

SHORT AND SWEET**Gaze cueing by pareidolia faces****Kohske Takahashi**Research Center for Advanced Science and Technology, The University of Tokyo, 4-6-1, Komaba, Meguro-ku 153-8904, Tokyo, Japan; e-mail: ktakahashi@fennel.rcast.u-tokyo.ac.jp**Katsumi Watanabe**Research Center for Advanced Science and Technology, The University of Tokyo, 4-6-1, Komaba, Meguro-ku 153-8904, Tokyo, Japan; e-mail: kw@fennel.rcast.u-tokyo.ac.jp

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Abstract. Visual images that are not faces are sometimes perceived as faces (the pareidolia phenomenon). While the pareidolia phenomenon provides people with a strong impression that a face is present, it is unclear how deeply pareidolia faces are processed as faces. In the present study, we examined whether a shift in spatial attention would be produced by gaze cueing of face-like objects. A robust cueing effect was observed when the face-like objects were perceived as faces. The magnitude of the cueing effect was comparable between the face-like objects and a cartoon face. However, the cueing effect was eliminated when the observer did not perceive the objects as faces. These results demonstrated that pareidolia faces do more than give the impression of the presence of faces; indeed, they trigger an additional face-specific attentional process.

Keywords: Pareidolia, gaze cueing, social attention, face-like objects

Objects are sometimes seen differently from their actual forms. For instance, clouds in the sky, the Cydonia region of Mars, and electrical outlets are often misperceived as faces (pareidolia phenomenon, [Figure 1a](#)). Pareidolia faces give people a strong impression that a face is present in an object, and this impression is accompanied by face-related brain activity (Hadjikhani, Kveraga, Naik, & Ahlfors, 2009). Even so, it is unclear how deeply pareidolia faces are processed as faces. Real (or cartoon) faces automatically trigger the processing of face-related features (e.g., identity, emotion, traits, or gaze). In particular, perceiving eye gaze elicits a reflexive shift of attention (gaze cueing; Frischen, Bayliss, & Tipper, 2007) towards where the gaze is directed.

The present study investigated whether gazes of face-like objects would trigger this reflexive attention shift. The face-like objects were modified so that the objects, when seen as faces, contained a directional gaze ([Figure 1a](#)).

Experiment 1 examined the cueing effect when observers were explicitly instructed that the objects could be seen as faces. The cue stimulus was the picture of a face-like object (either a cabinet or an electrical outlet), a cartoon face, or a frame circle (1.8°). Before the experiment, the pareidolia phenomenon was explained to the participants. Post-experiment interviews confirmed that all participants correctly discriminated the gaze direction. A trial began with the presentation of a red fixation point (500–1500 ms) followed by the cue stimulus that had eye gaze toward either the left or right. A target white dot (0.6°) appeared at 5.9° left or right from the fixation 176 ms after the cue onset. The participants indicated the position of the target as quickly and accurately as possible by pressing the corresponding keys. The cue was considered congruent when it was directed at the position of the target. There were 120 trials with the cartoon-face cue and 240 trials with the face-like object cue. The cue did not predict the target position. There were also 36 catch trials in which the frame circle was presented and the participants needed to withhold a response.

Experiment 1 demonstrated that the face-like objects could elicit a reflexive attention shift ([Figure 1b](#) and [1c](#)). The target at the cued location was detected more quickly than the target at the uncued location ($F(1, 12) = 23.5, p < 0.001$). The magnitudes of the cueing effects were comparable between the cartoon-face and face-like objects (interaction: $F(1, 12) = 0.48, p = 0.50$).

The pareidolia phenomenon involves individual differences in individuals' spontaneous awareness of faces (Uchiyama et al., 2012). Therefore, Experiment 2 investigated the role of face awareness. No explanation about the pareidolia phenomenon was given before the experiment. The cartoon face was replaced with a non-facial object (telephone). After the experiment, participants were asked if they were aware of the face during the experiment.

Experiment 2 showed that the reflexive attention shift occurred only when the observers perceived the object as a face (Figure 1d and 1e). Half of the participants reported that they perceived the face-like objects as faces, while the other half reported that they did not perceive these objects as faces. Face-awareness and cue-congruency showed a significant interaction ($F(1, 20) = 4.64, p < 0.05$); cue-congruency was significant for those who interpreted the stimuli as a face ($F(1, 10) = 14.8, p < 0.001$) but not for those who did not interpret it as a face ($F(1, 10) = 2.40, p = 0.15$). Error rates were also lower in the congruent condition than in the incongruent condition except when the objects were not seen as a face, which would support that the pareidolia faces modulate the attentional shift.

