The perception of illusory faces in examples of face pareidolia is supported by high spatial frequency content.

The ability to detect and interpret faces is fundamental to human communication. Faces convey complex information about a person’s identity, intention and emotional state, as well as other cues that inform our initial impression of someone and how we chose to behave towards them (XXX). This impressive capability for finding and extracting such information from faces is thought to be subserved by specialised cognitive and neural mechanisms (Kanwisher, 2000; Omer et al., 2019) but there is still considerable debate about whether these mechanisms are specialized for face perception per se, or whether a more simple explanation is that these mechanisms are responsive to image properties that occur in human faces, such as bilateral symmetry, round shapes or skin colours and textures (XXX).

A new approach that is being used to shed light on the tuning properties of face-selective mechanisms involves measuring the neural correlates of face pareidolia. Face pareidolia is the common misperception of illusory faces on ordinary objects. Our perception of face pareidolia is thought to be informative because, despite the differences that exist between examples of face pareidolia and real faces at the image level, they trigger the behavioural signature of face detection in human (Keys et al 2020; Caruana & Seymour 2022) and nonhuman primates (Taubert et al., 2017) and they elicit more activity than ordinary non-face objects from face-selective mechanisms in the primate brain (Decramer et al., 2021; Rekow et al., 2022; Taubert et al., 2018; Taubert et al., 2021; Taubert et al., 2022; Wardle et al., 2020). However, there have been few attempts to quantify the image properties that give rise to these illusory faces.

Numerous findings have indicated that the initial processing of human faces is dependent on low-spatial frequency content (XXX) with researchers arguing that this dependency reflects rapid processing in a subcortical route with low visual fidelity (XXX). Since there has been a clear indication that face pareidolia also drives activity in this subcortical route (Taubert et al. 2018; Guillon et al., 2016), it follows that the perception of illusory faces in examples of face pareidolia might be carried by low-spatial frequency content. Here, our primary goal was to test this hypothesis and determine whether the illusory faces that emerge spontaneously in examples of face pareidolia are carried by low-spatial frequency content.

However, examples of face pareidolia are spontaneous in nature and tend to vary in a number of socio-emotional cues that are thought to be mediated by spatial frequency content. For example, illusory faces vary in their facial expressions (Alais et al., 2021; Wardle et al., 2022) and gaze direction (Palmer & Clifford, 2020). There is a longstanding presumption in cognitive neuroscience that emotional valence (either positive, happy expressions or negative, threatening expressions) are carried by low-spatial frequencies, though empirical findings have been mixed. Inconsistencies may be, in part, due to a large proportion of these studies using posed expressions, lacking in spontaneity and ecological validity (Dawel, 2021.) Further, some researchers have filtered their stimuli using imprecise methods available in point-and-click software packages. These filters might lack the accuracy that is necessary for inferences about spatial frequency content because they operate on pixel radius as opposed to cycles per frame.