

Study finds facial expressions are inherited

Scientists have found that family members share a facial expression “signature”—a unique form of the universal facial expressions encountered worldwide. In a rare study taking into account blind subjects, Gili Peleg, *et al.* have discovered that family members were identified by their facial expressions 80% of the time, giving scientific support to the observation that a child “has her Daddy’s smile.”

“Before our study, it was clear that there is a component of imitation that influences facial expressions, but there was no study that compared the gestalt of facial movements of relatives in several emotions,” Peleg told *PhysOrg.com*. Peleg is a PhD student supervised by Professors Eviatar Nevo and Gadi Katzir at the International Graduate Center of Evolution at the Institute of Evolution, part of the University of Haifa in Israel.

In the 1970s—contrary to some views of the time but in accordance with Darwin—psychologists Paul Ekman and Eibl Eibesfeldt showed that facial expressions are universal: people from different parts of the world smile when happy and frown when sad, etc. Scientists also know that individuals have unique facial expression signatures. Due to the existence of different nerves and muscles, some people will have, for example, dimples, “Duchenne” smiles (with circles under the eyes) and the ability to lift one eyebrow.

Wanting to know if there might be a heritable basis for these individual signatures, Peleg *et al.* studied the gestalt of facial movements, seen in details such as the intensity and frequency of expressions.

“Facial expressions are non-verbal communication phenotypes, meaning they are composed from genetics and environmental conditions,” said Peleg. “We decided to investigate a population of born-blind persons in order to eliminate the social influence and the effects of imitation.”

In the study, the scientists video-taped 51 subjects—21 who were blind, and a total of 30 of their family members—when provoked to exhibit six emotional states: concentration, sadness, anger, disgust, joy and surprise. Next, the researchers used a classification tool to assign values (e.g. for types of movements, frequencies) to each of the subject’s expressions. After defining the values, another classification tool determined which subjects were family members.

Quite convincingly, 80% of the classifications correctly identified family members when taking into account all six emotional expressions. The single emotion that received correct classification of family members when tested alone was anger at 75%. In a test comparing the family members with each other, the scientists also found that related subjects showed similar frequencies of facial expressions for the emotions of concentration, sadness and anger, but not the others.

“The hereditary influence that appeared in think-concentrate, sadness, and anger may relate to the induction of the high diversity of facial movements by these emotions, as we found in a previous study,” said Peleg. “We believe that if our study population was larger, we could get significant results even in the other three emotional states: disgust, joy and surprise.”

Peleg *et al.* hope that finding a heritable basis for facial expression signatures may lead to discovering genes responsible for facial expressions. If so, it might be possible to develop repair mechanisms for people lacking facial expressions, such as people with autism. Much information can be communicated through a person’s facial expressions, and the scientists also wonder about their evolutionary significance.

“Communication abilities have an evolutionary advantage; therefore facial expression phenotypes should be conserved,” said Peleg. “Facial expressions are important in inter-individual and hierarchical interactions of people within our own species; between different human races; between different tribes; and in animals

between different species. The relationships of mother-babies; bonding of pairs; aggression interactions between individuals and so on should be very important in hierarchical situations in human and animal societies. Likewise, facial expressions should be of great importance as pre-mating isolating mechanisms between species.

“The genetic basis of facial expressions is probably composed of an array of gene coding for muscle structure, bone structure and muscle innervations,” Peleg continued. “However, our results also demonstrate kinship sequences of facial expression. This could indicate genetic conservation and the existence of brain regions that control facial expressions.”

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