

Chapter

4



**Prenatal, Birth, and
Postnatal Periods**

Conception (plus a review from Ch.3)

- **Gametes (germ cells):** Reproductive cells—egg and sperm—that contain only half the genetic material of all other cells in the body
- **Meiosis:** Cell division that produces gametes

In meiosis, 23 chromosomes from mother and 23 chromosomes from father leads to conception—23 pairs of chromosomes.
- **Conception:** The union of an egg from the mother and a sperm from the father; fertilization
- **Zygote:** A fertilized egg cell

Conception

Female Reproductive System

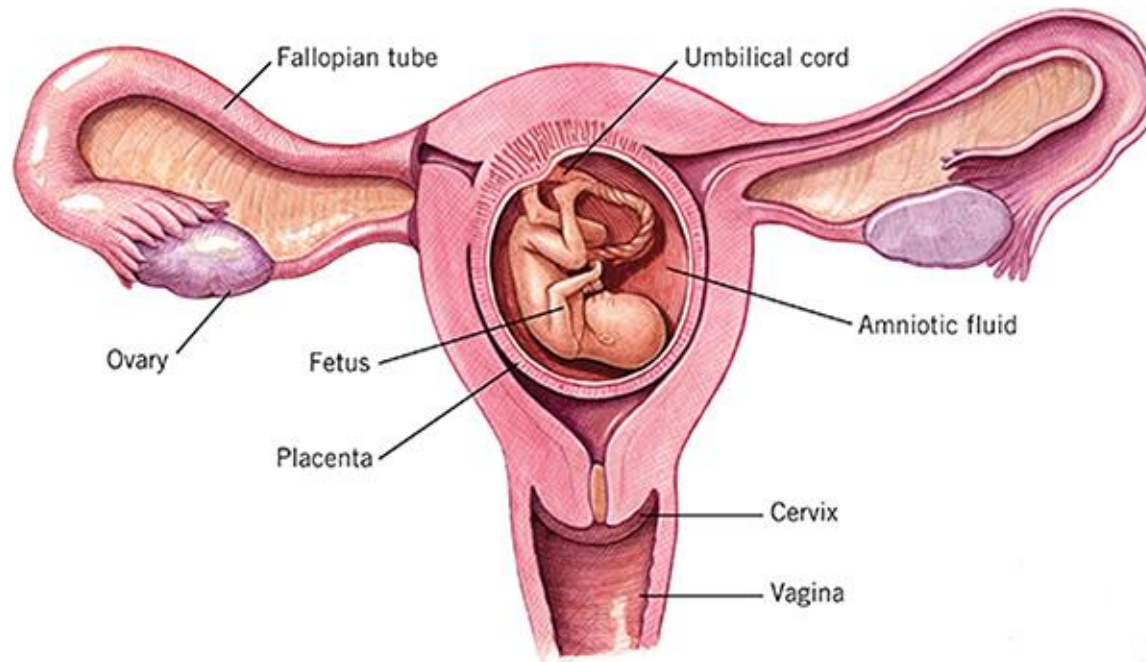


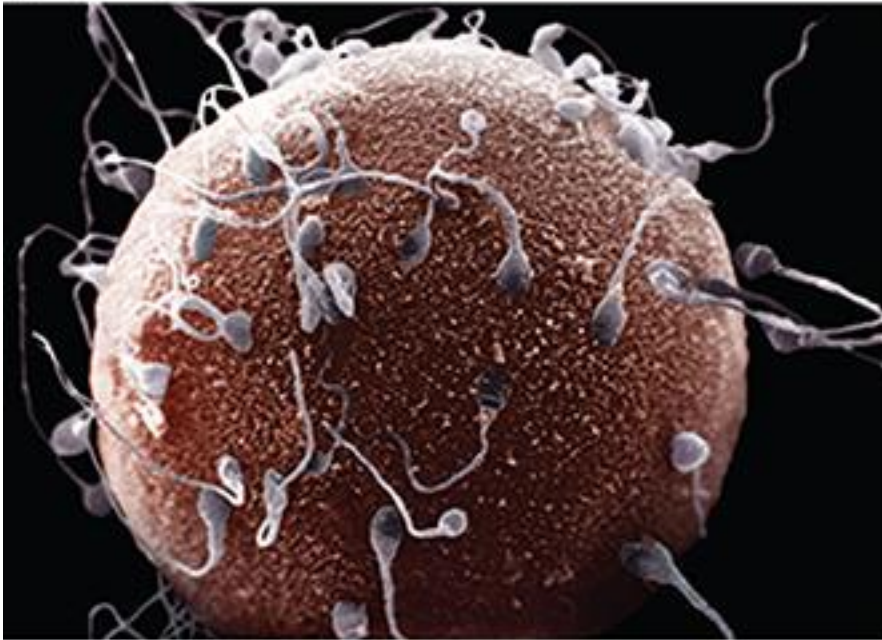
FIGURE 2.2

Siegler et al., *How Children Develop*, 5e, © 2017 Worth Publishers

Conception

Sperm nearing the egg

(a)



(b)

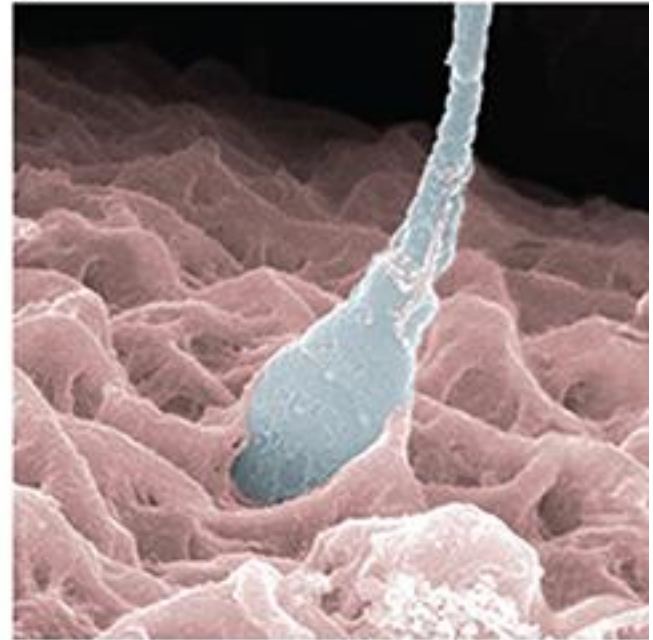


FIGURE 2.3

Siegler et al., *How Children Develop*, 5e

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Periods of Prenatal Development

Time	Period	Description
Day 2 - 14	Ovum-Germinal	Begins with conception and lasts until the zygote becomes implanted in the uterine wall. Rapid cell division takes place. Cells undifferentiated --> differentiated
2nd to 8th week	Embryonic	Following implantation, major development occurs in all the organs and systems of the body. Development takes place through the processes of cell division, cell migration, cell differentiation, and cell death, as well as hormonal influences.
