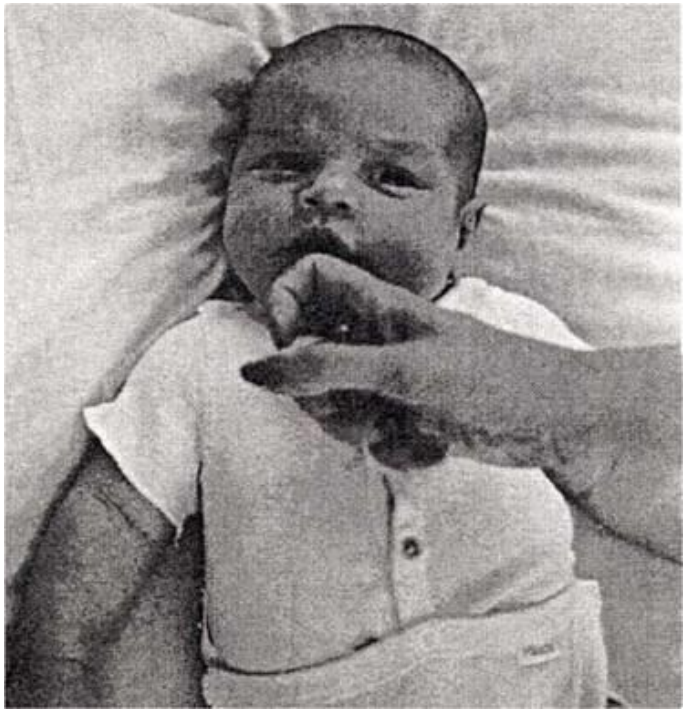
- 2 Reflex Categories:
- Survival
  - Nutrition
  - Protection
- Posturing
  - Body awareness
  - Understanding 2 Sides of body

Reflexes

- http://www.youtube.com/watch?v=_JVINnp7NZ0

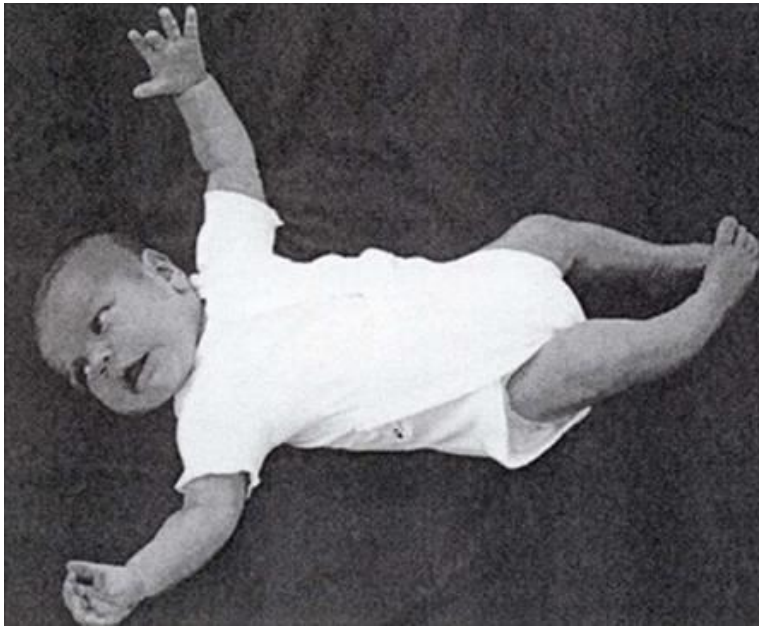
Rooting

Stimulus /Response	S: touch of lips R: move head in that direction
Concerns	No reflex problematic for nutrition



Moro/Startle

Stimulus / Response	S: Loud noise is made/support is taken away R: Arms move out to sides & upward, legs extend downward



Palmar Grasp

Stimulus / Response	S: Pressure is applied to the palm R: Grasps & holds on tight

Labyrinthine

Stimulus / Response	S: Placing newborn on abdomen/back R: Whole body curls (flexor tonus/ Whole body extends (extensor tonus)

Asymmetric Tonic Neck

Stimulus / Response	S: Back-lying position, turn head to one side R: Limbs on same side straighten, bend on other side
Other	Also called ‘fencer’s’ position

ATNR- Fencing Position Reflex

Symmetric Tonic Neck

Stimulus / Response	S: Back-lying position and head is pushed backward R: arms straighten, hands open, legs elevates S: Front-lying position and head is pushed downward R: knees & elbows flex, hands closed, buttocks elevates

Stepping/Placing

Stimulus /Response	S: Infant upright with feet touching surface R: Step is performed