Directional stimuli other than faces (e.g., an arrow) also modulate attentional orienting (Brignani, Guzzon, Marzi, & Miniussi, 2009). In our experiments, it is possible that the asymmetry of the face-like objects (Figure 1a) might have elicited the cueing effect. If so, we would expect the cueing effect irrespective of the face awareness. However, since the gaze cueing was not observed when the

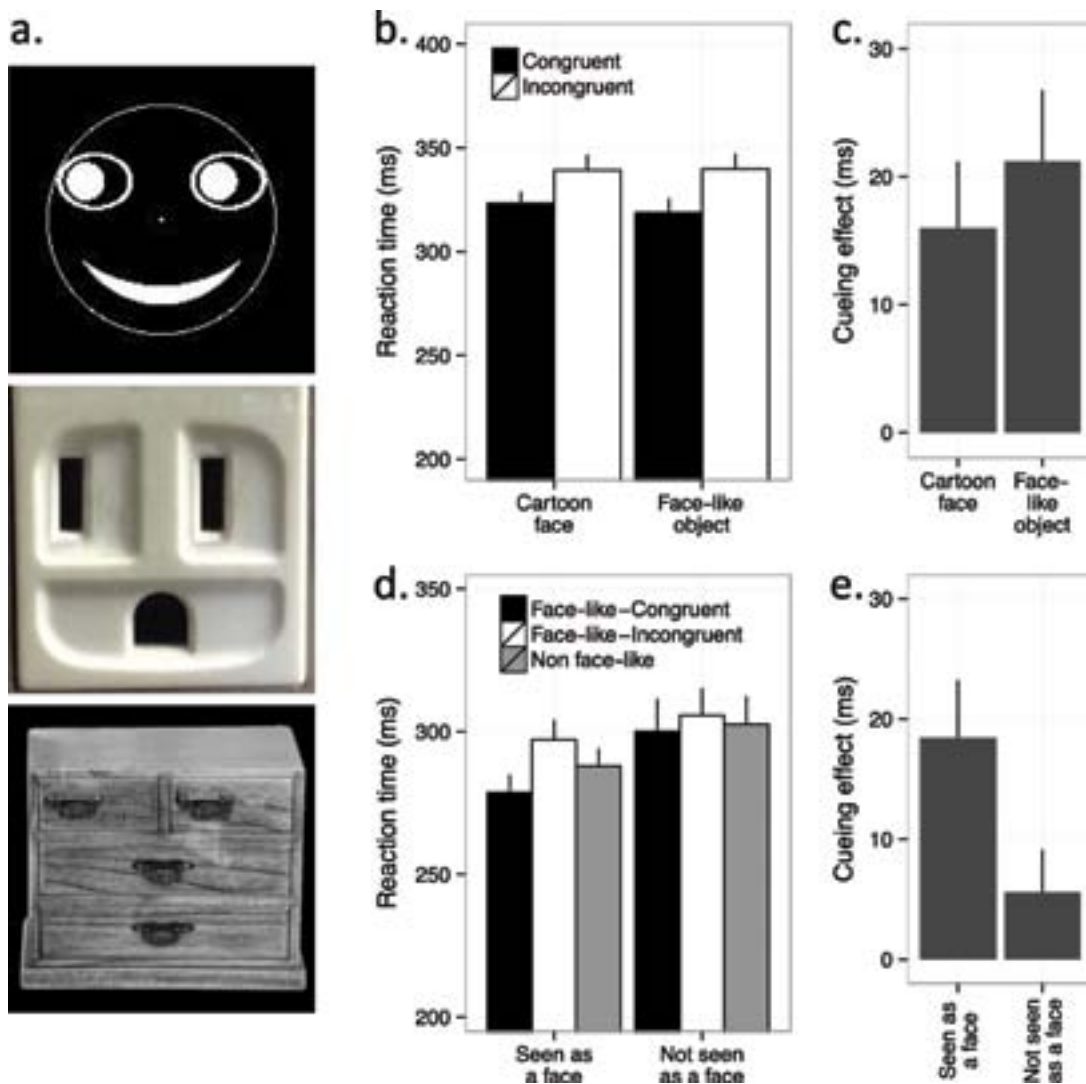


Figure 1. (a) Illustration of a cartoon face and face-like objects. All have a left-directed gaze. (b) and (c) Reaction time (b) and magnitude of cueing effect (c) in Experiment 1. The error bars indicate the standard error from the mean. (d) and (e) Reaction time (d) and magnitude of cueing effect (e) in Experiment 2.

participants were not aware of the face, it is likely that the cueing effect observed here would not arise from the geometric asymmetry, but from face-related processing.

Ristic and Kingstone (2005) presented an ambiguous stimulus that could be seen as either a car or a face and observed the gaze cueing effect only for the observers who were told that the ambiguous stimuli depicted a face, which implied that the gaze cueing depends on the subjective interpretation of stimuli. Our study further emphasized the robustness and automaticity of the attentional shift by gaze. In the pareidolia phenomenon, the visual stimuli have no ambiguity. Observers know obviously what the objects are and that the objects are not a face. Thus, it might be reasonable to ignore the gaze, since the object is not a face. Nevertheless, once the participants saw the “faces” in the objects, gaze of the pareidolia faces mandatorily modulates attention regardless of what the object is. Resistance would be futile even if one figured out that the objects are not a face.

Pareidolia faces do more than give the impression of the presence of faces. Perhaps, anything that is potentially seen as a face would trigger this gaze cueing effect, regardless of what that object is exactly. This might seem futile because the “gaze” of face-like objects cannot signal any beneficial information; however, the threshold for triggering the gaze process might be low, which would then increase individuals’ chances of avoiding potential danger in order to survive (e.g., Chen & Yeh, 2012).

In this study, we examined only reflexive attention; however, individuals can also infer facial information—such as emotional expression, personality, or identity—from face-like objects (Windhager et al., 2008). Further studies are necessary to determine whether face-like objects automatically trigger face-related processes other than reflexive attention shifts.

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