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Averted eye-gaze disrupts configural face encoding☆

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HIGHLIGHTS

- In the current research, two experiments detail how eye-gaze orientation (direct vs. averted) modulates how perceivers process faces.
- Experiment 1 finds that averted gaze disrupts configural face encoding (compared to direct eye-gaze) using a version of the composite face procedure.
- Experiment 2 manipulates whether perceivers can engage in configural encoding using face-inversion, and finds that inversion effects are greater for faces with direct than averted-gaze.
- Collectively, these present findings extend research on the social cognitive implications of eye-gaze.

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ABSTRACT

Faces are processed in a configural manner (i.e., without decomposition into individual face features), an effect attributed to humans having a high degree of face processing expertise. However, even when perceiver expertise is accounted for, configural processing is subject to a number of influences, including the social relevance of a face. In the current research, we present two experiments that document the influence of eye-gaze direction (direct or averted) on configural encoding of faces. Experiment 1 uses a version of the composite face paradigm to investigate how eye-gaze influences configural encoding. The results indicate that averted gaze disrupts configural encoding compared to direct eye-gaze. Experiment 2 manipulates whether perceivers can engage in configural encoding using face-inversion, and finds the inversion effects are greater for faces with direct than averted-gaze. We interpret these results as evidence that averted eye-gaze signals that a face is subjectively unimportant, thereby disrupting configural encoding.

Introduction

Faces are central to social cognition, conveying information about a target's sex, age, race, emotional state, and identity (Hugenberg & Wilson, 2013; Macrae & Quadflieg, 2010). Given the significance of the face to navigating a wide variety of situations, it is perhaps not surprising that humans process faces differently than virtually all other stimuli. Specifically, there is considerable evidence that faces are processed in a *configural* manner, which emphasizes the spatial relations between face parts over the individual face features themselves (e.g., Farah, Wilson, Drain, & Tanaka, 1998)—a processing style indicative of well-honed perceptual skill (Diamond & Carey, 1986; Maurer, Le Grand, & Mondloch, 2002).[1]

Although configural encoding is a hallmark of face processing, there is evidence that this ability is not unconditionally deployed, but instead may be a motivated and resource dependent process (e.g., Palermo & Rhodes, 2002). For example, configural encoding occurs strongly for faces of a perceiver's racial ingroup, while other-race faces are often instead processed in a component-based, *featural* fashion typical of non-experts (e.g., Rhodes et al., 2009; Tanaka, Kiefer, & Bukach, 2004). Although this asymmetry in processing styles has been attributed to differential expertise processing same-race and other-race faces (e.g., Michel, Rossion, Han, Chung, & Caldara, 2006), similar ingroup advantages in configural encoding have been observed even when perceiver expertise is held constant. To illustrate, using a paradigm designed by Young, Hellawell, and Hay (1987) to measure configural

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[1] Following Maurer et al. (2002), herein we define holistic processing as a subset of configural processing.

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encoding, Hugenberg and Corneille (2009) found that perceivers encode social ingroup faces more configurally than social outgroup faces, despite all of the faces being the same-race as participants (see also Michel, Corneille, & Rossion, 2007; Young & Hugenberg, 2010). In other experiments, directly manipulating the apparent social status of same-race targets (e.g., janitor vs. CEO) elicits greater configural encoding of high status faces (Ratcliff, Hugenberg, Shriver, & Bernstein, 2011). Thus, the processing style used during face encoding appears to be sensitive to the group membership or social relevance of a face; although, as discussed in detail below, this conclusion has been criticized by some in the face perception literature on methodological and theoretical grounds (e.g., Richler & Gauthier, 2013).