Infancy: Not Moving Independently

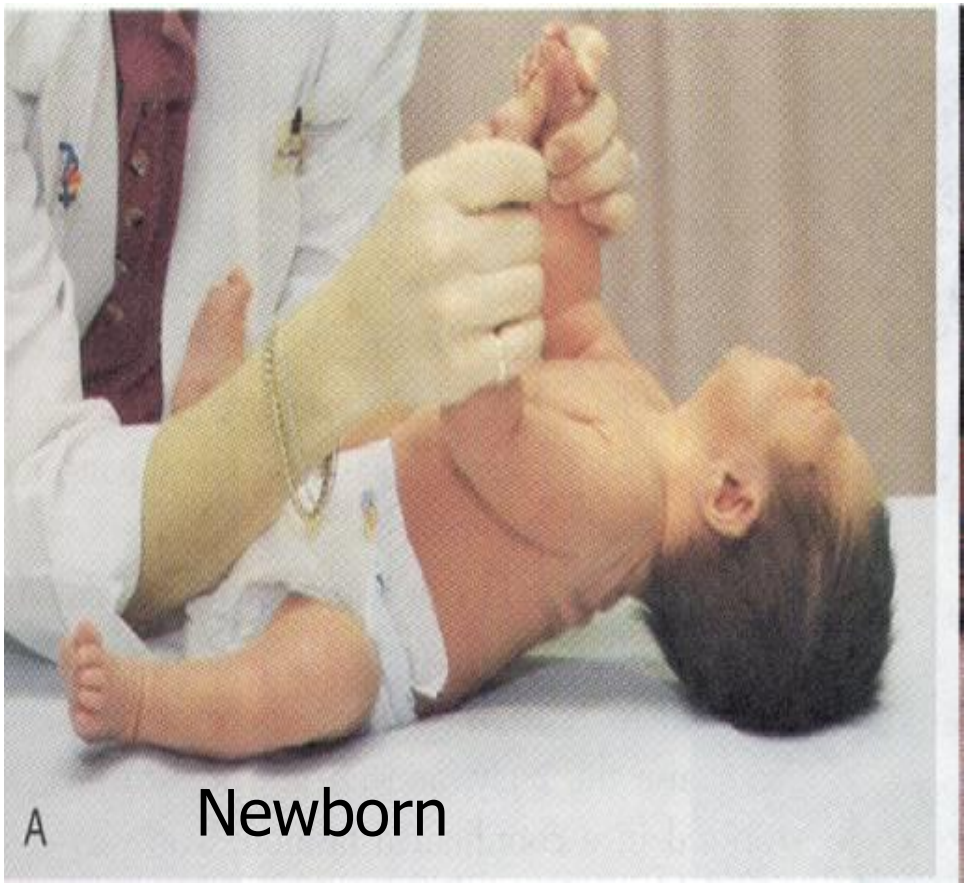
- Posture control & mobility
- Arm & hand control
- Vocalization
- Sensory awareness & perception
- Socialization & play

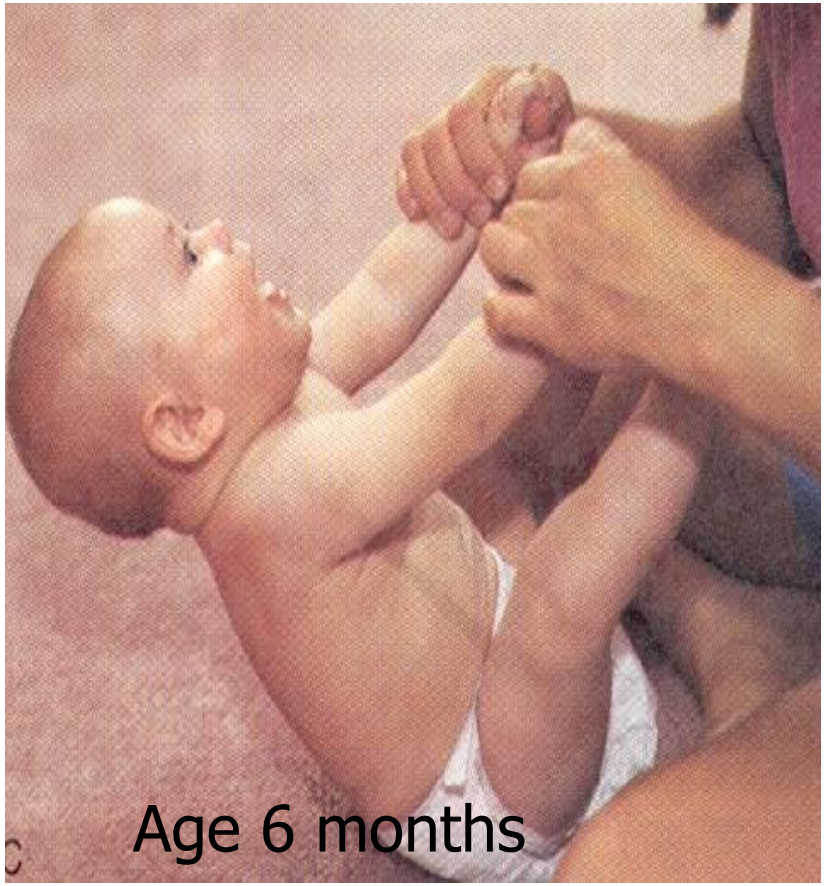
Posture Control & Mobility/Gross Motor Behaviour

