# Study on the Development of Empathy through Positive Emotional Contagion in Infancy

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## Abstract

Seeing or hearing emotional distress from an infant can create a chain reaction with infants nearby, and cause them to produce signs of distress through facial expressions, body language, references to mothers, and ultimately vocal responses, supporting the concept of emotional contagion. The present project attempts to elicit similar (but opposite) emotional contagion by using positive rather than negative stimuli. A cohort of infants will be presented, at 5 and again at 10 months of age, with an audio only track of infants laughing, a similar track of infants laughing but with audio and video, and a control condition of moving geometric shapes. Each condition will be presented for 2 minutes. Affective responses will be coded from video recorded facial expressions and body movements as well as from cortisol measured from saliva samples. In addition, the EKG will be measured to assess attentional differences among the three conditions. At the 10-month visit, a measure of maternal-infant attachment will also be administered. It is predicted (a) that infants will show more positive facial expressions and more attention (as measured by heart-rate slowing) during the audio-video and audio-only conditions relative to the control condition, and (b) that these measures of affect and attention will increase from 5 to 10 months.

**Keywords:** Empathy, Positive, Contagion, Emotion, Stimulus

## Introduction and Literature Review

A high emotional state that provides individuals or groups a stronger social connection is the emotion of empathy. The process of empathy can be observed to be one of the many factors of moral development of the human mind, and can lead to positive outcomes in most social situations or relationships. One of the questions of this particular moral behavior that leads to this research is, “When exactly does empathy begin to develop (at what age in particular) and is there a specific event that triggers empathy related neural impulses in the brain?” Previous studies show how the contagious crying phenomenon plays a strong effect amongst infants and is one of the earliest stages of moral development (Geanu et al 2010). Seeing or hearing emotional distress from an infant can create a chain reaction with infants nearby, and cause them to produce signs of distress through facial expressions, body language, references to mothers, and ultimately vocal responses, supporting the concept of emotional contagion (Geanu et al 2010). There are many theories as to why this is an occurrence. An idea in particular behind why humans emotionally feel the same as another is based on the concept of “mirror neurons.” Mirror neurons are



*=Mentor

neurons in the brain that assist the individual observing the nearby individual to visualize themselves in the same actions as the other (Iacoboni 2008). There have also been more studies on the neurological aspect of empathy that indicates that the region of the brain where empathy is active is the same region where neural impulses of physical pain are active. This idea is an example of why humans react with strong facial distress and upper body movement such as cringing when another person is seen getting physical injured (Decety 2011). In regard to negative emotional states, another question in the research is, "Can this effect occur in infants with positive emotional states such as laughing in correlation to the development of empathy?" Could there be a contagious laughing phenomenon?

## The Appropriate Time in Infancy to Measure Laughter

The study requires to code the positive emotions as early as possible in infancy, but not until the infants are of an age that acquires a fully developed laughter. The first sign of positive emotions occurs within one to two months as the very first "social smile" emerges. Psychologists confirm this initial smile as the response to positive interactions with parents or other caregivers. Though coding depicts this as a positive response, the act of laughter does not occur until infants reach three to four months (Wormann et al. 2013). Therefore, the observations occur when the infants are five months old.

## Method

*Participants and procedures*

The approach to finding infants for the study is tedious and acquires an inconsistent rate in finding new participants. The procedures include creating and distributing fliers that clearly advertise the purpose behind the research and state the compensation, putting the study in local newspapers, and approaching strangers or known people. Only mothers with five month old infants are asked to participate in the study. The infants are also asked to be brought back at ten months for an update on their emotional responses. The mothers of the infants contacts one of the lab members with their interest, and is given directions to the correct location of the laboratory.

On a lab day, an experimenter will meet the mother and infant outside in the parking lot, and then bring them to the experiment room where a board will be hung up with the name of the mother and infant written on it. The mother will be asked to fill out consent forms, before the lab begins. The infant will be placed in the baby seat facing the television/stimulus and turning its back on a lamp. This lamp will be the light that indicates the appropriate time to begin coding the baby. In the observation room, the experimenter and the assistant will have already set up the programs that controls the stimulus in the experiment room. The duration of each of the three conditions is two minutes. Condition one is the control with videos of animations such as school buses, animated creatures, etc. The second condition contains only audios of laughing babies. The third condition is of videos of other infants laughing along with the audio. Throughout the experiment, the mother is to sit by the infant due to potential of emotional distress occurring from distance. No other person is to be in the experiment room during the conditions.

*Heart Rate, EEG, & Cortisol levels*

In order to get a clearer understanding of the psychological state of the infants during the experiment, the study records the physiological aspect of the infant in order to clarify the correlation between mind and body. By testing the heart rate and the cortisol levels, the state of the infant will

made clearer. The heart rate indicates the infant's anxiety levels and the excitement which relates to the emotions responding to the stimulus (Peira et al 2014). Another way the lab will measure stress levels of the infant will be through cortisol levels through saliva tests since cortisol is released during stress or low blood glucose (O'Connor et al. 2013).

