

EARLY CONTROVERSIES ABOUT SENSORY AND PERCEPTUAL DEVELOPMENT

A. Nature vs. Nurture

1. Empiricist philosophers believed that an infant was a tabula rasa (blank slate) who must learn to interpret sensations.
2. Nativist argue that many basic perceptual abilities are innate.

B. Enrichment vs. Differentiation

1. Enrichment theory claims that sensory stimulation is often fragmented or confusing. To interpret such ambiguous input, we must use our available cognitive schemes to add to or “enrich” it.
2. Differentiation theory argues that perception involves detecting distinctive features or cues that are contained in the sensory stimulation we receive.

“MAKING SENSE” OF THE INFANT’S SENSORY AND PERCEPTUAL EXPERIENCES

- ### **A. The Preference Method is a simple procedure in which at least two stimuli are presented simultaneously to see whether infants attend more to one of them than the other (s).**

- B. The Habituation Method is the process whereby a repetitive stimulus becomes so familiar that responses initially associated with it (i.e., head or eye movements, changes in respiration or heart rate) no longer occur. Habituation is a simple form of learning.
- C. Evoked Potentials is a change in patterning of the brain waves that indicates that an individual detects (senses) a stimulus. Two stimuli that are “different” produce different patterns of electrical activity.

D. High-Amplitude Sucking is a method of assessing infants' perceptual capabilities that capitalizes on the ability of infants to make interesting events last by varying the rate at which they suck on a special pacifier.

INFANT SENSORY CAPABILITIES

- A. Vision is the least mature of the newborn's sensory capabilities.
1. Newborn infants are more likely to track faces (or facelike stimuli) than other patterns although this preference for faces disappears within a month or two.
 2. Using the habituation method, researchers have found that neonates see the world in color, although they do have trouble discriminating blues from greens and reds from yellows.
 3. Rapid development of the visual brain centers and sensory pathways allows their color vision to improve quickly.

4. Young infants do not resolve fine detail very well. Studies of visual acuity suggest that a neonate's distance vision is about 20/600, which means that she sees at 20 feet what an adult with excellent vision sees at about 600 feet.

B. Hearing

- Using the evoked potential procedure, researchers have found that soft sounds that adults hear must be made noticeably louder before a neonate can detect them.
- Habituation studies indicate that neonates are capable of discriminating sounds that differ in loudness, duration, and frequency (Bower, 1992).

1. Reactions to Voices

- a. Young infants are particularly attentive to voices, especially high-pitched feminine voices.
- b. Research by Anthony DeCasper and his associates reveals that newborns suck faster on a nipple to hear a recording of their mother's voice than a recording of another woman.

2. Reactions of Language

- a. Not only do babies attend closely to voices, but they are also able to discriminate basic speech sounds – called phonemes – very early in life.
 - b. Infants 2 to 3 months old could distinguish consonant sounds that are very similar (i.e., ba and pa).
 - c. Less than 1 week old can tell the difference between the vowels A and I and can even segment words into discrete syllables.
- ## 3. Consequences of Hearing Loss

- a. Otitis media, a bacterial infection of the middle ear, is the most frequently diagnosed among infants and preschool children.
- b. Antibiotics can eliminate the bacteria that causes this disease but will do nothing to reduce the buildup of fluid in the middle ear, which often persists without any symptoms of pain or discomfort.
- c. This fluid may produce mild to moderate hearing loss that can last for months after an infection has been detected and treated.
- d. Otitis media strikes hardest between 6-months and 3-years of age.

C. Taste and Smell

1. Infants are born with some very definite taste preferences.
2. Different tastes elicit different facial expressions from newborns.
 - a. Sweets reduce crying and produce smiles and smacking of the lips.
 - b. Sour substances cause infants to wrinkle their noses and purse their lips.
 - c. Bitter solutions often elicit expressions of disgust – a downturning of the corners of the mouth, tongue protrusions, and even spitting.

D. Touch, Temperature, and Pain

1. Receptors in the skin are sensitive to touch, temperature, and pain.
2. Even while sleeping, neonates habituate to stroking at one locale but respond again if the tactile stimulation shifts to a new spot (i.e., from the ear to the chin).
3. Later in the first year, babies begin to use their sense of touch to explore objects – first with their lips and mouths, and later with their hands. So touch is a primary means by which infants acquire knowledge about their environment, which contributes so critically to their early cognitive development (Piaget, 1960).