- Events leading to mobility in the upright position:
  - Sitting with support
  - Sitting alone
  - Crawling
  - Creeping
  - Walking with support
  - Walking alone

- **Between 1-3 months**
  - Lift head while lying on abdomen
  - Turn & twist
  - Roll to side

Head Control





3 MONTHS

- Turn over from back to front
- Sit without support
- Push chest off the floor with arms
- **Crawling**

Pulling with the arms and then pushing with legs while the abdomen is in contact with surface

4-5 MONTHS

- Keeps head steady when sitting

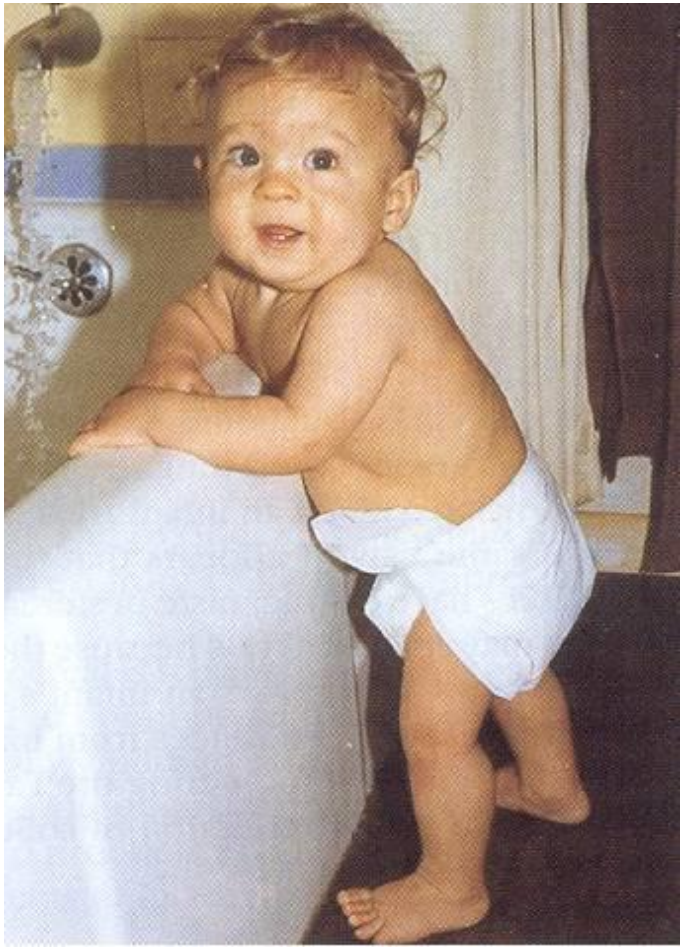
8-9 MONTHS

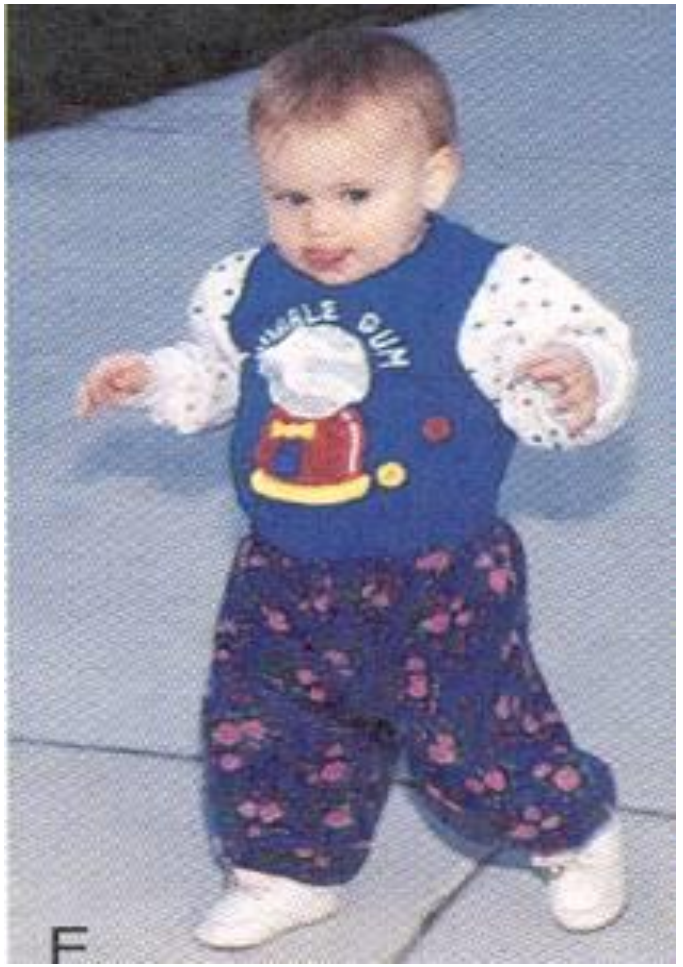
- Creeping
- Moving on hands and knees

15 MONTHS

