

# What About The Children?



## RESEARCH SUMMARY

**Hoehl, S., Wiese, L., Striano, T. (2008) Young Infants' Neural Processing of Objects is Affected by Eye Gaze Direction and Emotional Expression. *PLoS ONE*, 3(6), 1-6 (Public Library of Science)**

Human infants develop social skills early in life. Eye contact between child and carer is key for this aspect of development. By 3 months infants can follow another person's gaze, and are sensitive to a person's facial expression. At 4 months, these responses are well-defined enough to be detected from electrical brain potentials. This study was constructed to see whether infants of 3-4 months in age could link the direction of another person's gaze with a threat-related emotional stimulus. At the same time the infant's electrical brain potential was monitored as the experimental measurement of brain activity.

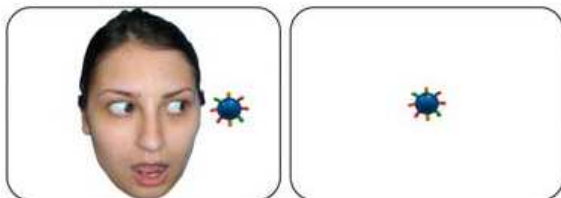
Three groups of 15 typical infants in the age range 3-4 months were the subjects of the experiment: a different group for each of the three studies. The infants sat on their mother's knee in a dimly lit room and facing a 17-inch VDU on which were shown the test pictures. Electroencephalogram (EEG) recordings were taken from each infant. Photos of neutral and fearful expressions were selected from a standard set of adult faces (male and female actors) in full frontal portrait position. For each picture the eye gaze direction (gazing left, central or right) was manipulated by Adobe Photoshop for each facial type – neutral or fearful. As an example, in the picture shown below, a bright blue star (the object) was used as a face-object stimulus. This object was placed in the direction of the gaze of the eyes on the screen; this is called the gaze-cued object.



Example of a fearful face with gaze-cued object.

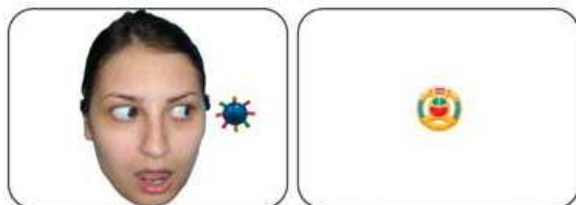
Three separate studies were performed.

### Study 1



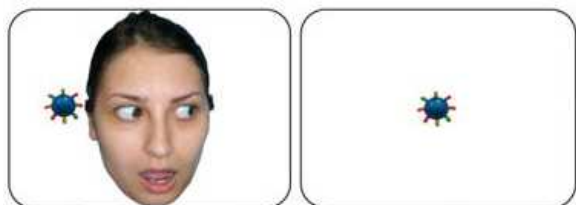
The infant was shown a random sequence of 160 repeated images of either a neutral or a fearful face with the gaze directed at its respective object (left picture above for fearful face; a neutral face would use a different object). The infant was then shown pictures of the object alone (right picture above but now with accompanying face removed) that had previously been gaze-cued by a picture of an adult with a fearful or neutral expression; the object associated with a fearful expression evoked a substantial increase in the infant's electrical brain response compared with the object associated with the neutral expression.

## Study 2



This study was similar to study 1 and used the same gaze-cuing procedure (left picture above with blue star). However, instead of showing the same gaze-cued object, a different test object was used with the accompanying face removed (right picture above with multi-coloured object). No differences in electrical brain responses were found; this suggested that the infant did not make any association between the gaze-cued object and a different object stimulus.

## Study 3



This study was similar to study 1 except that the object was placed in a direction opposite from the eye gaze (left picture above). When the infant was shown the object on its own (right picture above), there was no measurable electrical brain response. This implies that the infants were sensitive to the adult's eye gaze direction.

These remarkable experiments suggest that infants of age 3-4 months can a) discriminate an emotional expression from a neutral expression and b) associate the emotional expression with a gaze-cued object. The EEG studies indicate that the region within the brain for this set of responses in the infant is located in the prefrontal cortex and the anterior cingulate; these are regions that in later life are implicated in conflict monitoring and attention control.

In simple terms, infants appear to learn significant social/emotional cues from eye contact very early in life, and their brain can respond to an object that causes fear in an adult facial expression. The infant picks up an adult's emotional warning signal without actually suffering harm itself. The authors conclude that 'from an evolutionary perspective the neural mechanisms examined in this study are highly adaptive as they may directly contribute to survival in potentially dangerous situations.' It appears that the infant is taking in a lot more from its social environment at only 12-16 weeks than many adults realize.

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Research originates from the Neurocognition and Development Group, Max Planck Institute for Human Cognitive and Brain Sciences, Leipzig, Germany and Hunter College, City University of New York