Eye gaze, social relevance, and face processing

Previous research has documented that group memberships or social status can influence configural encoding. Recent models of ingroup/outgroup biases in face perception (e.g., Hugenberg, Wilson, See, & Young, 2013; Hugenberg, Young, Bernstein, & Sacco, 2010; Van Bavel, Swencionis, O'Connor, & Cunningham, 2012; Young, Hugenberg, Bernstein, & Sacco, 2012) argue that such factors have their effects because they signal the subjective relevance of a face, triggering perceivers to deploy their scarce processing resources. From this perspective, signals of relevance come not just from a target face's social categories, but also from their behaviors (e.g., Shriver & Hugenberg, 2010) and other transient states.

Eye-gaze is just such a source of this valuable social information. In humans, eye-gaze can signal the subjective social value of a target, or the extent to which a target is worthy of extensive face processing. To illustrate, compared to faces with averted gaze, faces displaying direct gaze are more attentionally captivating (Frischen, Bayliss, & Tipper, 2007), are perceived as more affiliative (e.g., Mason, Taktow, & Macrea, 2005; Wirth, Sacco, Hugenberg, & Williams, 2010), and are associated with approached-motivated facial expressions (Slepian, Weisbuch, Adams, & Ambady, 2011). Importantly, eye-gaze orientation has been also shown to influence facial identity recognition, with averted eye-gaze reducing memory accuracy (e.g., Adams, Pauker, & Weisbuch, 2010; Mason, Hood, & Macrae, 2004). In line with well-established models of face memory biases, Adams et al. (2010) attribute this memory deficit to averted eye-gaze signaling that a face is subjectively unimportant to attend to and encode. This latter finding is especially significant when considering the potential impact of eye-gaze on configural processing. Processing style differences (configural vs. featural encoding) have been posited to play a causal role in face memory, with configural encoding hypothesized to undergird accurate face memory (e.g., Maurer et al., 2002; Tanaka et al., 2004). If averted eye-gaze disrupts face memory, this may be due to eye-gaze orientation exerting an influence on face perception, specifically whether a face is processed in a configural or featural manner.

Current research

Configural processing is a foundational process in face perception, playing a key role in how humans extract information from and encode others' faces (Maurer et al., 2002). Collectively, there is clear evidence that eye-gaze orientation (direct vs. averted) influences the perceived social value of a face and affects face memory, however, as yet no research has demonstrated that targets' eye gaze influences configural processing. The current research is designed to directly test this hypothesis. We present two experiments providing novel evidence that averted eye gaze (compared to direct eye gaze) disrupts configural face processing, even when holding constant factors such as perceiver expertise and group membership. In Experiment 1 we manipulate targets' eye gaze within-subjects (direct vs. averted), and employ the classic version of the *composite face paradigm* (Young et al., 1987) to demonstrate that the strong configural face processing observed for faces with direct eye gaze is disrupted by averted eye gaze. In Experiment 2, we replicate these findings using a manipulation of face inversion, perhaps the best-known means of disrupting configural face processing (Yin, 1969). Again, configural processing is observed more strongly for direct eye gaze, as compared to averted eye gaze faces. These findings broaden the scope of social cues that influence face processing by involving a cue that is both dynamic and subtle, with implications for work on face memory as well as more general models of face processing.

Experiment 1

Experiment 1 measures whether averted-gaze disrupts the typically strong configural face encoding seen for direct-gaze faces, using the composite face paradigm as a measure of configural processing (Young et al., 1987). In the version of the composite face task employed here, participants are presented two faces in quick succession—a target—face followed by a test-face—and are tasked with deciding whether the *top* half of the two faces are the same or different. Whereas the top half of the second face (i.e., test-face) is sometimes the same and sometimes different across trials, the bottom half of the face is always different, creating a new "composite" face (see Fig. 1). Because configural processing involves creating a Gestalt of all of the features together, placing a new bottom half on a face actually changes the percept