9th week to birth (about 38 weeks)	Fetal	Continued development of physical structures and rapid growth of the body. Increasing levels of behavior, sensory experience, and learning.

Where do twins fit in?

Monozygotic/Paternal Twins (*at mitosis*)

- Twins that result from the splitting in half of the zygote
- Each of the two resulting zygotes have exactly same set of genes (i.e., identical)

Dizygotic/Fraternal Twins (*at conception*)

- Twins that result when two eggs happen to release in fallopian tubes at the same time
- Fertilized by two different sperm
- Fraternal twins have only half their genes in common

The Laws of Developmental Direction

The order in which characteristics emerge (**not restricted to physical or prenatal development**)

- General guidelines
- Relevant to motor development and early postnatal development

Law	Hint	Example
Cephalo-Caudal	Head to tail	Eyes, nose, arms will develop before legs, toes
Proximo-Distal	Center to outside	Heart before hands, elbows before fingers
Gross-Fine	Unrefined to refined	Nubs of the hands become elongated, covered with skin, fingers have fingernails

Fetal Behavior

Movement

- Fetal movement starts 5–6 weeks after conception
- Emergence of hiccups, swallowing
- Movement of limbs, fingers
- Respiratory readiness for breathing independently after birth

Behavioral Cycles

- Rest–activity cycles; less activity in latter half of prenatal period
- Circadian rhythm apparent
- REM during active sleep

Fetal Experience

Sight—minimal

Touch—contact with parts of the body; grasping umbilical cord, rubbing face, sucking thumb

