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# Human Facial Emotion: A Comparative and Evolutionary Perspective Using a Canine Model

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**Abstract :** Despite its growing interest, emotions are still an understudied cognitive process and their origins are currently the focus of much debate among the scientific community. The use of facial expressions as traditional hallmarks of discrete and holistic emotions created a circular reasoning due to a priori assumptions of meaning and its associated appearance-biases. Ekman and colleagues solved this problem and laid the foundations for the quantitative and systematic study of facial expressions in humans by developing an anatomically-based system (independent from meaning) to measure facial behaviour, the Facial Action Coding System (FACS). One way of investigating emotion cognition processes is by applying comparative psychology methodologies and looking at either closely-related species (e.g. chimpanzees) or phylogenetically distant species sharing similar present adaptation problems (analogy). In this study, the domestic dog was used as a comparative animal model to look at facial expressions in social interactions in parallel with human facial expressions. The orofacial musculature seems to be relatively well conserved across mammal species and the same holds true for the domestic dog. Furthermore, the dog is unique in having shared the same social environment as humans for more than 10,000 years, facing similar challenges and acquiring a unique set of socio-cognitive skills in the process. In this study, the spontaneous facial movements of humans and dogs were compared when interacting with hetero- and conspecifics as well as in solitary contexts. In total, 200 participants were examined with FACS and DogFACS (The Dog Facial Action Coding System): coding tools across four different emotionally-driven contexts: a) Happiness (play and reunion), b) anticipation (of positive reward), c) fear (object or situation triggered), and d) frustration (negation of a resource). A neutral control was added for both species. All four contexts are commonly encountered by humans and dogs, are comparable between species and seem to give rise to emotions from homologous brain systems. The videos used in the study were extracted from public databases (e.g. Youtube) or published scientific databases (e.g. AM-FED). The results obtained allowed us to delineate clear similarities and differences on the flexibility of the facial musculature in the two species. More importantly, they shed light on what common facial movements are a product of the emotion linked contexts (the ones appearing in both species) and which are characteristic of the species, revealing an important clue for the debate on the origin of emotions. Additionally, we were able to examine movements that might have emerged for interspecific communication. Finally, our results are discussed from an evolutionary perspective adding to the recent line of work that supports an ancient shared origin of emotions in a mammal ancestor and defining emotions as mechanisms with a clear adaptive purpose essential on numerous situations, ranging from maintenance of social bonds to fitness and survival modulators.

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