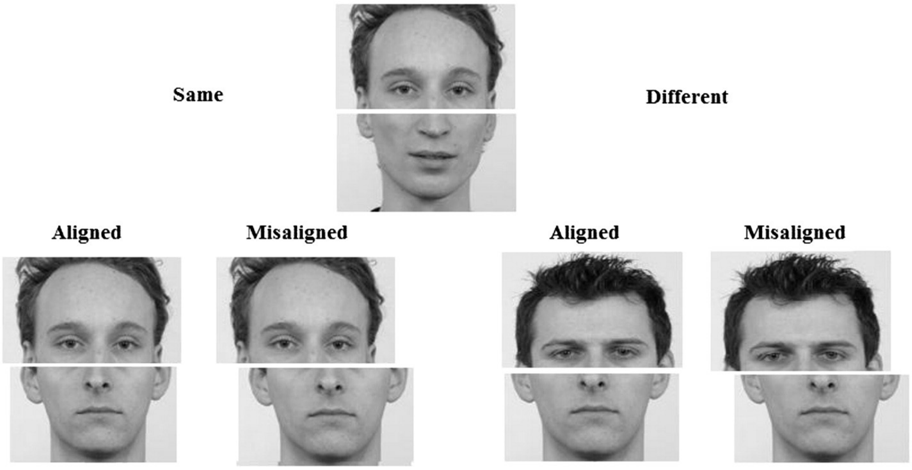

Fig. 1. Illustration of composite face task.

of the top half, making the decision more difficult than it may otherwise seem. However, the same-different decision can be made much easier by disrupting the typical configuration of a face. To do this, in half of the trials, the bottom half of the face is laterally offset from the top half.

Configural encoding is indicated by both decreased recognition accuracy and slowed reaction times to render same/different decisions on trials where the top-half of the target face is aligned with a novel bottom-half, compared to trials where the familiar top-half is misaligned with the novel-bottom half (e.g., Rossion, 2013; Singer & Scheinberg, 2004). These performance decrements are taken as evidence that the top portion of the target-face appears qualitatively different when aligned with a novel bottom-half because the two face-halves are being processed in a configural manner. Using this version of the composite task, the critical trials are therefore those when the top-half of the face is the "same" on both the target-face and test-face, and the lateral alignment of the novel bottom-half face is manipulated, as these trials provide evidence for the configural integration of the familiar top-half of the target-face and novel bottom-half of the test-face.

In line with past research demonstrating that averted eye gaze undermines face memory (e.g., Adams et al., 2010), we hypothesize that averted eye gaze will undermine configural processing. In the current experiment, we predict this composite face effect will occur for direct-gaze, but will be attenuated for averted-gaze faces, indicating strong configural encoding for direct-gaze, but not for the averted-gaze faces.

Method

Participants

38 White undergraduates (21 females) completed the experiment in exchange for partial course credit.

Materials and procedure

The stimulus faces depicted 16 neutrally-expressive Caucasian targets (8 females, 8 males) presented in color and sized to 500 × 550 pixels. The faces were selected from the well-validated Radboud face database (Langner et al., 2010). Each of these faces were photographed with direct and averted gaze, thus the direction of eye-gaze was not manipulated using photo software or other artificial means. The 16 target-faces were split into two groups of 8 faces, each comprised of 4 female/4 male faces. Between-subjects, we counterbalanced which group was shown with direct and averted gaze. Random assignment to one of two counterbalancing conditions determined which group of faces was viewed showing direct or averted gaze. Thus, participants viewed all 16 target-faces, with 8 displaying direct gaze and the remaining 8 displaying averted-gaze. For faces with averted-gaze, half of the faces were gazing to the left, and the remaining half were gazing to the right. The averted target-faces were shown looking away during both the initial face presentation and during the test-phase of each trial (i.e., the averted face trials showed only averted-gaze faces at presentation and test).

To generate the composite faces, each face was first split into a top and bottom-half, with the dividing line being the approximate middle of the nose. These images were used as the target-stimuli. Next, for each of these 16 target-faces, four composites were created: two "same" and two "different" composites. Each of the "same" composites consisted of the top half of the original target-face and the bottom half of a different face of the same gender. Each of the two "different" composites consisted of both new top and bottom halves of a face of the same gender. As a result, the "same" composites consisted of identical top halves paired with different bottom halves (compared to the original target-face), while the "different" composites were different top and bottom halves than the target-face, thus creating entirely novel faces. As described above, for each of the two "same" and "different" composites, one was aligned (the top half was presented directly over the bottom half) and one was misaligned (the top-halve was laterally offset from bottom halve).

