

# The cognitive and social impact of acquired facial differences: From visual salience to dehumanisation

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*Faces are central to human perception, communication, and social judgment. This review explores how acquired facial differences alter face perception and elicit implicit bias, disrupted gaze patterns, and emotional disengagement. Drawing from neuroscience, developmental psychology, and cultural history, I examine how facial atypicality affects attention, emotion recognition, and empathy. Facial differences trigger heightened visual salience but reduced social processing, contributing to dehumanisation. Cultural and media portrayals reinforce harmful associations between appearance and morality. Understanding the cognitive mechanisms behind facial stigma is critical for addressing prejudice and improving social inclusion for individuals with facial differences.*  
**Keywords:** Face perception; Facial difference; Visual salience; Implicit bias; Mirror neuron system.

## The social centrality of faces

**F**ACES are vital for human interaction, perception, and communication and in many contexts our primary source of information about other people. Faces are one of the most salient stimuli we encounter regularly (Keys et al., 2021). Our perceptual system is so tuned to perceive faces, that we often see faces in non-face objects, a phenomenon called face pareidolia. Objects benefit from having ‘illusory faces’ by being faster detected than objects without illusory faces (Keys et al., 2021), a side effect of our visual system’s need for rapid face detection to identify others and avoid threats (Caruana & Seymour, 2022).

We use faces to recognise identities and emotions (De Sonnevile et al., 2002) and we behave more prosocially if others’ faces resemble our own (DeBruine et al., 2008). The development of social cognition relies on face processing. Social cues in faces are critical to infer others’ intentions and interests (Crivelli & Fridlund, 2018) and infants

develop facial perception very early. Faces are one of the most frequent stimuli in a newborn’s daily life (Fausey et al., 2016), since they cannot see very far yet and faces are often in their visual field. Newborns preferentially orient toward faces (Gamé et al., 2003; Macchi Cassia et al., 2004; Morton & Johnson, 1991; see also Kwon et al., 2016) and faces have privileged memory already in infancy (Bahrick et al., 2002). For newborns, the salience of faces seems to be driven by the typicality of the eyes and mouth configuration (Farroni et al., 2005; Morton & Johnson, 1991). Exposure to facial features and facial expressions of emotion within sensitive developmental periods is crucial for the development of social brain networks (Johnson, 2005).

Faces have evolutionary importance for mate selection, due to possible links between facial attractiveness and health (Henderson & Anglin 2003; Rhodes, 2006). However, recent research has questioned the link

between health and attractiveness as being weak and unreliable (Foo et al., 2017). Facial attractiveness is also linked to social and moral judgements, particularly judgements of trustworthiness (O'Doherty et al., 2003). Judgements of facial attractiveness and trustworthiness are both made extremely rapidly and are highly predictive of one another (Todorov et al., 2009). More importantly, these rapid judgements tend to be resistant to change over time and only consolidate people's confidence in a judgement already made (Todorov et al., 2009).

The best understood predictors for facial attractiveness are symmetry, closeness to a population average, and sexual dimorphism. However, these factors do not explain as much variance in attractiveness as the literature suggests (Jones & Jaeger, 2019). Yet, there is surprisingly little variation in ratings of attractiveness, at least at the extreme low and high ends of the attractiveness spectrum across populations globally (Little et al., 2011; Pavlovic et al., 2023; Sorokowski et al., 2013), indicating that facial attractiveness may be largely biological. Based on the current evidence, we have to accept that facial attractiveness judgments are more complex than previous evolutionary theories predicted.

