Visual processing and emotion perception from ingroup and outgroup facial expressions

Cong, Yong-Qi; Sauter, Disa; Ruiz, Julia Vacas; Fischer, Agneta

DOI
10.1080/02699931.2025.2504556

Publication date
2026

Document Version
Final published version

Published in
Cognition and Emotion

COGNITION AND EMOTION
2026, VOL. 40, NO. 1, 237–244
https://doi.org/10.1080/02699931.2025.2504556

Routledge
Taylor & Francis Group

OPEN ACCESS Check for updates

Visual processing and emotion perception from ingroup and outgroup facial expressions

Yong-Qi Cong, Disa Sauter, Julia Vacas Ruiz and Agneta Fischer

Department of Psychology, University of Amsterdam, Amsterdam, The Netherlands

ABSTRACT

When viewing racial ingroup versus outgroup faces, different visual processing strategies are used, resulting in better identification and memory of ingroup faces (Other Race Effect). Similarly, emotion recognition tends to be more accurate from ingroup facial expressions (Ingroup Advantage Effect). This study examines whether differential visual processing strategies for ingroup and outgroup faces extend to emotion perception and how they relate to emotion recognition accuracy. We conducted an eye-tracking experiment with Dutch participants ($N =$ 99) making perceptual emotion judgments of Dutch (ingroup) and Chinese (outgroup) facial expressions. We hypothesised that ingroup and outgroup faces would be visually processed differently and that these differences would relate to emotion recognition accuracy. As expected, we observed different viewing patterns: participants looked longer at the eyes and nose of ingroup faces and at the mouth of outgroup faces. However, differences in visual processing were minimally linked to emotion recognition accuracy, suggesting that accurate emotion decoding involves perceptual processes at different levels and that various looking patterns can lead to correct emotion recognition. These findings extend the Other Race Effect by demonstrating that differential looking patterns occur also during emotion perception, contributing to the understanding of face and emotion perception across racial groups.

ARTICLE HISTORY
Received 13 August 2024
Revised 1 May 2025
Accepted 5 May 2025

KEYWORDS
Face; ingroup; outgroup; emotion recognition; eye-tracking

Introduction

The process of inferring others' emotions from their facial expressions is complex and can be affected by factors ranging from the facial characteristics of the expresser to the social context (Hess & Hareli, 2015). One important but not well understood aspect is how the cultural or ethnic background of the expressers influences how emotions are perceived from their facial expressions (Jack, 2013; Quesque et al., 2022). In the literature on cross-cultural emotion communication, cultural background is usually operationalised in terms of race or ethnicity (Elfenbein & Ambady, 2002; Wood et al., 2016). This has been shown to be relevant when perceivers infer emotions from others' facial expressions: they are generally more accurate in identifying emotions when viewing expressions displayed on faces that share the same cultural or ethnic background as themselves, compared to faces that have a different background (Elfenbein & Ambady, 2002). This phenomenon has been termed the *ingroup advantage effect*.

This superiority in emotion perception from ingroup faces has been proposed to reflect the fact that facial expressions of the same emotion have slightly different appearances in different cultures, known as *emotion dialects* (Elfenbein, 2013). On this view, perceivers are better at recognising emotions from facial expressions if they are more familiar

CONTACT Yong-Qi Cong y.cong@uva.nl Department of Psychology, University of Amsterdam, Nieuwe Achtergracht 129B, 1018 WS, Amsterdam, The Netherlands

Supplemental data for this article can be accessed online at https://doi.org/10.1080/02699931.2025.2504556

with the emotion dialect of the expresser. However, evidence suggests that in addition to emotion dialects, there are other underlying mechanisms that contribute to the ingroup advantage in emotion perception, because the ingroup advantage has been observed even when the ingroup and outgroup members share the same cultural and linguistic background. This is the case when an ingroup vs outgroup distinction is created on the basis of other types of social identities (Thibault et al., 2006) or in a minimal group paradigm (Young & Hugenberg, 2010).