Each trial began with a fixation marker presented for 1000 ms at the center of a computer screen. A target-face was next shown for 300 ms before being occluded by one of four patterns of random Gaussian noise, which remained on screen for 500 ms. A test-face was then shown until participants responded via keystroke. For each trial, participants were instructed to indicate whether the top-half of the test-face was the same or different as the top-half of the target-face. The same/difference judgments were rendered using the "A" and "L" keys, respectively. For each response, both accuracy and reaction time were recorded. The experiment was a 2 (Gaze Direction: direct, averted) × 2 (Composite Type: aligned, misaligned) within-subjects design.

Results and discussion

Of interest was whether participants showed stronger composite-face effects (i.e., more accuracy on misaligned than aligned trials) for direct-gaze than averted-gaze faces. As noted above, and consistent with research employing the present version of the composite face task, only responses on "same" trials were used for the calculation, as these are the trials that allow for a measure of whether the top and bottom halves of the test face are integrated into a configural face representation when aligned with each other (e.g., Hugenberg & Corneille, 2009; Michel et al., 2006, 2007). Both response latencies and proportion correct for participants' responses were calculated separately for direct- and averted-gaze faces.

To test our predictions, we first submitted the accuracy scores to a 2 (Gaze Direction) × 2 (Composite Type) repeated-measures ANOVA. This ANOVA revealed a main effect of gaze direction, with averted-gaze faces being recognized more accurately than direct-gaze faces, $F(1, 37) = 9.46$, $p < .01$, $\eta^2 = .20$. However as predicted, this main effect was qualified by an interaction between gaze direction and composite type, $F(1, 37) = 6.19$, $p = .02$, $\eta^2 = .14$. As seen in Fig. 2, for faces displaying direct-gaze the composite-face effect was observed, with participants demonstrating less accuracy for aligned ($M = .87$, $SD = .14$) than for misaligned faces ($M = .92$, $SD = .11$), $t(37) = -2.02$, $p = .05$, $d = -.40$. However, for faces displaying averted eye-gaze no composite-face effect was observed, with participants demonstrating equivalent accuracy for aligned ($M = .94$, $SD = .09$) and misaligned faces ($M = .91$, $SD = .10$), $t(37) = 1.42$, $p = .16$, $d = .31$. In short, the classic pattern of configural processing observed for direct eye gaze was disrupted by averted eye gaze.

Of additional interest is whether similar results occur for response latencies. To test this, we first removed error trials and any individual response times ±2.5 standard deviations from participants mean response latency. Following this, we submitted participants' untransformed reaction times (RTs) to render their same/different judgments

Fig. 2. Proportion correct for "same" trials for faces displaying direct and averted-gaze. Error bars represent standard error of the mean.

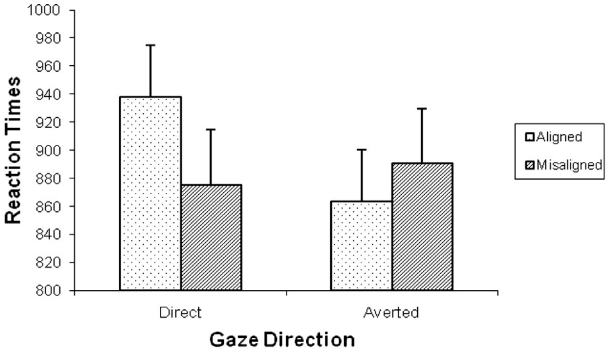

Fig. 3. Reaction times to render same/different decisions for faces displaying direct and averted-gaze on aligned and misaligned trials. Error bars represent standard error of the mean.