Taste—can detect flavors in the amniotic fluid

Smell—amniotic fluid takes on odor from what the mother eats

Hearing—responds to various sounds from at least 6 months

Environmental Agents & Prenatal Development

Teratogen

An environmental agent that has harmful effects on the prenatally exposed child

- Timing and type determine impact

“Benefogens”

Prenatal exposure to these agents have beneficial effects

- Examples:
 - Folic acid
 - B vitamin
 - AZT

Teratogen Examples

Teratogen	Effects	Timing
Radiation	Disrupted development of central nervous system	8 to 15 weeks most critical
	Growth and developmental retardation	3 to 8 weeks most critical
	Microcephaly	3 to 38 weeks
Tobacco use by mother	Limb malformation, urinary tract damage	4 to 6 weeks
Tobacco use by father (secondhand smoke)	Low birth weight, reduction in weight by an average of 2 oz.	Late pregnancy
Alcohol	Fetal alcohol syndrome	3 to 38 weeks
	Fetal alcohol effect	3 to 38 weeks
	Growth and developmental retardation Craniofacial dysmorphism	3 to 38 weeks
Cocaine	Growth retardation, small head size	3 to 8 weeks
	Premature birth, problems with placenta, low birth weight	After 17 weeks
	Attention difficulties, emotional regulation	After birth for several years

Hazards to Prenatal Development

Cigarettes
Slow fetal development, low birth weight, possible links to SIDS

Environmental Pollutants
Potential birth defects

Alcohol
Fetal alcohol syndrome

Environmental Hazards to Fetus and Newborn

Occupational hazards
Automobile exhaust; factory workers

Maternal factors
Age, nutrition, disease, emotional state, mental illness

Potential Results of Hazards

Sudden infant death syndrome, or SIDS—when an infant 1 year of age or less dies suddenly and unexpectedly with no cause

Fetal alcohol spectrum disorder, or FASD—when a mother's alcohol consumption during pregnancy affects the fetus; can include facial deformities, mental retardation, attention problems, hyperactivity, and other defects

Fetal alcohol effects, or FAE—when an infant has some but not all effects of FASD. Roughly 1 in 1000 infants born in the United States has FAE.

Maternal Factors

Age

- Infant mortality rate high for teen mothers 15 years or younger
- Women delaying pregnancies to their 30s or 40s risk infertility

Nutrition

- General malnutrition of mother affects growth of fetal brain; later cognitive impairments
- Spina bifida, neural tube defects

Maternal Factors

Disease

- Rubella
- STIs can damage CNS of fetus
- Infections, such as influenza may lead to schizophrenia
- Zika virus – microcephaly

Maternal Emotional State

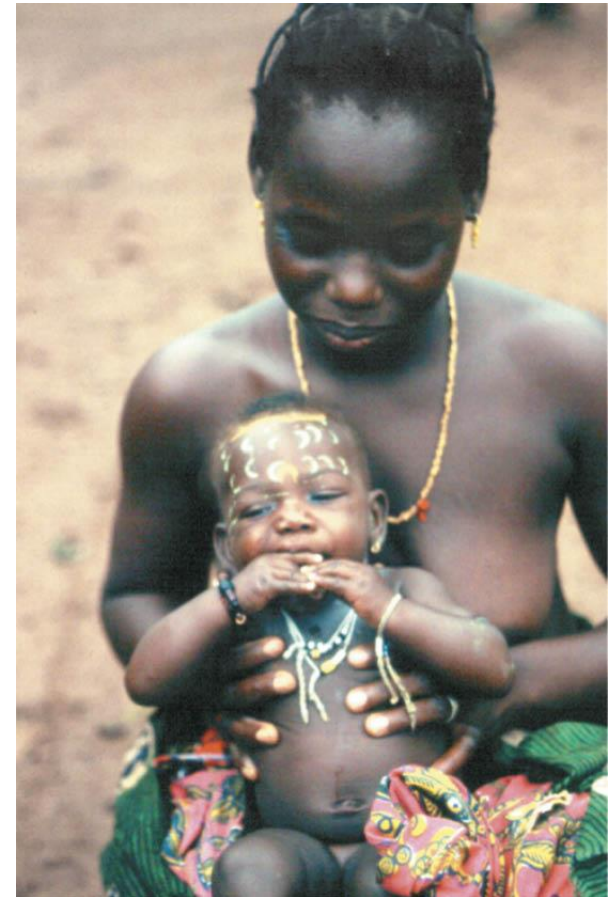
- High maternal stress leads to increased stress hormone levels
- Could lead to behavior problems in children who were prenatally exposed to high levels of stress hormones

Continuum of Care-Taking Casualty

Emphasizes the long-term and continuous nature of the caretaker's role.