One complementary (i.e. not mutually exclusive) explanation proposed for the ingroup advantage effect is that there are motivational differences between the processing of ingroup and outgroup faces. These motivational differences favouring ingroup targets could lead to ingroup faces being differently processed than outgroup faces (Hugenberg, 2005; Hugenberg & Corneille, 2009; Young & Hugenberg, 2010). Support for this argument comes from a substantial body of research from the face perception literature, which shows superior processing of ingroup (e.g. the same race as the perceivers) over outgroup (e.g. with a different racial appearance than the perceiver) faces. Specifically, there is a parallel of the ingroup advantage of emotion recognition in the face perception literature, which is known as the *Other Race Effect* (ORE). ORE refers to the observation that faces of an observer's own race are better recognised and remembered than faces of another race (Meissner & Brigham, 2001).

Consistent with the motivational account, the ORE has been found to align with differential visual processing for ingroup and outgroup faces. For example, research has shown that individuals attend more to the eyes of ingroup faces than outgroup faces (Brielmann et al., 2013; Kawakami et al., 2014; Stelter et al., 2021), with potential implications for emotion perception. For example, attention to the eyes have been shown to relate to differences in the extent to which smiles are perceived to be genuine on White and Black faces (Friesen et al., 2019). Ingroup faces have also been shown to be processed more holistically (i.e. processing the interconnectedness and spatial relationship between face parts), which is associated with more effective face recognition (Richler et al., 2010). Holistic processing is characterised by longer looking time and fewer fixations at the centre of the face (i.e. around the nose; Mega & Volz, 2017). These findings suggest that the eyes and nose might be key areas that reflect how ingroup and outgroup faces are differentially processed.

Based on this work, we theorised that the differential visual processing strategies, and specifically attention to the eyes and nose, might contribute to the superior recognition of emotions from faces of ingroup members. There is some evidence suggesting that visual processing strategies are relevant to the perception of emotions from facial expressions. For example, people allocate more attention to facial features that are diagnostic for specific emotions (Eisenbarth & Alpers, 2011; Scheller et al., 2012). However, it is unclear whether differences in visual processing strategies for ingroup and outgroup faces extend to the context of facial emotion decoding and whether these differences relate to emotion recognition accuracy. Addressing these questions would help shed light on the mechanisms underlying the superior recognition of emotions from ingroup faces.

The current study sought to investigate the effect of differential visual processing strategies of ingroup and outgroup faces on emotion decoding. Drawing from previous literature (Friesen et al., 2019; Kawakami et al., 2014; Mega & Volz, 2017), we were particularly interested in attention to the eyes and nose area. Additionally, we also examined the mouth area, as it has been suggested that differential information decoding from ingroup versus outgroup faces is mainly driven by the lower face (Yan et al., 2016). Our hypotheses were: (1) visual processing strategies are different for ingroup and outgroup faces during the decoding of emotional facial expressions, specifically with regard to attention on the eyes, nose, and mouth. (2) differential visual processing strategies directly relate to emotion recognition accuracy. The study received ethical approval from the Ethics review board at the University of Amsterdam.

Method

Participants

Sample size was determined by an a priori power analysis based on an effect size estimate for Hypothesis 2 (the effect of differential visual processing on emotion recognition). This was done using effect sizes obtained from studies investigating the relationship between visual processing and the ORE (Brielmann et al., 2013; Kawakami et al., 2014). Based on an effect size of $d = 0.3$, we would need 71 participants to achieve 0.8 power.[1] Only individuals who were born and raised in the Netherlands were eligible to participate. Two participants were excluded: one had a direct family member who was Asian and the other one had grown up outside of the Netherlands. The final sample consisted of 99 participants between the ages of 17 and 60 years ($M = 22.9$, $SD = 6.4$). Eighty-three of the participants identified as female, 15 as male, and 1 as other. Participants received either course credit or monetary compensation for their participation.

