The Functional Basis of Face Evolution

* Important social outcomes, ranging from electoral success to sentencing decisions
* Lambroso and his physiognomic characteristics (2)
* Amygdala, a subcortical brain region critical for fear conditioning and consolidation of emotional memories, plays a key role in the assessment of face trustworthiness (11, 12-15)
* The objectives of current research:
  + Identify the underlying dimensions of face evaluations
  + Introduce tools for formally modelling how faces vary on these dimensions
  + Determine the facial features that give rise to judgements on these dimensions
  + Link the findings to a broader evolutionary context that can account for rapid yet not necessarily accurate judgements from faces
* **To identify the underlying dimensions of face evaluation, we**
  + Identified traits that are spontaneously inferred from emotionally neutral faces
  + Collected judgements on these trait dimensions
  + Submitted these judgements to a principal component analysis
* 55 participants generated unconstrained descriptions of faces. These descriptions were then classified into trait dimensions. 14 dimensions accounted for 68% of the descriptions and were selected for the subsequent analysis.
* Participants (n=327) were then asked to judge the same neutral faces an these trait dimensions and dominance. For two of the traits, the interrater agreement was very low, and they were not included in the subsequent analysis. The judgements for the remaining traits were highly reliable (Cronbach’s alpha > 0.90)
* The findings suggest that the dimensions for face evaluation identified here are robust with respect to both selection of face stimuli and trait judgements. The findings also suggest that judgements of trustworthiness and dominance can be used as approximations of the underlying dimensions. Valence and dominance, of evaluation of emotionally neutral faces
* Wiggins et al (19, 23), starting with a large set of traits describing interpersonal relationships, have shown that interpersonal perception can be described by two orthogonal dimensions, affiliation and dominance, that are similar to the dimensions identified here.
* Modeling of Face trustworthiness and face dominance. Given these findings, we built models for representing how faces vary on trustworthiness and dominance. By contruction, this model does not make a priori assumptions about the importance of specific facial parts (eg nose, eyebrows)
* Using the face model, we randomly generated 300 emotionally neutral faces and asked participants to judge them on trustworthiness (study 3, n=29) and dominance (study 4, n=25).
* Consistent with the prior findings, the correlation between the mean trustworthiness and dominance judgements was low
* People were more sensitive to changes in trustworthiness at the low end of the spectrum than ay the high end. That is, although the physical distance between any two categories of faces was the same (1.5 SD), people were better at discriminating faces at the negative end of the trustworthiness dimension
* Moving from the negative to the positive extreme of the trustworthiness dimensions, faces seemed to change from expressing anger to expressing happiness. Moving from the negative to the positive extreme of dominance dimension, faces seemed to change from feminine and baby-faced to masculine and mature-faced.
* In contrast to the findings for the trustworthiness dimensions, dominance evaluation was weakly related to facial features resembling emotional expressions. Extremely submissive faces were classified as fearful. There was also a tendency to classify extremely dominant faces as angry, consistent with prior findings (25-27), but this categorization was not significantly different from chance.
* Emotional expressions often signal the behavioural intentions of the person displaying the emotion (28). For example, the expressions of happiness and anger signal to the perceiver that the person can be approached or should be avoided, respectively, and there is evidence that angry faces trigger automatic avoidance responses (29, 30)
* The finding that the valence evaluation of faces is sensitive to features resembling emotional expressions is consistent with prior studies suggesting that trait judgements of emotionally neutral faces are an overgeneralization of perception of emotional expressions (26, 27, 31). For example, judgments of trustworthiness are negatively correlated with judgments of happiness from emotionally neutral faces (32), as are judgements of affiliation, an attribute similar to trustworthiness (27).
* Facial masculinity and maturity cues signal physical strength and the correspondent ability to cause harm
* Whereas the valence evaluation of faces is more sensitive to features resembling expressions signalling approach/avoidance behaviours, the dominance evaluation is more sensitive to features signalling physical strength.
* Accurate assessments of threat are essential for survival (10), and threatening faces should be both untrustworthy, signalling that the person may have harmful intentions, and dominant, signalling that the person is capable of causing harm
* Our findings suggest that faces are evaluated on two fundamental dimensions, valence and dominance. Whereas valence evaluation is an overgeneralization of perception of facial cues signalling whether to approach or avoid the person, dominance evaluation is an overgeneralization of perception of facial cues signalling the physical strength/weakness of the person. Functionally, the valence and dominance related facial cues give rise to inferences about the person’s intentions, harmful vs harmless, and the person’s ability to implement these intentions, respectively.
* Attractiveness judgements were highly correlated with both trustworthiness (0.79) judgements and the valence component (0.81).
* However, it should be noted that the dimensional model is most applicable to implicit face evaluation where no specific evaluative context is provided (14). When a context makes a specific evaluative dimension relevant (eg) competence, decisions would be most likely influenced by evaluations on this dimension. Eg, in electoral decisions, voters believe that competence is the most important attribute for a politician and evaluation of competence but not trustworthiness predict electoral success (4).
* Similarly, in mating decisions, physical attractiveness could trump evaluations on other specific dimensions, including trustworthiness (37). In other words, in specific contexts, other dimensions of face evaluation may be critical for decisions
* The accurate perceptions of emotional expressions and the dominance of conspecifics are critical for survival and successful social interaction (28, 38-40).
* Overgeneralization hypothesis