### **Faces with visible differences**

Faces, particularly beautiful ones, are often associated with a neural reward response (Aharon et al., 2001; Cloutier et al., 2008; Pegors et al., 2013). Faces that divert from a norm additionally are linked to neural responses reflecting saliency (Hartung et al., 2019; Workman et al., 2021). While much research has been done on the benefits of facial beauty (e.g. health and social advantages), much less has been done on the effects of facial abnormalities. Averageness and symmetry are predictors of attractiveness (Foo et al 2017; Jones & Jaeger, 2019), but faces with visible differences are by definition not average and with high probability not symmetric. Similar to the 'beauty is good' (and unattractive is bad) stereotype (He et

al., 2022; Dion et al., 1972), there seems to be another aspect of this stereotype that indicates that divergence from facial norms is worse. Looking at abnormal faces has been linked to a saliency response in perceptual brain networks, while simultaneously, deactivation of social brain areas can be observed (Hartung et al., 2019). The disengagement of social brain networks when looking at abnormal faces may reflect social disengagement and possible dehumanisation. A recent eye-tracking study confirmed that people with high levels of implicit bias spend less visual attention on anomalous facial anatomy (Villavisanis et al., 2023). People hold negative prejudices against people with facial differences and disadvantage them in socio-economic games (Workman et al., 2021). These effects seem to be particularly high in people who hold high just-world beliefs (Workman et al., 2021), meaning that they believe that the world is just and works in a way that people get what they deserve (Lucas et al., 2011).

Negative perceptions of people with facial differences have been found to occur implicitly, shaping judgments across various traits and abilities (Stone, 2022). This implicit bias appears to be deeply ingrained. Automatic associations are found to persist despite familiarity, or being acquainted with, someone with a facial difference (Grandfield et al., 2005). The suppression of automatic associations requires conscious effort (Grandfield et al., 2005), so while individuals may actively regulate their biases, the underlying implicit associations remain intact. Indeed, Stone and Potton (2017) showed that stronger negative emotions were evoked and exhibited toward facial differences when anonymity is high, but these negative reactions were found to be suppressed in socially accountable settings. This highlights that bias toward facial differences occurs automatically but is regulated when social norms discourage overt prejudice.

The media often exploits the link between facial appearance and social judg-

ments to convey moral flaws or conflicts. Have you ever wondered why it is sometimes so easy to identify the villain in a movie or book just by the way a character looks? Villains are frequently displayed with facial differences, like Scar in *The Lion King*, and in the masks of the Chinese Opera and the Dan culture of Western Africa, asymmetric masks represent ugliness and moral failing (Scheuerle & Mohs Firth, 2021). Antagonists are portrayed to be older, maimed, scarred, paler, deformed and acquiring disabilities or visible differences is a common trope in villain origin stories (e.g. Darth Vader in *Star Wars*). The tropes of marking villainy by visible difference are especially prominent in media aimed at children and adolescents (Croley et al., 2017), reinforcing harmful stereotypes.

### **Facial mutilation as punishment**

Associating people with facial differences with moral flaws seems common, but many cultures currently have, or have had in the past, (illegal) practices or even laws that involve punishments to take away attractiveness or facial features from people who are considered moral violators. Historically, we can see evidence of the legal practice of facial mutilation and facial branding of women who were accused of affiliating with the enemy during war time. Even in present times, facial mutilation is surprisingly common in – and outside of – legality. For example, honour crimes or vitriol crimes are a common form of vengeance and humiliation to deface someone, often women accused of infidelity, non-reciprocal lovers, or assumed members of opposing gangs. Facial disfiguration has been prevalent throughout history and across cultures. Mutilation of the ears and nose is documented as a punishment in the New Kingdom Egypt (1550-1070 BCE), during the medieval and early modern period (e.g. King Edmund's (920-946) third law code; Cock & Skinner, 2019; Cole et al., 2020; Wormald, 1999), and in Jefferson's Bill 64 (1779; Cock, 2019).

Nasal mutilation has also been observed in medieval Spain, Novgorod (the Russian state from 12th to the 15th century), and the Holy Roman Empire (Byzantine). Types of facial mutilation started to evolve in the early modern period, with acid attacks becoming more common in the UK, East and South Asia due to vitriol (sulfuric acid) being manufactured on an industrial scale in the 1740s (Anderson, 2013). While there are significant cultural differences in choice of weapon and relationships between victims and perpetrators, facial disfiguration with punishment as a motivation seems to be distributed in many cultures. Historic instances of facial disfiguration often resulted as punishment for moral transgression regulated by law. Modern facial disfiguration more frequently stems from a need for revenge for perceived moral transgressions on a personal level, particularly in the cases of romantic or sexual disputes, which reflects nasal mutilation for adulterous women, historically.