VISUAL PERCEPTION IN INFANCY

A. Perception of Patterns and Forms

1. Early Pattern Perception (0 to 2 Months)

- a. Very young infants prefer to look at high-contrast patterns with many sharp boundaries between light and dark areas, and at moderately complex patterns that have curvilinear features.
- b. Babies prefer to look at whatever they see well (Banks & Ginsburg, 1985), and the things they see best are moderately complex, high-contrast targets, particularly those that capture their attention by moving.

2. Later Form Perception (2 Months to 1 Year)
- a. Between 2 and 12 months of age, the infant's visual system is rapidly maturing.
 - b. She now sees better and is capable of making increasingly complex visual discriminations.
 - c. She is also organizing what she sees to perceive visual forms.
 - d. Philip Kellman and Elizabeth Spelke (1983) were among the first to explore these issues. Infants were presented with a display consisting of a rod partially hidden by a block in front of it.
 - Newborns exposed to a partially screened moving rod see two separate objects rather than a continuous form.
 - But the impressive ability to use object movement to perceive form is already present by 2 months of age.
 - By age 3 to 4 months, infants can even perceive form in some stationary scenes that capture their attention.

- e. 12-month-old infants are even better at constructing form from limited information. After seeing a single point of light move so as to trace a complex shape such as a star, 12-month-olds (but not 8-or 10-month-olds) prefer to look at actual objects with different shapes.

3. Face Perception

- a. Most studies report that, for the first 8 weeks, infants lock on to high-contrast outer boundaries of facial stimuli and spend little time looking at the internal features (eyes, mouth, and lips) that might define a face as a coherent and meaningful form.
- b. As 9-to 12-week-old infants begin to scan internal detail, they also come to prefer faces to scrambled faces.
- c. 3-month-olds know what faces are supposed to look like, for they clearly prefer a normal face to an otherwise identical stimulus with its patterns of visual contrast reversed.
- d. 3-month-olds also recognize and prefer to look at their own mothers' face than those of other women who are similar in appearance.

B. Perception of Three-Dimensional Space

- Infants younger than 2- to 3- months of age do not exhibit any stereopsis – a convergence of the visual

images of the two eyes to produce a singular, nonoverlapping image that has depth.

- Nativists would argue that several cues to depth and distance are monocular – that is, detectable with only one eye.

1. Early Use of Kinetic (Motion) Cues

- a. As a moving object approaches, its retinal image becomes larger and larger and may expand to occupy the entire visual field (this is, loom) as it draws near the face.
- b. We might infer that they can use kinetic cues to perceive movement across the third dimension.

- c. By 3-to4-weeks of age, many infants blink in response to looming objects, thus displaying a “defensive” reaction that becomes much stronger over the next 3 months.
2. Development of Size Constancy
- a. Size constancy is the ability to infer that the dimensions of an object remain constant over a change in distance.
 - b. Until recently, researchers claimed that size constancy could not emerge until 3 to 5 months of age, after infants had developed good binocular vision (stereopsis) that enabled them to make accurate spatial inferences. But even newborns know something about an object’s real size.
3. Use of Pictorial Cues
- a. Albert Yonas and his associates have studied infants’ reactions to monocular depth cues, which are the tricks artists and photographers use to portray depth and distance on a two-dimensional surface.

- b. Yonas found that 7-month-olds reliably reached toward the windows that appeared nearest, whereas 5-month-olds displayed no such reaching preferences.
4. Development of Depth Perception
 - a. In the early 1960s, Eleanor Gibson and Richard Walk developed an apparatus they called the visual cliff to determine whether infants can perceive depth.

INTERMODAL PERCEPTION

- Intermodal perception is the ability to recognize by one sensory modality (i.e., touch) an object that is familiar through another (vision).
- A. Theories of Intermodal Perception
 1. Differentiation theorists such as Thomas Bower (1982) and Eleanor Gibson believe that the senses are integrated at birth and that the defining features of many stimuli (size, shape, texture, sight, sound, or touch sensation) cause infants to investigate further, using all their sensory modalities.
 2. Enrichment theorists such as Piaget (1954; 1960) believe that the senses are separate at birth and must mature independently before the infant will be able to compare and eventually integrate information from different sensory channels.