Materials and apparatus

It has been suggested that emotion perception from posed compared to spontaneous facial expressions may differ (Dawel et al., 2022; Naab & Russell, 2007). Therefore, we used three different types of stimuli: two types of posed (FACS-standardised and non-standardised) and spontaneous facial expressions of emotion. All stimuli were still photographs. The *standardised* expressions were posed expressions based on proposed prototypes of emotional facial expressions using the Facial Action Coding System (FACS, Ekman & Friesen, 1978). They were taken from the ADFES (Dutch own-race; Schalk et al., 2011) and EFEID (Chinese other-race; Chen & Yen, 2007) and expressed five emotions (anger, disgust, fear, sadness, and happiness). The *non-standardised posed* and *spontaneous* expressions were taken from a set of stimuli developed by the authors for another study (Cong et al., 2025), The *posed* expressions resulted from instructions to pose a specific emotion (e.g. anger), but without instructions about which specific muscles to engage. The *spontaneous* expressions were captured when individuals were experiencing an emotion while recalling emotion-specific events in their life. The *non-standardised posed* and *spontaneous* expressions included eight emotions (anger, disgust, fear, sadness, joy, love, compassion, and pride). See Supplementary Method for details on the stimulus selection criteria.

Participants' eye movements were monitored using an EyeLink® eye-tracker with a sampling rate of 1000 HZ and an average accuracy of 0.25°–0.5°. The eye-tracker was located under a monitor screen (size 34×27.5 cm; 1280×1024 pixels) where the stimuli were presented. Participants were seated approximately 65 cm away from the monitor screen and their head was supported by a chin rest. The experiment was programmed in SR Experiment Builder (SR Research Ltd., Mississauga, Canada).

Design and procedure

After informed consent, the session started with a 9-point calibration for the eye-tracker. Then, the main experiment began with four practice trials. After the practice trials, the experimenter offered participants the opportunity to ask questions and then proceeded to the main task. The presentation of the different types of stimuli was blocked and presented in a fixed order, starting with the *standardised* expressions, then *posed*, and last the s*pontaneous* expressions. The order of trials within each block was randomised.

Each trial started with a fixation cross in the centre of the screen for 500 *ms*, followed by a facial expression stimulus shown for 3000 *ms*. The facial expressions were shown for a relatively long time as previous research shows that better recognition for emotional expressions from ingroup faces only occurs during longer presentation times (Young & Hugenberg, 2010). Then the facial expression was replaced on the screen by response options, which were all the possible emotions for a given stimulus type (i.e. five options in the block with standardised expressions and eight options in the other). Participants were asked to give their response by pressing a key. The next trial started immediately after the key press was recorded.

There was a total of 188 trials, excluding the practice trials. The first block consisted of 60 trials, with 12 facial expressions of each of the five emotions (half ingroup faces, half out-group faces; half male expressers, half female expressers). The second and third block each consisted of 64 trials, with eight expressions of each of the eight emotions (half ingroup faces, half out-group faces; half male expressers, half female expressers). The entire experimental session lasted about one hour.

Analysis plan and data processing

Following past research on face perception and facial expression recognition, we operationalised visual processing as attention to different areas of the face. First, we examined whether attention would be differentially allocated to specific areas of the face. We differentiated eyes (i.e. only the eyes) from the eye area (i.e. eye area plus eyebrows and the spaces between the eyes). We included both measures because the first is a frequent area of interest in the face perception literature (Kawakami et al., 2014), while the latter is used more often in the emotion perception literature, likely because eyebrows can carry information relevant to emotion decoding (Jack et al., 2009; Smith et al., 2004; Yan et al., 2016). The second area of interest was the nose, as attention to the centre of the face likely reflects holistic processing (Mega & Volz, 2017). Finally, we examined attention to the mouth, an underexplored area in past research on this topic.

In order to examine visual attention allocation to the different areas of the face, we thus defined four areas of interest (AOIs): the Eyes, Eye Area, Nose, and Mouth. This was done for each facial expression manually, so that the AOI would precisely capture the features of each individual expression. Although the study was not pre-registered prior to data collection, we still wanted to separate hypothesis testing from hypothesis generation. Therefore, before any analysis was conducted, we split the data in two and conducted exploratory analyses on the first half of the data. Based on the results from the first half of the data, we pre-registered confirmatory analyses for the second half of the data (https://osf.io/6×4yd). Here we report the results per AOI of both the exploratory and confirmatory analyses. An alpha of 0.05 was used for all significance testing and a Bonferroni-Holm correction was applied to correct for multiple comparisons.