The experimenter will have the assistant start the EKG data, which is the program used to measure the heart rate. At the beginning of each condition, the assistant will click the "start" button simultaneously as the experimenter turns on the light behind the infant, and likewise the assistant and experimenter will press the "stop" button while simultaneously turning off the light. This will accurately record the physiology of the baby at the exact time periods of each condition. The infant's saliva sample is taken three times throughout the experiment for the cortisol levels. The first saliva sample is taken before the experiment begins, the second is taken after all three conditions are completed, and the final sample is taken fifteen minutes after the second one.

*Coding*

The lab gathers together approximately once a week, watches the recordings of the infants, and compares our previous dissection of every move of the baby with a coding system that rates the level of positivity of the infant's reaction to the stimulus. The coding system consists of duration of positive response, intensity of positive response, duration of distress, intensity of distress, parent interference, number of references to the mother, and duration of reference to mother. When the video begins, coding is only to begin once the light turns on in the back. Each condition coded is divided into four epochs with four 30-second increments. The positive response is measured on an intensity scale of 1-5 depicting the facial regions and body movements of the infants during each condition and each epoch. Facial regions include lower part of the face (around the mouth such as curling of lips), upper-mid part of the face (around the eyes such as squinting), and upper part of the face (forehead such as burrowing of eyebrows or wrinkles). A score of one shows only one region with movement in the face with low expression of joy or expression is ambiguous. A two shows two or more facial regions with movement, a three has two facial regions along with movement of arms and legs, and a four has two facial regions with movement, movement of arms and legs, and lasts longer than one second. A five is the ultimate indicator of laughter with two or more facial movements and movement in arms and legs along with rhythmic upper body movement. Distress is coded in a likewise manner on an intensity scale of 1-5. A one has only one facial region of movement with a low intensity of distress, a two has two facial regions of movement, a three has all three facial regions or otherwise strong indication of emotional distress. A four is a clear portrayal of crying, and a five is crying with arms and legs moving around frantically. The final item coded for each participant video is the infant's reference to the mother, where we count and record the length of time the infant lays direct eye contact with the mother to no contact at all.

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## Discussion

The study is still being conducted and no final results have been gathered. The process of finding infants, performing the experiment, and coding the recorded videos are still undergoing. The concept of contagious laughing is hypothesized by the lab that there can be a positive emotional contagion, and the act of infants laughing can psychologically encourage the infants nearby to laugh in unison. However, ten infants have their affective positive emotional data collected, and eight infants have their heart rate data collected in measures of beats per minute (BPM) to depict their excitement stage when exposed to other laughing infants. When the average duration of positive emotional responses was recorded for all three conditions, the control had a mean duration of 10.4 seconds, the audio-video stimulus had 11.5 seconds, and the audio only stimulus had 16.7 seconds. The intensity of each positive stimulus was coded on a 0.0-5.0 scale. The mean intensity for the control was 3.3, the audio-video stimulus was 4.80, and the audio only stimulus was 4.40. When measuring the average heart rate, the control had 140.50 BPM, the audio-video stimulus had 141.56 BPM, and the audio only stimulus had 142.02 BPM. In conclusion, the lab's hypothesis is supported from the data collected thus far by showing that the infants appear to be at a higher arousal state when surrounded by other infants laughing or showing any signs of positive emotions, and that the development of empathy could very well begin at the early age of five months.


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**Literature Cited**


Decety, (2011).Dissecting the Neural Mechanisms Meditating Empathy. *Emotion Review*, 3 (1) (2011), pp. 92-108

Geangu E., O. Benga, D. Stahl, and T. Striano. 2010. Contagious crying beyond the first days of life. *Infant Behavior and Development*, 33 (3) (2010), pp. 279-288

Iacoboni, M. 2008. Imitation, Empathy, and Mirror Neurons. *Annual Review of Psychology*, 60 (1) (2008), pp. 653-670

Peira N., M. Fredrikson, G. Pourtois. 2014. "Controlling the emotional heart: Heart rate biofeedback improves cardiac control during emotional reactions". *International Journal of Psychophysiology*, 91 (3) (2014), pp. 225-231

O'Connor T.G, K. Bergman, P. Sarkar, V. Glover. 2013. Prenatal cortisol exposure predicts infant cortisol response to acute stress. *Developmental Psychobiology*, 55 (2) (2013), pp. 145-155

Wormann V, M. Holodynski, J. Kartner, H. Keller. 2013 The Emergence of Social Smiling: The Interplay of Maternal and Infant Imitation During the First Three Months in Cross-Cultural Comparison. *Journal of Cross-Cultural*, 45 (3) (2013), pp. 339-361