- Bipedal locomotion progress from
- Tries to pull himself up on the side of the crib,
- Moving around the room holding onto furniture,
- Walking free of support,
- Walking with feet spread and arms raised

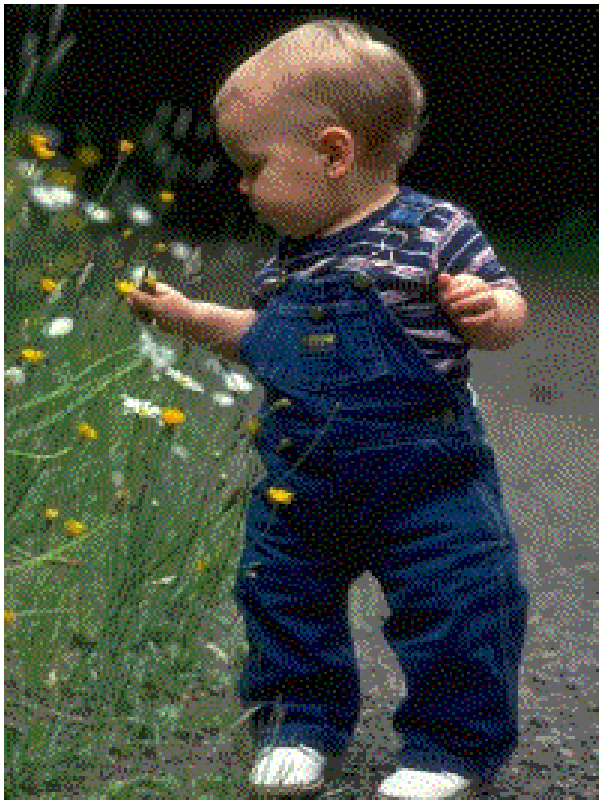
Bipedal locomotion progress





18 MONTHS

- At 18 months, the infant can:
  - Walk fast, effort getting started, once going, finds it hard to stop
- At 2 years:
  - Walk backwards
  - Cross-lateral use of arms



Arm & Hand Control/ Fine Motor Behaviour

- Reaching
- Grasping
- Letting go of an object

Aspects Using the Arms & Hands in Coordination

- Newborn
  - Grasping reflex
  - Arms kept out to side of body
  - Holds hands fisted