on "same" trails to a 2 (Gaze Direction) × 2 (Composite Type) repeated measures ANOVA. This analysis produced a significant interaction, $F(1, 37) = 5.20$, $p = .03$, $\eta^2 = .12$ (Fig. 3). As predicted, for faces displaying direct eye-gaze, participants were slower to make same/different decisions when the top and bottom-halves of the composite faces were aligned ($M = 937$, $SD = 302$) relative to when they were misaligned ($M = 875$, $SD = 241$), $t(37) = 2.47$, $p = .02$, $d = .23$, indicating the typical pattern of configural processing. However, for averted-gaze faces, the alignment manipulation had no influence on RTs (aligned: $M = 863$, $SD = 224$; misaligned: $M = 891$, $SD = 255$), $t(37) = -.89$, $p = .38$ $d = -.12$, indicating disruption of configural processing. In summary, on both measures of accuracy and response time in the composite face task, the current results suggest that averted eye-gaze disrupts configural encoding.

Experiment 2

Experiment 1 provides evidence that configural encoding is sensitive to eye-gaze orientation. These findings are consistent with past demonstrations that configural encoding is sensitive to social factors, including the purported race (e.g., Michel et al., 2007), social group membership (Hugenberg & Corneille, 2009), and social status (Ratcliff et al., 2011) of a target face. However, there has been considerable recent debate in the face perception literature as to how best to measure configural encoding, with some claiming that the version of the composite face paradigm used in Experiment 1 suffers from methodological shortcomings (e.g., Richler, Cheung, Wong, & Gauthier, 2009; Richler & Gauthier, 2013; Richler, Cheung, & Gauthier, 2011).

To summarize, Richler and colleagues have argued that the classic composite face task developed by Young et al. (1987) and used in Experiment 1 is a "partial" design due to the confounding of same/different and congruent/incongruent, arguably making it unclear whether a composite face effect reflects actual differences in configural encoding or a mere response bias. That is, in this "partial design," all "same" trials are also incongruent, in that they have the same top half but a different bottom half, whereas all "different" trials are congruent, in that both the top and bottom halves of the test face are different from the original face. To address this purported weaknesses, Richler and colleagues have designed a modified composite face paradigm, which they argue provides an unbiased measure of configural encoding (e.g., Richler et al., 2011; see also Bukach, Cottle, Ubiwa, & Miller, 2012). This newer version of the task (a "complete" design in their terminology) includes *congruent* trials, where both the top and bottom portion of the test-face are the same or different from the target-face, and *incongruent* trials, where only the top or bottom portion of the test-face differs. Then, the classic alignment manipulation is employed, leading to aligned/misaligned congruent and incongruent trials, respectively. In this case, both same and different trials are analyzed, providing a measure of accuracy that accounts for response biases.

This methodological debate bears not only on the interpretation of Experiment 1, but also on the larger theoretical question of whether configural encoding is subject to the influence of top-down factors. For instance, studies using the newer "complete" paradigm find that configural encoding is not affected by top-down factors (Richler et al., 2011), leading Richler and colleagues to argue that past demonstrations of social variables affecting face encoding using the "partial" composite task (e.g., Hugenberg & Corneille, 2009; Ratcliff et al., 2011) were caused by shifts in response bias.

However, in a detailed rebuttal, Rossion (2013) highlights several conceptual and methodological concerns with the "complete" composite task and argues in favor the design used in Experiment 1 and elsewhere. The basis of these concerns is that the emphasis on congruent vs. incongruent trials in the "complete" design is misplaced and measures attentional interference (akin to incongruent trials [e.g., red written in green print] impairing performance in the Stroop test) while failing to assess the *perceptual* process underscoring configural face encoding. Further, Rossion reiterates that the critical aligned and misaligned "same" trials in the classic composite task adequately and directly measure configural face perception, as the familiar top-half of the face is indeed perceived as qualitatively different when it is matched with a novel bottom half on aligned trials, leading to an increase in erroneous "different" response and slowed RTs that cannot be attributed to response bias.

