# The Development of Visual Perception

By Don L Corrington

Visual perception is the ability of the brain to interpret information received from the effects of visible light reaching the eye's retina, and combining, organizing and translating that information along with other sensory inputs, pervious experiences and innate abilities to create an awareness of one's surroundings.

Robert L. Fantz, a developmental psychologist at Western Reserve University, worked on the pattern and spatial visual recognition abilities of infants. He initially conducted experiments using chicks hatched in darkness and observed their pattern of pecking at spherical objects more than pyramid shaped objects when they were first introduced to a lighted area.

But an infant's verbal, manual, and motor responses are restricted, so he chose to use the infant's own eye-gaze to determine the baby's visual preference. He found that infants looked at different things for varying lengths of time. He placed infants in a "looking chamber," which had two visual displays above the infant's head. An observer viewed the infant's eyes by looking through a peephole. If the infant fixated on one of the displays, the observer could see the display's reflection in the infant's eyes. This allowed the experimenter to determine how long the infant looked at each item displayed.

He found that infants only 2 days old looked longer at patterned objects, such as faces and concentric circles, more than red, white, or yellow discs. Also, infants 2 to 3 weeks old preferred to look at patterns such as a face, a piece of printed matter, or a bull's-eye more than they preferred to look at the red, yellow, or white discs. The infants also preferred to look at a representation of a normal human face rather than one with scrambled features.

Further research in 1975 by Goren, Sarty and Wu and again 1991 by Johnson, Dziurawiec, Ellis and Morton, found that newborn infants, as young as 9 minutes from birth, demonstrated the preference for turning their heads and eyes significantly more to track a two-dimensional face-like representation more than a scrambled-like representation of a face. A blank pattern provided the least interest to the infants.

Additionally an attractiveness effect was found to exist in three sets of studies with newborn infants who averaged less than 3 days from birth at the time of testing (Slater, von der Schulenburg, Brown, Badenoch, Butterworth, Parsons & Samuels, 1998; Slater**,** Bremner, Johnson, Sherwood, Hayes & Brown, 2000; Slater, Quinn, Hayes & Brown, 2000).

In these studies newborns were found to apparently use information about internal facial features in making preferences based on attractiveness. Also the attractiveness effect seemed to be orientation specific, when the pairs of attractive-unattractive faces were upturned the attractiveness partiality was not present.

These studies suggest that we are born with an innate ability to recognize human faces and preference towards attractive faces. Other research suggests that the identification of another race effect is starting to emerge by 6 months and is present at 9 months of age. The findings suggest that facial input from the infant's visual environment is also an important element early in infancy to provide for recognition accuracy for faces of different races in adulthood.

However, visual perception does not only rely on the images we receive to create a sense of our surroundings. For example, the ability to determine the distance objects are from us, can greatly influence our discernment of our immediate environment.

Height perception, can be crucial as to our feeling of safety and comfort. An experiment was conducted at Cornell University by Eleanor J. Gibson and Richard D. Walk (1960) in which infants of various ages were placed on a fabric-covered runway that ran across the center of a sheet of Plexiglas. The Plexiglas covered a cloth with a high-contrast checkerboard pattern. On one side the cloth was placed immediately beneath the Plexiglas, and on the other, it dropped about 4 feet below. This apparatus was named the Visual Cliff.

36 infants, ranging in age from six months to 14 months, were tested on the visual cliff. Each child was placed upon the center board, and his mother called him to her from the cliff side and the shallow side successively.

All of the 27 infants who moved off the centre board crawled out on to the shallow side at least once. But only 3 attempted to crawl on to the ‘deep’ side (cliff side). Many of the infants crawled away from the mother when she called to them from the ‘deep’ side; others cried when she stood there because they could not get to her without crossing the ‘deep’ side. Gibson and Walk concluded that most human infants can discriminate depth as soon as they can crawl by utilizing visual situational information.

They also tested chicks, kids and lambs, rats, kittens and Aquatic Turtles.

The chicks, at an age of less than 24 hours would always hop off the centre board on to the shallow side, rather than the ‘deep’ side.

The kids and lambs never stepped on to the ‘deep’ side, even at 1 day old.

The rats (who depend upon their whiskers to navigate, rather than visual cues), showed little preference for the shallow side, so long as they could feel the glass with their whiskers. When the centre board was placed higher than their whiskers, they nearly always descended onto the shallow side.

The kittens (although they rely on their whiskers, also use sight as they are predatory); at 4 weeks old showed preference for the shallow side, and ‘froze’ when placed onto the ‘deep’ side or circled back to the centre board.

However, kittens who had been reared in darkness for their first 27 days of life crawled onto the shallow and deep side equally. When placed on the deep side, they demonstrated similar behaviors as if they had placed on the shallow side they did not “Freeze” or circle back like kittens not raised in darkness.

After this initial research, these kittens were kept in ‘normal’ lighting conditions. They were tested daily on the visual cliff and by the end of 1 week the ‘dark reared’ kittens demonstrated similar behaviors to kittens who had been reared in the light i.e. almost unanimous preference for shallow side.

Only 76% of the Aquatic Turtles crawled off onto the shallow side. Gibson and Walk suggested that the turtles had poorer depth discrimination than other animals because their natural habitat did not really present the turtles with the ‘occasion to fall’.

This experiment seemed to have demonstrated that most human infants can discriminate depth as soon as they can crawl.

It should be noted that more recent work of Witherington and Campos suggested an alternative conclusion. They proposed that the visual cliff is really tapping into something different from depth perception. While reviewing file footage, they noticed that even the youngest infants would brace themselves before touching the shallow end suggesting they already had depth perception.

The researchers searched for another explanation and found it in locomotion. The infants with the most profound aversion to the cliff were those with the most experience walking/crawling. They believed what was actually happening was that the infant was learning to associate the physical environment with the visual environment. Crossing the glass just didn’t “add up,” the body expected to fall, and when it did not, the body felt unusual. This phenomenon, known as propriception is the sense we develop of the relative position of neighboring parts of our body.

Therefore, one might surmise that visual perception is a complex process. Having instinctive and inherent characteristics as well as learned elements and features. It relies on visual, tactical and other body senses to provide our brain the input to create an awareness of our surroundings.