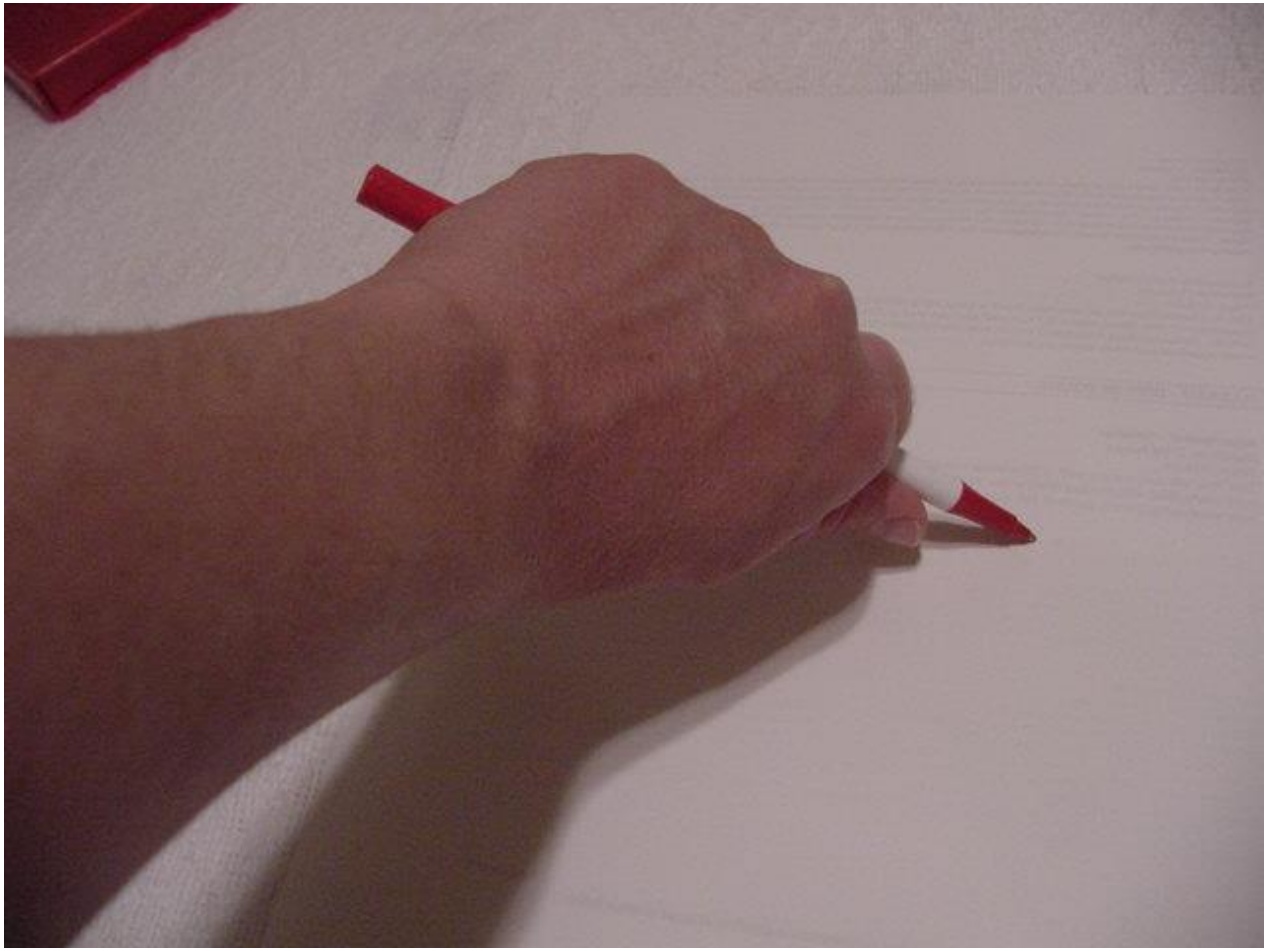
4 MONTHS

- Undirected reaching
- When reaching entire body gets involved

Arm & Hand Control/ Fine Motor Behaviour

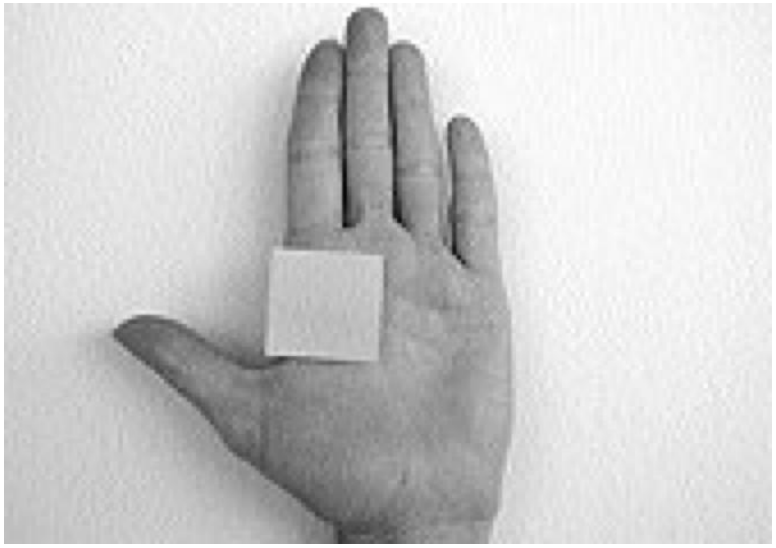
- 5 Months
  - Arms move to midline of body

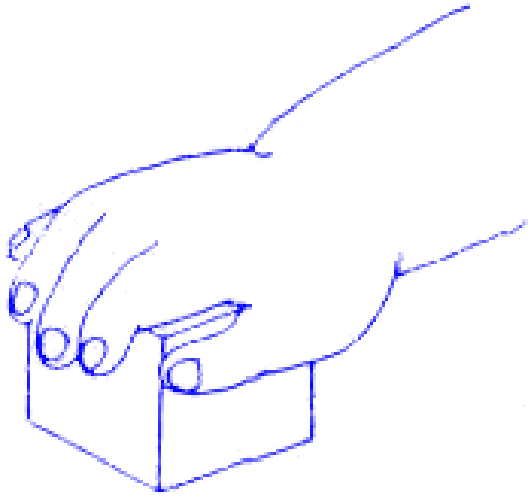
- 6 Months
  - Coordinate process of
    - seeing an object,
    - reaching for the object &
    - grasping the object
  - Grasp object with entire hand