Settling this matter is neither the primary aim nor within the scope of the current paper. Given the ongoing debate regarding potential difficulties with both versions of the composite face task (see Richler et al., 2011; Rossion, 2013), it seems important to replicate the findings of Experiment 1 with a separate means of assessing configural processing. Experiment 2 was designed to do just this by employing a second, commonly used means of manipulating configural processing: face inversion (Yin, 1969). Face inversion disrupts the usual configuration of face parts (e.g., the eyes are on the bottom of an inverted face) but does not interfere with the ability to process isolated features (e.g., the eyes still look like eyes). As such, inversion disrupts configural, but not featural, face processing (Maurer et al., 2002; Mondloch & Maurer, 2008; Tanaka & Sengco, 1997) and consequently impairs outcomes that rely on configural encoding. For example, inversion exerts a larger influence on face encoding and recognition than on a vast variety of non-face stimuli (e.g., cars, airplanes, houses; see Valentine, 1988). In the context of the current experiment, manipulating participants' ability to engage in configural face processing through inversion should therefore primarily affect faces with direct-gaze. To the extent that faces with averted gaze are not processed configurally, inversion effects should be weaker for these targets. We tested these predictions in a face memory task, where participants viewed faces with direct and averted gaze in either an upright or inverted orientation. For upright faces, we expect a memory advantage for direct, relative to averted gaze faces (e.g., Adams et al., 2010). Inversion is predicted to eliminate this advantage due primarily to a decrease in memory for faces with direct-gaze. Such

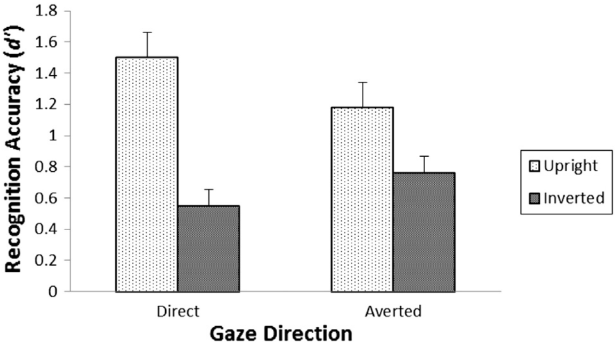

Fig. 4. Recognition accuracy for faces displaying direct and averted-gaze in upright and inversion conditions. Error bars represent standard error of the mean.

findings would indicate that the direct-gaze faces are encoded configurally, while averted-gaze faces are not.

Method

Participants

80 White participants (37 females) were recruited on Mechanical Turk (Buhrmester, Kwang, & Gosling, 2011) and were compensated \$0.30 for their participation. Of these, 5 participants failed to complete the experiment, and another 4 were removed due to below chance performance on the memory task, leaving a final sample of 71 participants.

Materials and procedure

All instructions, stimuli, and measures in the experiment were delivered and recorded using Qualtrics research software. The experiment began with instructions informing participants that they were completing a face perception task that involved first viewing faces and then later being asked questions about them. Face orientation (upright or inverted) was manipulated between-subjects and participants were randomly assigned to condition. We again used faces from the Radboud database (Langner et al., 2010) and manipulated gaze orientation within-subjects.

The face memory task was split into two portions: encoding and recognition. During the encoding phase of the task, participants viewed 16 faces: 8 direct-gaze (4 females; 4 males) and 8 averted-gaze (4 females; 4 males). Each encoding trial began with a central fixation point that was presented for 1000 ms, which was then occluded by a face displaying either direct or averted eye gaze. Each face was presented for 1000 ms, and was occluded by a blank screen. Faces were presented in a separate random order for each participant.

