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Self-Perception by 3-Month-Old Infants

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Recent empirical findings in the domain of infancy call for a new interpretation of the origins of self-knowledge. From birth, infants appear to express a sense of self. Remarkable abilities discovered in the young infant suggest that in development, and prior to the emergence of a conceptual self, infants manifest a situated or ecological self. According to Neisser (1991), infants are actively constructing a situated or ecological self, before they acquire a conceptual self. The situated or ecological self is based on established perceptual abilities of the young infant. It refers to the sense of self as a differentiated and organized entity, situated in the environment as an agent of action and transformation. According to this view, a personal sense of agency is an early fact of life forming an implicit self-knowledge that guides the infant in his/her interaction with the environment, hence its resources. Neisser (1985) suggested that from the earliest age, babies are tuned to and capable of extracting perceptual information that corresponds to spatio-temporal invariants of the stimulation. This early capacity allows young infants to perceive objects and events, and to situate themselves as perceivers and actors in the environment (J. J. Gibson, 1979; E. J. Gibson, *in press*). However, questions remain about what information is used by young infants to specify themselves as an agent in the environment and how the use of such information announces explicit self-recognition emerging by the second year. Although the development of self-recognition by young infants in front of a mirror has been well documented, very few studies have attempted to isolate the relevant information underlying self-perception in infancy.

Only a few infancy studies have demonstrated that self-perception originates in development with the discovery of the contingency between visual and proprioceptive feedback from body movements. In a study by Papousek and Papousek (1974), infants showed a preference for a pre-recorded video of their face over an on-line one. Using a similar preferential looking paradigm, Bahrack and Watson (1985) demonstrated the early detection of proprioceptive-visual contingency, by presenting the infant with non-facial images of the self. In the Bahrack and Watson study, the infant could see simultaneously two video monitors, one with a contingent view of his/her legs, and the other with a non-contingent, pre-recorded view of his/her legs, or the view of another baby's legs wearing identical booties. Bahrack and

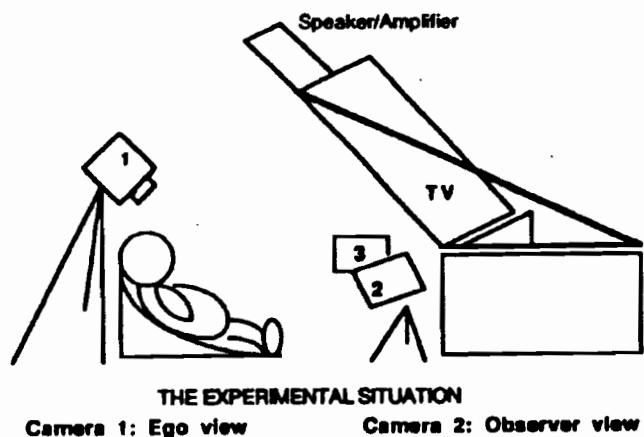
Watson showed that 5-month-olds look preferentially to the non-contingent view. They also observed this phenomenon in a situation where an occluder prevented the infant from seeing his/her legs directly. Three-month-olds show split preferences, looking either much longer at the contingent, or much longer at the non-contingent view. Overall, Bahrack and Watson demonstrated that early perceptual discrimination of the self does not correspond only to facial images of the self but includes other parts of the body. This is important because it shows that young infants are sensitive to visual and proprioceptive contingency in general, and not only to the contingency of eye contact as suggested by previous researchers who emphasized the social rather than perceptual context in which first discrimination between self and others takes place. Nevertheless, questions remain as to what information is relevant to the young infant in his/her discrimination of intermodal proprioceptive-visual contingency. As it stands, Bahrack and Watson's experiment provides limited information regarding what is actually detected by the young infant. Is it a temporal contingency, a spatial contingency, or a mixture of both, i. e., a spatio-temporal contingency? In other words, does infants' detection reported by Bahrack and Watson depend exclusively on a discrimination of the temporal discrepancy between visual and proprioceptive feedback, or could it also depend on the detection of a change in the spatial calibration of the two sense modalities?

Questions

As a follow-up to the study by Bahrack and Watson, and using the general paradigm of Papousek and Papousek, the present research is an initial attempt to further specify what information is relevant in self-perception by young infants. What is the role of spatial information in determining self-perception by young infants? Do 3-month-olds discriminate between different spatial configurations of themselves?

General paradigm

Infants were presented with two on-line (immediate feedback) images of themselves pertaining to the same body part (legs) but filmed from two different perspectives. The infants' preferential looking for either one of the images was analyzed.



on the lower part of the seat, taped to the other side of a sheet of paper on which the feet rested. The microphone was invisible to the infant, connected to an amplifier and a speaker affixed on top of the TV. Contingent to any leg movement, this device produced a commensurate rustling/scratching sound originating from the speaker on top of the TV monitor. This auditory feedback provided the infant with a contingent reinforcement accompanying the legs' movements. Such reinforcement enticed the infant to generate movements and to orient towards the location of the sound it produced (TV). A third camera placed about 2 meters away in front of the infant provided a close-up view of the infant's eyes for further analyses of the preferential looking at either view of the self. The diagram below illustrates the experimental situation.

Results

Analyses of looking time at either the ego or the observer's view, show unequivocally that three-month-olds look longer at the observer's view compared with the ego view. Out of the 10 infants, 9 look markedly longer at the observer's view (73% to the observer's view vs. 27% to the ego view). These results corroborate what both Papousek and Papousek (1974) and Bahrick and Watson (1985) found with 5-month-olds who tend to look longer at the unfamiliar view of the self.

Discussion

These preliminary observations suggest that from 3 months of age, infants show discrimination of various views of the self. They indicate that spatial congruence between proprioceptive and visual feedback is a determinant of self-perception early in development. However, it is not clear whether it is the direction of the legs' movement or the spatial arrangement of the legs on the screen that is causing the infants to prefer the observer's view. The direction of movement is reversed on the horizontal plane in the observer's view, compared with the ego view. In addition, the feet appear at the bottom of the screen in the observer's view; whereas, the toes appear at the top in the ego view. Experiments are planned which will specify the relative weights of each of these variables in determining the infants' visual preference for the observer's view.

Method

Ten 3-month-old infants were presented with their own image on a split screen of a large TV monitor (25 inches). The infants were seated in a 60° reclined position looking up towards the TV which was inclined 30° above their head at a distance of 1.5 meters. The reclined posture of the infants prevented them from seeing their own legs directly, unless by lifting up their head and looking down. One camera was placed one meter away, in front of the infant to provide a frontal view of the infant's legs from the waist down. This first view of the infant's legs (observer's view) was projected to one side of the split screen. Another camera was placed 1.5 meters above the infant to provide a view of the infant's legs equivalent to the one s/he would normally perceive when looking down directly towards them. This second perspective of the infant's leg (ego view) was projected to the other side of the split screen. In other words, the temporal aspect of the contingency was absolutely the same in both views of the infant, only the spatial arrangement was changed (observer's view vs. ego view). The side of the screen on which the observer's view occurred was counterbalanced between subjects. Five of the infants viewed the observer's view to the left of the split screen, and five viewed it to the right. To entice the infant to look at the TV, long socks with black and white stripes were put on the baby's feet and legs. Furthermore, to encourage them to move their legs, thus providing some potentially interesting action on the screen, a small microphone was placed under the infant's feet

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