6 ½ MONTHS

- Radial Palmar grasp





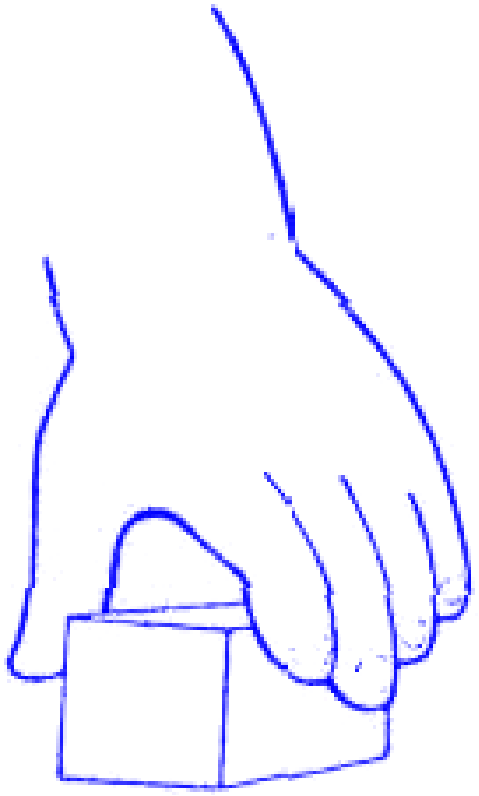
8 MONTHS

- Pincer grasp

9 MONTHS

- Grasp without palm

- Thumb used in a rudimentary w

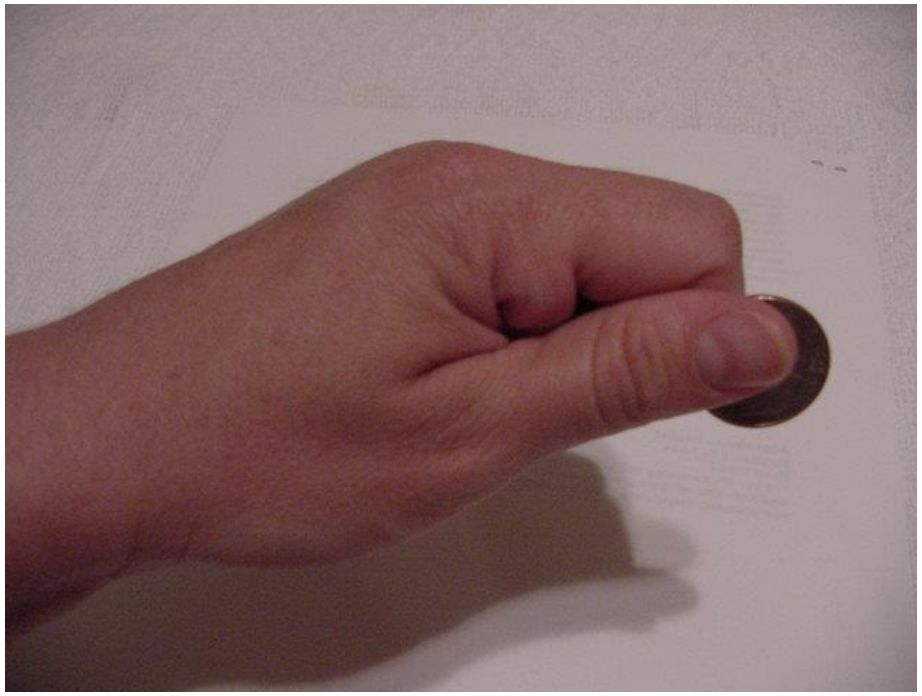


15 MONTHS

- Place 1 block on another

16 MONTHS

- Thumb opposition apparent



18 MONTHS

- Build tower of 4 blocks

2 YEARS

- Perform a mature thumb opposition

Vocalization

Communication

Transferring of info by some symbolic form from 1 person to another

Language

Method of communication: spoken, written, gesture

Vocalization

- **Birth**
- Undifferentiated crying
- **3 Months**
- Differentiated crying/vital crying
- response to discomfort: pain, cold, hunger

6 MONTHS

- Meaningful sounds:
  - Speech sounds
- Phonemes, babbling, lallation

- **7 Months:**
  - echo speech sounds
- **20 Months:**
  - name objects
- **4 Years:**
  - simple sentences