After participants had seen all 16 faces in the encoding phase, participants completed a 5-minute word search puzzle as a filler task designed to clear working memory. The words in the puzzle were unrelated to the experiment and neutrally valenced. Whether or not participants completed the puzzle, the filler task remained on screen for 5 min before the experiment automatically advanced. After the word-search puzzle, participants began the recognition phase of the experiment. To assess face memory, participants viewed the same 16 faces from the encoding phase randomly intermixed with 16 novel faces (8 direct-gaze; 8 averted-gaze [4 each female and male]). For each face, participants indicated whether they viewed the face earlier (i.e., it was "old") or not (i.e., it was "new"), via "A" and "L" keys, respectively.[2] Importantly, gaze direction was held constant across encoding and recognition, such that if a face was presented displaying averted or direct-gaze during encoding it was shown with the same gaze direction during recognition.

Results and discussion

In the current study, of particular interest was whether averted eye gaze disrupted the effects of face inversion on face recognition. While face inversion typically disrupts face recognition for direct-gaze faces (due to the disruption of configural processing; Yin, 1969), if averted-gaze faces are not processed configurally then inversion should have a comparatively weak influence on subsequent recognition.

To address this question, we first calculated face recognition sensitivity using the signal detection measure d', which accounts for both hits and false alarms (Green & Swets, 1966). Participants' sensitivity scores were then submitted to a 2 (Gaze Direction) × 2 (Face Orientation) mixed-model ANOVA, with the first factor within-subjects and the latter factor between-subjects. This ANOVA revealed a main effect of face orientation, $F(1, 69) = 19.73$, $p < .001$, $\eta^2 = .22$, with upright faces recognized more accurately than inverted faces, replicating the classic inversion effect in face perception (Yin, 1969). As predicted, however, this inversion effect was qualified by a significant interaction with gaze direction, $F(1, 69) = 4.82$, $p = .03$, $\eta^2 = .07$ (see Fig. 4).

As expected, for faces displaying direct-gaze, upright faces ($M = 1.50$, $SD = .91$) were recognized better than were inverted faces ($M = .55$, $SD = .75$), $t(69) = 4.80$, $p < .001$, $d = 1.15$. Although this upright ($\mathrm{M} = 1.18$, $\mathrm{SD} = .78$) over inverted ($\mathrm{M} = .77$, $\mathrm{SD} = .84$) effect was replicated for averted-gaze faces, $t(69) = 2.18$, $p = .03$, $d = .52$, it was significantly weaker. Comparing recognition for faces displaying direct and averted-gaze across conditions finds, as expected, that in the upright face condition, participants remembered faces with direct-gaze more accurately than those with averted-gaze, $t(33) = 2.21$, $p = .03$, $d = .38$, replicating the superior recognition for direct-gaze compared to averted-gaze faces (e.g., Adams et al., 2010). However, in the inverted face condition, there was no difference in recognition accuracy for faces with direct-gaze and averted-gaze, $t(36) = -1.12$, $p = .27$, $d = -.26$.

These results provide several important insights. First, we find superior memory for direct, relative to averted-gaze faces, replicating past work (e.g., Adams et al., 2010). Second, and important for the current work, we also demonstrated that averted eye gaze attenuates the classic inversion effect on face memory. Considered together with Experiment 1, these results provide additional evidence that eye-gaze modulates configural encoding. Whereas direct eye gaze engages configural face processing, averted eye gaze appears to disrupt the configural processing typical of faces.

General discussion

A wealth of research in the face perception literature demonstrates that humans process our fellow human faces configurally—integrating features into a seamless perceptual gestalt. However, there is evidence that the deployment of configural face encoding is conditional (Palermo & Rhodes, 2002). Indeed, ingroup faces are processed more configurally than outgroup faces (Hugenberg & Corneille, 2009; Young & Hugenberg, 2010) and faces high in social status are processed configurally moreso than low status faces (Ratcliff et al., 2011). Importantly, in these instances, expertise with the different classes of faces is held constant, implicating motivation to process subjectively relevant and socially significant faces as a core determinant of whether faces are processed configurally or instead in a more feature-based manner.