Results

> *Hypothesis 1:* Visual processing strategies differ between ingroup and outgroup faces during the decoding of emotional facial expressions. More specifically, we expected perceivers to look longer at the eyes and nose of ingroup faces, and longer at the mouth of outgroup faces.

To test hypothesis 1, we ran a Linear Mixed Model (LMM) for each of the AOIs. The looking time for the interest area was the outcome variable, and Stimulus Group (ingroup vs. outgroup) was included as a fixed effect predictor, with ingroup set as the intercept. Participant, Emotion, and Block were treated as nested random effects. Emotion and Block were both included as random effects because these were not primary variables of interest and we did not have a priori hypotheses relating to these variables. We report the findings from both exploratory and confirmatory analyses for each of the AOI below.[2] All reported *p* values are from two-tailed tests.

Eyes and eye area

We expected perceivers to spend more time looking at the eyes or eye area of the ingroup (i.e. Dutch) faces. Starting with the Eyes, in the exploratory analysis of the first half of the data, we did not find looking time to differ between the ingroup and outgroup faces, $t(7848) = 0.249$, $p = 0.803$. However, the confirmatory analyses in the second half of the data yielded a significant effect of Stimulus Group, $t(7848) = -2.75$, $p = 0.006$. Since the results were not consistent between the first and second half of the data, we proceeded to run the analysis with the entire dataset. This analysis found no significant difference in looking time at the Eyes of the ingroup vs outgroup faces, $t(15697) = -1.80$, $p = 0.071$. The results of the entire dataset are visualised in Figure 1A.

We then examined the Eye Area as the outcome variable. In the exploratory analysis, there was no significant effect of Stimulus Group, $t(7848) = -1.45$, $p = 0.148$, but in the second half of the data, there was a significant effect, $t(7848) = -5.22$, $p < 0.001$. With the entire dataset, we replicated the finding from the second half of the data: looking time at the Eye Area significantly differed between ingroup and outgroup faces, $t(15697) = -4.52$, $p < 0.001$, marginal $R^2 = 0.0007$, conditional $R^2 = 0.408$. However, the effect size was very small: the marginal R-squared of 0.0007 indicated that only 0.07% of the total variance was explained by the fixed effect predictor Stimulus Group. These results are visualised in Figure 1B.

Nose

We next assessed whether looking time at the Nose was longer for ingroup than for outgroup faces. In exploratory analyses on the first half of the data, there was no significant effect of Stimulus group, $t(7848) = -1.903$, $p = 0.057$, which was replicated in the second half of the data, $t(7848) = -1.799$, $p = 0.072$. These findings suggest that looking time at the Nose did not differ between ingroup and outgroup faces. Since the effect sizes in the previous analyses (i.e. with Eyes and Eye Area) were small, we wanted to see whether we could detect a significant effect with more power. We therefore conducted an additional analysis using the entire dataset. With the entire data set, we did find a significant effect of Stimulus Group on looking time at the Nose, $t(15697) = -2.618$, $p = 0.009$, marginal $R^2 = 0.0002$, conditional $R^2 = 0.372$, meaning that looking time at the Nose significantly differed between ingroup and outgroup faces. Specifically, perceivers looked longer at the nose of the ingroup faces ($M = 893.09$, $SD = 748.31$) than outgroup faces ($M = 870.29$, $SD =$