Sensory Awareness & Perception

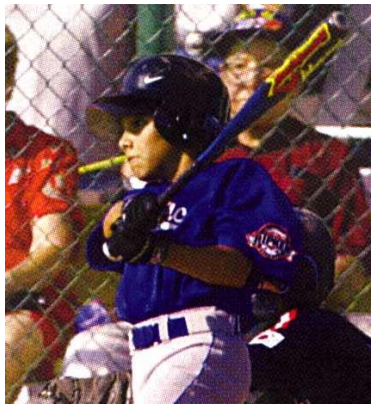
- Sensory receptors respond to specific stimuli
  - Light
  - Heat/cold
  - Stretching of muscle fibers
  - Pressure on joints
  - Vibrations
  - Chemical stimulants

Perceptual Process

- Gives meaning to the stimuli coming to the brain by way of the sense organs
- Sensory awareness = composed of 4 factors:
  - Reception
  - Perception
  - Conceptualization
  - Expression

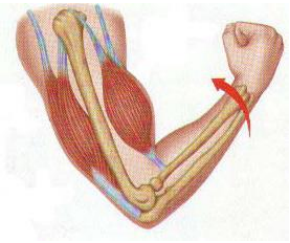
Sensory

Perception



Expression

Past event



Vision

- Comprehension of info that is gathered in the brain through the eyes and reconstruction of this info into conceptual images that have meaning
- It involves:
  - Sight
  - Perception
  - Integration
  - Conception

Visual Perception

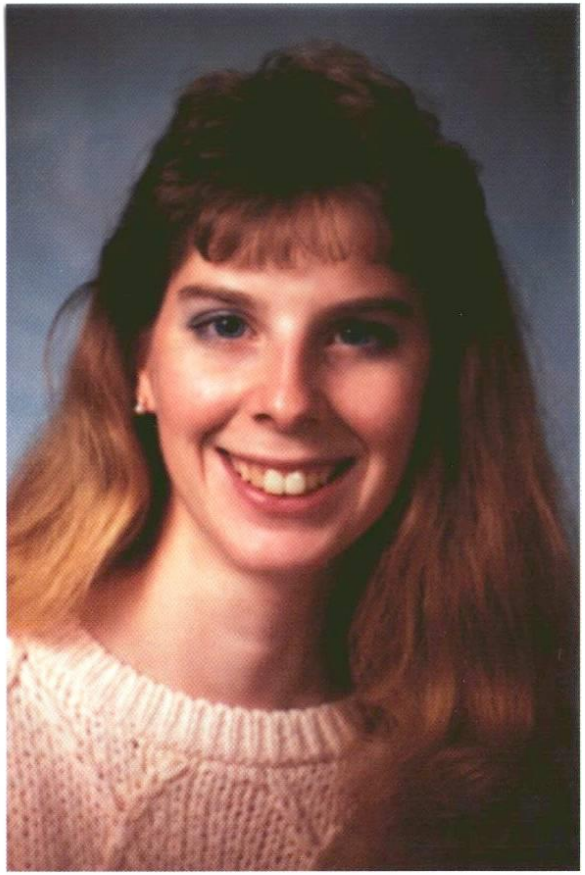
2 Weeks	Follow object with eyes
3 Months	Perceive an outline
8 Months	Figure ground perception
1 ½ Years	Coordinated focusing of eyes

Outline That Infants See

TRANSPARENCY 43

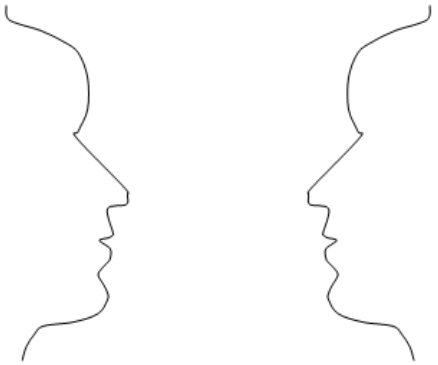
The Newborn Baby's Limited Focusing Ability

Newborn View

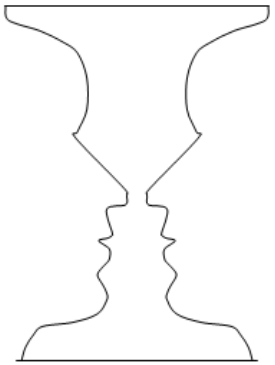


Adult View

Figure-Ground Perception



are distinct.