Universally, the aim of facial disfiguration is about ongoing punishment through humiliation. Aside from the physical, psychological, and psychosocial effects on the victim as a direct result of the sustained injuries, a permanently changed face impacts virtually every aspect of a person's life. Facial disfiguration is a means of destroying appearance and, more often than not, facial symmetry which is strongly linked to beauty and perceptions of trustworthiness as a proxy of moral goodness (Todorov, 2009). Intentional disfiguration aims at ongoing punishment through humiliation by impacting a person's ability to communicate and interact socially. What cognitive mechanisms of face processing underlie this stigma?

### **What are the effects of acquiring a facial difference on face processing?**

First, an obvious impact of an acquired facial difference is a change of appearance which may impact facial recognition and face processing. People who know the affected person need to grow accustomed to

the facial change to recognise the person. This involves updating or forming new memories and adding new information to existing knowledge about a person's appearance. It might even risk failure to recognise them. An existing schema or template of someone's face in our memory would need to incorporate a past and current version that links to the memory of that person, including visual, emotional, and motor components. Facial differences do not only impact appearance but also the mobility of facial features. They can impair facial movement and distort facial expressions which makes it more difficult for people to express themselves and for others to recognise their facial expressions. To my knowledge, there is no empirical evidence on whether emotions or facial expressions are more difficult to process and recognise in faces with visible differences. However, there is some tentative evidence from faces altered by natural aging: while the impact of hyperfunctional facial lines produced by repeated expressions of emotion over lifetime are slightly different from acquiring a facial difference, they have been linked to erroneously inferring impressions of emotion and personality (Finn et al., 2003).

Second, the acquired facial difference also affects visual saliency by drawing attention to the facial difference and away from areas that are critical for face processing. People with facial differences are stared at more than people without facial differences (Halioua et al., 2011), but avoidance responses towards facial stigma especially do not occur during covert attention (Boutsen et al., 2021). Facial differences are highly salient, automatically capturing attention and consequently, influencing social judgement. This is congruent with neuroimaging findings showing that facial differences elicit heightened neural activity in visual processing regions of the brain (ventral occipito-temporal cortex and the fusiform gyrus) relative to the same faces without visible differences (Hartung et al., 2019).

Facial differences are highly noticeable and attention-grabbing due to their distinctiveness, but they also disrupt typical gaze behaviour, diverting focus from socially relevant cues such as the eyes (Rasset et al., 2022; 2023). Facial differences – likely due to their salience – appear to have a distinct effect on perceptual encoding and promote feature-based rather than holistic processing (Boutsen et al., 2021). Several eye-tracking studies have shown that participants fixate on areas affected by visible differences while reducing attention to the eyes (less frequent and shorter fixations; Ishii et al., 2009; 2016; Meyer-Marcotty et al., 2010; Morzycki et al., 2018; Rizvi et al., 2024; Villavisanis et al., 2023), a pattern which in some studies was associated with increased feelings of disgust, surprise, and anxiety (Rasset et al., 2022; 2023). This disrupted gaze pattern has significant consequences as it impairs emotional and social processing and hence reinforces negative emotional responses toward individuals with facial differences (Rasset et al., 2022; 2023; Stone & Pottton, 2017), a process that may facilitate dehumanisation. Villavisanis and colleagues (2023) illustrated that individuals with higher implicit bias actively avoided looking at affected facial regions, whereas those with greater empathy focused more on non-anomalous regions.

Third, looking at faces with visible differences often elicits strong negative emotions, particularly fear and disgust. Stone and Pottton (2017; see also Shanmugarajah et al., 2012) found that participants experienced stronger negative emotions (anger, fear, disgust, anxiety, embarrassment and repulsion), stronger sorrow emotions (sadness and sympathy), stronger curiosity and surprise and weaker positive emotions, when they viewed disfigured faces compared to unattractive or attractive faces. Especially when facial differences affect the internal expressive features of a face, stronger emotional reactions are elicited than if the facial difference concerns the forehead. They also found a link between attention to facial differences

and negative emotion with disgust sensitivity (Stone & Potton, 2017).