- The environment is mediated by the caretaker
- Interactions between genetic, historical, and current environments are crucial

How does the example in the last paragraph on p. 124 fit into the ORG \leftrightarrow diagram?



The Newborn (i.e., Neonate)

- Birth of baby after 38 weeks of conception
- “Neonate” or “newborn” = from birth to two weeks
- Physiological and behavioral development *in utero* has prepared the newborn to interact with the outside world
- Capable of responding to the environment (*right away*) in systematic ways

Apgar Test

APGAR SCORING SYSTEM

	0 Points	1 Point	2 Points	Points totaled
Activity (muscle tone)	Absent	Arms and legs flexed	Active movement	↓
Pulse	Absent	Below 100 bpm	Over 100 bpm	
Grimace (reflex irritability)	Flaccid	Some flexion of Extremities	Active motion (sneeze, cough, pull away)	
Appearance (skin color)	Blue, pale	Body pink, Extremities blue	Completely pink	
Respiration	Absent	Slow, irregular	Vigorous cry	

Severely depressed	0-3
Moderately depressed	4-6
Excellent condition	7-10

<https://www.youtube.com/watch?v=auTFzWjRu7A>

Brazelton's Neonatal Behavioral Assessment Scale

NBAS used to measure neonates' reflexes and behavior patterns

- Motor behavior
- Response to stress
- Adaptive behavior
- Control over physiological state

<https://www.youtube.com/watch?v=tqc8gKuXs3s>

Sensation vs. Perception

- **Sensation:** ability to detect changes in environment (the detection of a stimulus)
 - Stimulation of sensory receptors and their connections to neurons in sensory center of central nervous system (CNS)
 - Includes the 5 senses
 - e.g., changes in light are the stimuli which cause visual receptors to fire
- **Perception:** organized response to stimulus
 - Requires sensation, an integrated response resulting in a function response
 - E.g., responding to a stimulus (the color blue) with the word *blue*

Nativism vs. Empiricism Approach

- **Nativism:** suggests perception is innate, hardwired, present at birth
- **Empiricism:** suggests we acquire perception through experience
- Similar to nature vs nurture debate. Neither wrong.

Testing Perception in Infants

- Infants can't talk! How do we know if preverbal infants can perceive a change in the environment?
- **Visual preference method:** Procedure to assess visual capabilities. Differences in the amount of gazing time indicates the ability to detect a difference between 2 stimuli
- **Visual Chamber** (Frantz, 1958, 1961)
 - Child lays in chamber with 2 images projected above
 - Observer can see which image child is looking at and compare gazing times
 - More time looking at 1 = preference = discrimination between 2
- **Visual Cliff** (Walk and Gibson, 1961)
 - <https://youtu.be/DrzmvI6iMrE?t=55s>

Visual Cliff cont.

- 7 month olds avoids crawling over deep end
- Can't answer nativism vs empiricism question for perception
 - Infants can't crawl at birth; about 6 months
 - Infants as young as 2 months had lower heart rate suggestion attention and could perceive depth
 - After learning to crawl, infants had higher heart rates (fear response. Fear of falling acquired through experience!)

Habituation-Dishabituation

- Procedure: present a stimulus (the sound “ba”) while infant is engaging in sucking response
 - If infant can detect stimulus: sucking stops
- **Habituation:** adaptation to a repeated stimulus
 - Sucking response resumes after repeated presentation of sound
- **Dishabituation:** discrimination between change in presented stimulus
 - Sucking response stops again after presented sound changes from “ba” to “pa”

Sensory Abilities

Visual Abilities

- Acuity: the ability to see things in sharp detail
 - Not equivalent to adult's, improves 3-4 times in first 6 months
- Color Perception: The ability to see in color
 - About same as adult's range of sensitivity around 1-3 months