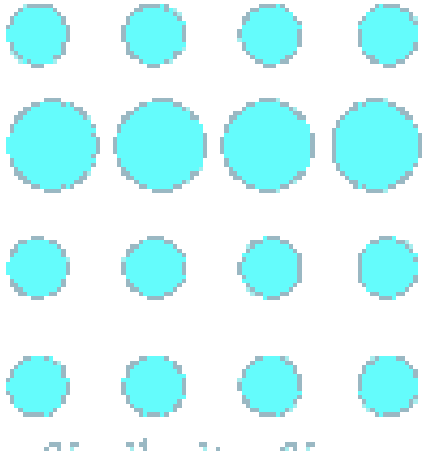
Candlestick

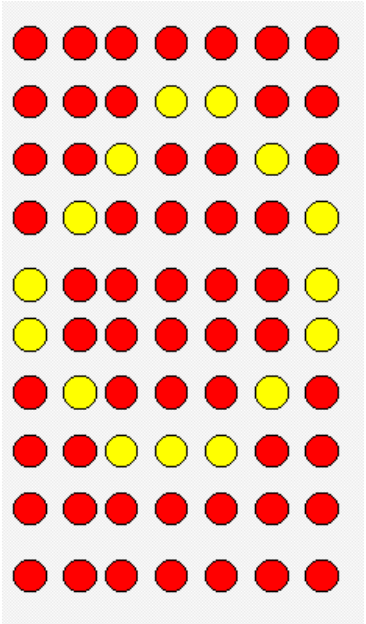
Visual Perception

- 2 Years
  - Differentiate unlike objects

4 YEARS

– Differentiate among shapes, sizes, varied symbols





Audition (Hearing)

- Birth
  - Respond to noise with moro reflex
- 3 Months
  - Respond to threatening sounds
  - Able to focus on specific sounds
- 4-5 Months
  - Locate sound by turning the head in direction of the stimulus

Tactility (Touching & Feeling)

- A system for gaining info from the cutaneous surfaces of the body by means contact

- Tactile abilities enable children to discriminate familiar objects

- Haptic sense
  - Combination of feeling and movement

Tactility (Touching & Feeling)

- At Birth
  - Skin reflexes examples??
- 5 Months
  - Differentiate & react to sensations that can affect survival (pain, wetness, temperature)
- 13 Months
  - Discriminate non-pain stimuli (roughness or smoothness)

- 16 Months
  - Becomes aware of third dimension (not everything is flat)

- 2 Years
  - Differentiate in shapes of objects

- 4 Years
  - Accurately identify features of objects by touch alone

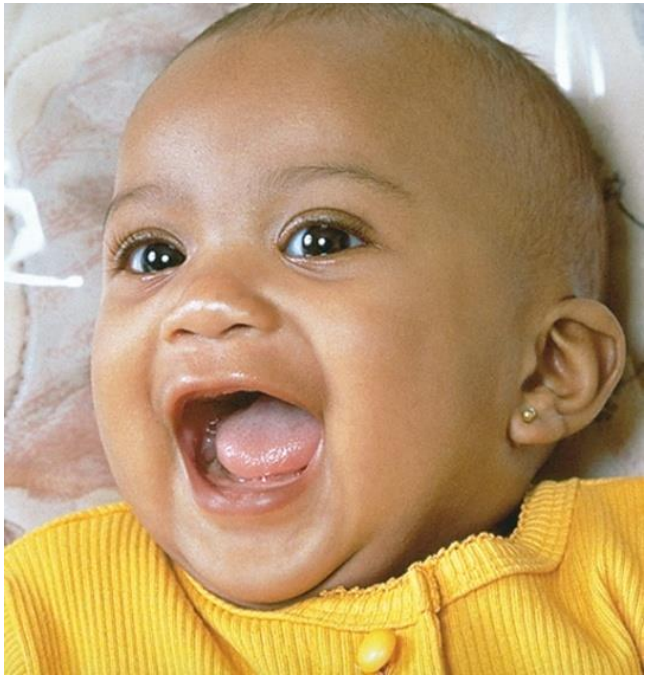
Social & Play

Recognition

- Birth
  - Respond to sounds of parent
- 1 Month
  - Differentiate btwn object & person
- 6 Months
  - Recognize family members
- 7 Months
  - Suspicious of strangers

Smiling

- 2 Months
  - Smiles in response to adults
- 4 Months
  - Instigate socialization by smiling first
- 5 Months
  - Smiles in mirror
  - Smiles @ a smile



Playing

- 3 Months
  - Spontaneous play
- 7 Months
  - Peek-a-boo games
- 15 Months
  - Solitary play
- 18 Months
  - Play next to other children
  - Seldom interacts
  - Seeks social approval

1 YEAR

- Express complex emotions
  - Anger, affection, jealousy, sympathy