In much of this past work, the apparent relevance of a target face was communicated via non-facial information, such as labels indicating group membership or status, while other work utilized structural properties of the face to indicate social group (e.g., Tanaka et al., 2004). In the current experiments, we sought to investigate how a more basic and transient aspect of the face might suggest the momentary importance of a given target. Specifically, eye-gaze provides dynamic and valuable social information, including information about others' intentions, including whether a target is attentionally engaged with the perceiver (e.g., Adams et al., 2010; Wirth et al., 2010). Importantly, eye gaze is known to influence related aspects of human face processing, including face memory. This result has been attributed to averted eye-gaze indicating that a face is not relevant and therefore can be perceptually disregarded (Adams et al., 2010).

Given that many have argued that accurate face memory relies on configural encoding (e.g., Tanaka et al., 2004), the present findings suggests a perceptual mechanism through which averted eye-gaze may reduce face memory: disrupting configural encoding. It appears that the direction of eye-gaze not only modulates the perceived social value of a face (e.g., Adams et al., 2010), but feeds down further into the perceptual stream to influence the low-level processes that form the basis of face perception (and that support subsequent face memory). Whereas past work has illustrated the impact of eye-gaze on face memory (e.g.,

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[2] Because this study was collected using an online interface, response latencies could not be reliably collected.

Adams et al., 2010; Mason et al., 2004), the present studies are the first to offer evidence of the perceptual mechanism through which these effects originate.

These results have interesting theoretical implications for the larger face processing literature. Given the recent debate regarding the ability of top-down factors to influence configural encoding and the methodological arguments regarding the optimal version of composite face paradigm (e.g., Richler, et al., 2009; Rossion, 2013) the present results are of some importance, particularly by utilizing a multi-method approach to demonstrate congruent findings across methods. To wit, the current experiments add to the evidence that configural encoding can be subject to motivational and social influences, even in circumstances when perceiver expertise with a class of faces is held constant (e.g., Hugenberg & Corneille, 2009; Michel et al., 2007; Ratcliff et al., 2011). However, as detailed above, prior demonstrations and the current Experiment 1 used the original version of the composite face task (Young et al., 1987). Studies employing the newer “complete” design do not show similar effects (e.g., Richler et al., 2011). Consequently, studies using the modified Richler et al. (2011) composite face task with faces displaying averted and direct-gaze would be valuable. In response to these concerns we utilized a multi-method approach. That is, our second experiment employed the classic face inversion manipulation, rather than the “partial” version of the composite face paradigm. This bolsters the strength of our claims by circumventing debates about the best way to measure configural encoding by using another approach that manipulates, rather than measures, configural encoding. Here, we find that inversion interferes more with memory for faces with direct-gaze than averted-gaze, effects that parallel those found in research investigating inversion effects on own-race and cross-race faces (e.g., Rhodes, Brake, Taylor, & Tan, 1989). Thus, whether configural encoding is measured (Experiment 1) or manipulated (Experiment 2), converging evidence from both Experiments suggests that averted eye-gaze orientation exerts a top-down influence on configural encoding, making alternative explanations more difficult to maintain.

More broadly, the present results speak to theoretical models of face perception. Prominent accounts posit that structural (e.g., race, age, sex) and transient face information (e.g., emotional states, eye-gaze) are processed via dissociable routes (e.g., Bruce & Young, 1986; Haxby, Hoffman, & Gobbini, 2002). From the perspective of these models, flexible information such as eye-gaze should not influence the basic encoding of face structure. However, the present results indicate that situationally flexible information (eye-gaze) can nevertheless determine how the structural properties of a face are processed, providing evidence for the dynamic integration of multiple streams of information during person perception (Freeman & Ambady, 2011).

To conclude, the present experiment finds that averted eye-gaze interferes with configural face processing. These findings offer a novel demonstration of the social cognitive and perceptual importance of eye-gaze. Moreover, the results provide evidence of the mechanism through which eye-gaze affects face memory (i.e., configural encoding) and add to a growing literature documenting the social and motivational sensitivity of face processing in general, and configural encoding more specifically, while underscoring the influence of flexible, transient face information like eye-gaze on the perception of face structure.

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