Sensory Abilities

Auditory Capabilities

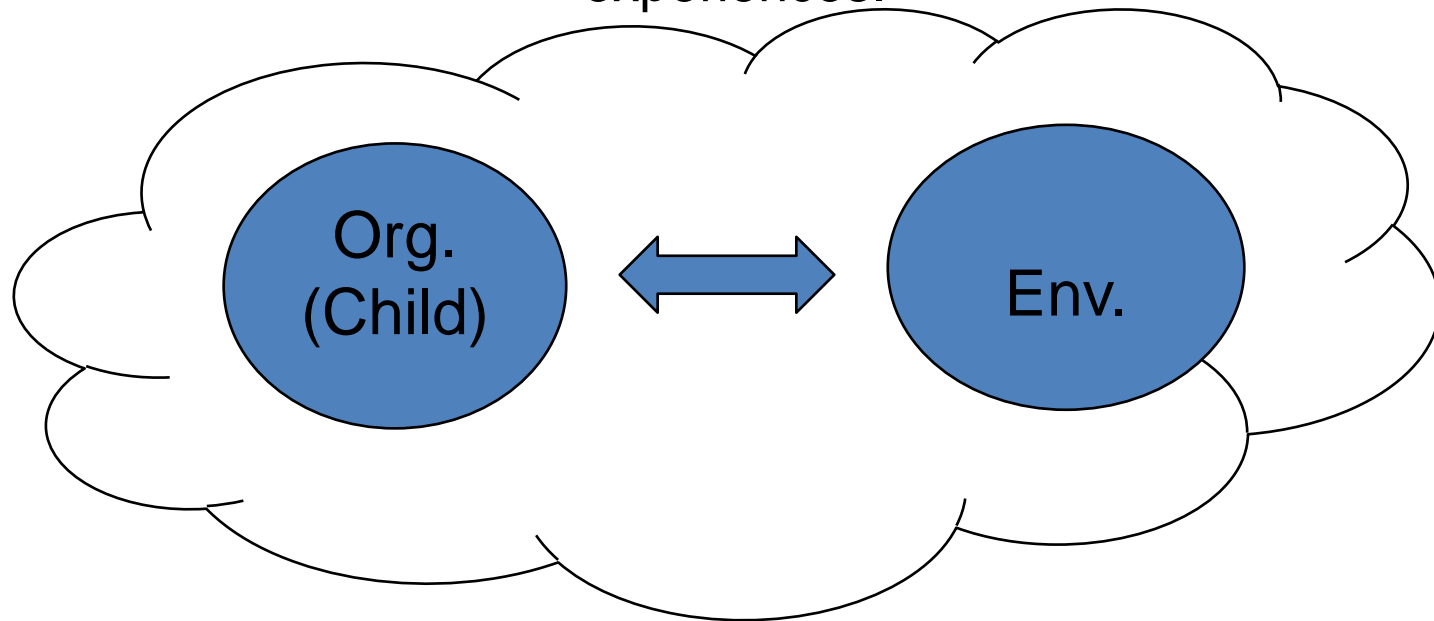
- Functioning prior to birth
- Can discriminate sounds early
- Increasing sensitive to sound localization (utilizing interaural time difference between two ears to find location of sound)
 - Constantly adapting! E.g., recalibration due to physical development (increase in head size), environmental changes (noise pollution, ear infection)

Sensory Integration: detecting shared, absolute, amodal features of stimuli

Sensory Abilities

How could these impact psychological development?

Think about the child's level of functioning based on their developing sensory abilities, ability to interact with the environment, and history of experiences.