We know that emotions affect almost every aspect of cognitive processing, including memory. The insular cortex linked to disgust and the amygdala linked to valence, fear and threat have both been linked to processing of disfigured faces. While the amygdala is known to mediate memory, disgust stimuli suppress attention (Krusemark & Li, 2011; Santos et al., 2008). Indeed, people have poorer recall of the contents of a conversation when a speaker has a visible difference (Madera & Hebl, 2012; Stevenage & Furness, 2008). This effect may be explained by both bottom-up attention being diverted towards the facial difference and top-down attention being suppressed by feelings of disgust resulting in less attention and poorer memory of the contents of a social interaction.

Finally, facial differences can impact the accuracy of interpreting facial expressions. One possible underlying mechanism might be an impairment of our mirror neuron system by attention distracted away from expressive features and lack of symmetry of those expressive features. The default location for attention in a typical face is the internal expressive features of eyes, mouth and nose (e.g. Kelly et al., 2010; Oosterhof & Todorov, 2008; Walker-Smith et al., 2013). This helps us recognise facial expressions and underlying intentions and emotions. Mirror neurons play a crucial role in processing facial expressions because they help us understand and emotionally resonate with others by internally simulating what we observe on their faces (Bonini et al., 2022). Looking at faces, normally automatically activates motor programs associated with producing that expression. These motor representations help simulate the emotion internally and allow for rapid and intuitive recognition of the emotional state without conscious reasoning (Sato et al., 2023). If the face we are processing is fundamentally different from our own, or unsym-

metric, this process might be disrupted and assigned with higher ambiguity which in turn may increase anxiety and fear responses. This would explain why participants react more to facial differences in the centre of the face (where the expressive features are) than on the periphery (Gardiner et al., 2010). Faces that are structurally different, may fail to fully engage the mirror system because the features are too atypical, asymmetric, or emotionally ambiguous. This failure of engagement could lead to impaired empathy and reduced facial mimicry – potentially contributing to social disengagement. Studies using facial electromyography have shown that blocking mimicry (e.g. by inhibiting facial muscles) reduces emotion recognition accuracy, especially for subtle or ambiguous expressions (Oberman et al., 2007).

### **Conclusion**

Faces with visible differences are often implicitly perceived as more threatening, even when there is no actual threat or negative expression present. Ambiguity or misattribution of negative emotion to faces with facial differences increases saliency and attention and may lead to fear responses and reduced perceived trustworthiness. There is substantial evidence that threat-related and fearful stimuli modulate attention. While faces with visible differences are not inherently threatening, they are often perceived that way due to neural systems for rapid anomaly detection, implicit cultural biases linking atypical appearance with moral or physical threat, and misinterpretation of emotional expression. This perception arises from a mix of evolved cognitive biases, visual salience, and learned stereotypes. This links back to the portrayal of villainy in media and literature, often by making a character stand out visually. As less frequent stimuli, faces with visible differences are also less familiar and hence can further elicit or increase fear responses.

Faces are fundamental to human social interaction, serving as powerful conduits for identity, emotion, and moral judgment. Our perceptual and cognitive systems are finely tuned to process facial information rapidly and intuitively – so much so that even minor deviations from typical facial configurations, such as those introduced by visible differences, can disrupt recognition, empathy, and social engagement. Acquired facial differences impact more than appearance; they profoundly affect how others perceive, attend to, and emotionally respond to the individual. These responses are shaped by deeply ingrained neural mechanisms, cultural narratives, and social learning that associate facial typicality with goodness and anomaly with threat. Consequently, facial differences often lead to reduced eye contact, distorted emotional

processing, and implicit bias – even among well-intentioned observers. Historically and in modern contexts, facial disfigurement has been used as a tool of punishment and dehumanisation, reinforcing the persistent moral symbolism attached to facial appearance. Understanding the cognitive and neural underpinnings of this stigma is essential not only for fostering empathy and dismantling prejudice, but also for creating a society where all faces – regardless of symmetry, familiarity, or normativity – are treated with equal dignity and humanity.

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