B. Are the Senses Integrated at Birth?

1. The results of a study by Bower et al. (1970) suggest that vision and touch are integrated: Infants expect to feel objects that they can see and reach, and in incongruity between vision and the tactile sense is discomforting.

C. Development of Intermodal Perception

1. Although intermodal perception has never been observed in newborns, it seems that babies only 1 month old have the ability to recognize by sight at least some of the objects they have previously sucked.

2. Intermodal perception between the vision and hearing emerges at about 4 months of age – precisely the time that infants begin to voluntarily turn their heads in the direction of sounds.

INFANT PERCEPTION IN PERSPECTIVE – AND A LOOK AHEAD

A. Perceptual Learning in Childhood: Gibson's Differentiation Theory

1. According to Gibson (1969), perceptual learning occurs when we actively explore objects in our environment and detect their distinctive (or invariant) features.
2. Gibson believes that the motivation for perceptual learning is inborn; from birth, humans are active information seekers who search for order and stability (invariants) in the natural environment.

BASIC LEARNING PROCESS

- Learning is one of those deceptively simple terms that are actually quite complex. Most psychologists think of learning as a change in behavior (or behavior potential) that meets the following three requirements:
 1. The individual now thinks, perceives, or reacts to the environment in a new way.
 2. This change is clearly the result of a person's experiences.
 3. The change is relatively permanent.
- A. Habituation: Early Evidence of Information-Processing and Memory
1. Developmental Trends
 - a. Habituation improves dramatically throughout the first year.

- b. Infants less than 4 months old may require long exposures to a stimulus before they habituate; by contrast, 5- to 12-month-olds may recognize the same stimulus as familiar after a few seconds of sustained attention are likely to retain this knowledge for days, or even weeks.
 - 2. Individual Differences
 - a. Infants reliably differ in the rate at which they habituate.
- B. Classical Conditioning
 - 1. Classical Conditioning of Emotions
 - a. It is quite likely that every one of us has learned many, many things through classical conditioning, including some of our fears, phobias, and attitudes.
 - 2. Can Newborns Be Classically Conditioned?
 - a. Though it is extremely difficult and was once thought impossible, even newborns can be classically conditioned.
- C. Operant (or Instrumental) Conditioning
 - 1. Four Possible Consequences of Operant Responses
 - a. positive reinforcer
 - b. negative reinforcer

- c. positive punishment
 - d. negative punishment
2. Operant Conditioning in Infancy
- a. Even babies born prematurely are susceptible to operant conditioning (Thoman & Ingersoll, 1993).
 - b. Apparently, older infants are quicker to associate their behavior with its consequences – an advance in information-processing that seems to explain infants’ increasing susceptibility to operant conditioning over the first few months of life.

3. Punishment as a Tactic for Controlling Behavior
 - a. Most parents occasionally resort to punishment as a control tactic (Hoffman, 1988), and some learning theorists have argued that there is a case to be made for its use, particularly if the prohibited act is something dangerous like playing with matches or probing electrical sockets with metallic objects.

D. Observational Learning

1. Newborn Imitation

- a. Researchers once believed that infants were unable to imitate the actions of another person until the latter half of the first year (Piaget, 1951).
- b. Beginning in the late 1970s, a number of studies began to report that babies less than 7 days old were apparently able to imitate a number of adult facial gestures, including sticking out their tongues, opening and closing their mouths, protruding their lower lips (as if they were sad), and even displays of happiness.

2. Advances in Imitation and Observational Learning

- a. Deferred imitation is the ability to reproduce a modeled activity that has been witnessed at some point in the past.

b. By age 14 months, nearly half the infants in one study imitated the simple actions of a televised model after a 24-hour delay, and nearly all the 14-months olds in a second experiment were able to imitate at least three (of six) novel behaviors displayed by a live model after a delay of 1 week.

REFLECTIONS ON PERCEPTION AND LEARNING

- Although we have focused heavily on perceptual growth in this chapter, we should remember that development is a holistic enterprise and that a child's maturing perceptual abilities influence all aspects of development.