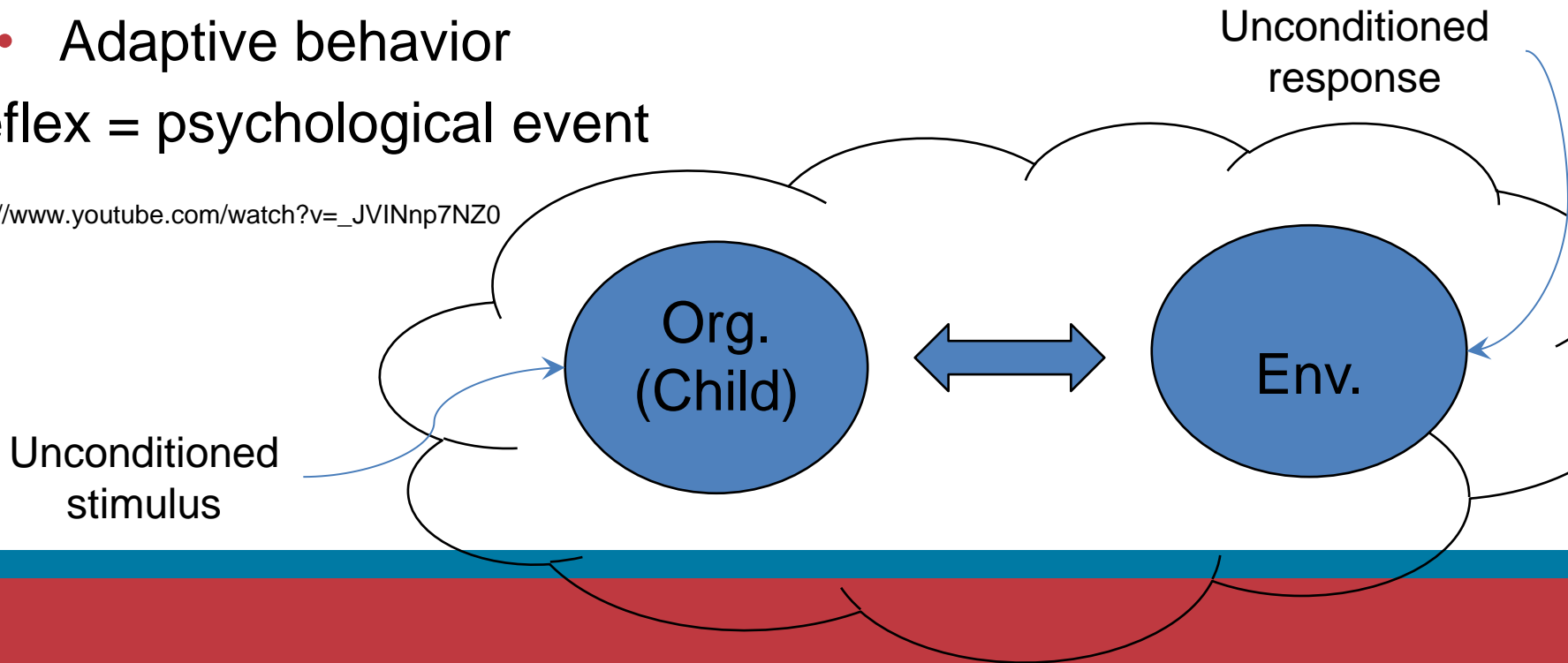
What are Reflexes?

“*Relationship* involving the eliciting of an unconditioned response by an unconditioned stimulus”

- Universal behaviors (responses) *elicited* by certain stimuli
- Developed through phylogenetic contingencies!
 - Natural selection
 - Adaptive behavior

Reflex = psychological event

https://www.youtube.com/watch?v=_JVINnp7NZ0



Reflex Examples (Just to name a few!) Table 4.3

Stimulus/Event	Reflex/Response
Touching eye, lid, lashes	Eyelid closes
Light weak/strong	Pupil dilation/constriction
Touch mouth	Mouth opens
Bitter, salty, sour taste	Grimacing, twisting of face/mouth
Tactile stimulation of the side of the mouth	Head turns in that direction (Rooting reflex)
Gently stroking the sole of the foot	Fanning the back of the toes (Babinski reflex)

4 Developmental Paths of Reflexes

1) Reflexes May Stay the Same

- E.g., puff of air elicits eye blink

2) Reflexes May Disappear

- E.g., Babinski reflex

3) Reflexes May Be Elicited by New Stimuli: Respondent Conditioning

- New stimulus (e.g., mom's voice) paired with unconditioned stimulus (e.g., mom's nipple) elicits now conditioned response (e.g., sucking)

4 Developmental Paths of Reflexes

... 4) Reflexes May be Elaborated Into New Behaviors: Operant Conditioning

- Process of changing behavior through consequences
- E.g., infant crying (originally a pain reflex) now functions to get mom's attention
- Most of our behavior is result of principles of operant conditioning (TO BE CONTINUED...)