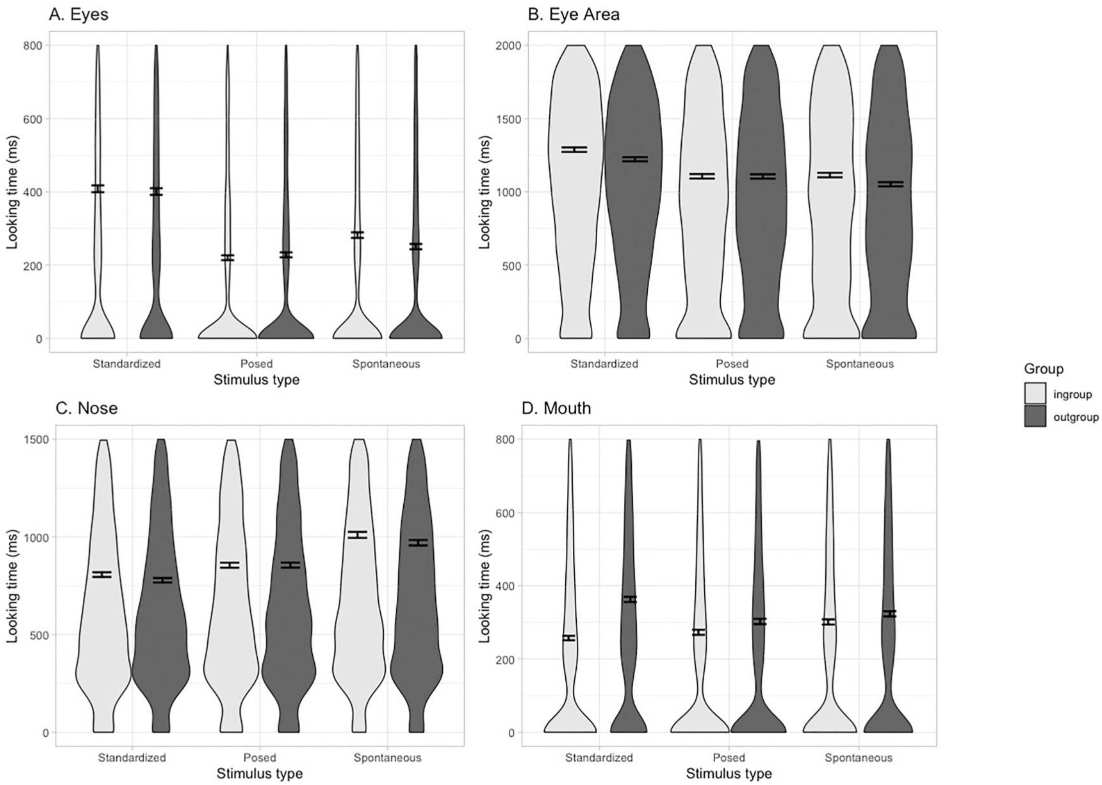

Figure 1. Looking time at each interest area for ingroup and outgroup faces.

Note. Looking time (*ms*) at each AOI for ingroup and outgroup faces is plotted by Stimulus type. Error bars indicate means and standard deviations. Looking time at the Eyes is displayed in the top left (A). Looking time at the Eye Area is displayed in the top right (B). Looking time at the Nose is displayed in the left bottom (C). Looking time at the Mouth is displayed in the right bottom (D).

710.04), indicating that ingroup faces were processed more holistically. However, the effect size is again small. These results are visualised in Figure 1C.

Mouth

In an exploratory analysis with the first half of the data, we found a significant effect of Stimulus Group, $t(7848) = 6.971$, $p < 0.001$, marginal $R^2 = 0.004$, conditional $R^2 = 0.339$, meaning that the time spent looking at the Mouth of ingroup faces significantly differed from the outgroup faces. In the second half of the data, we again found a significant effect of Stimulus group, $t(7848) = 9.72$, $p < .001$, marginal $R^2 = 0.005$, conditional $R^2 = 0.291$. Because the findings were consistent for both halves of the data, we conclude that perceivers looked longer at the Mouth of outgroup faces ($M = 328.90$, $SD = 391.21$) compared to ingroup faces ($M = 277.56$, $SD = 366.78$). The results of the entire dataset are visualised in Figure 1D.

To sum up, we found some evidence to support H1 that looking strategies differed between ingroup and outgroup faces. Specifically, perceivers spent less time looking at the Eye Area and Nose of the outgroup faces and more time at the Mouth of outgroup faces. Since H1 was confirmed, we proceeded to test H2.

> *Hypothesis 2:* Differential visual processing strategy is directly related to emotion recognition accuracy.

Emotion recognition accuracy

Before testing H2, we first checked whether there was an ingroup advantage in emotion recognition, that is, whether emotions were more accurately inferred from ingroup as compared to outgroup facial expressions. We performed a Generalized Linear Mixed Model (GLMM) with Recognition Accuracy as binary outcome variable, Stimulus Group as a fixed effect predictor, and Emotion, Block and Participant as random effect predictors. With ingroup faces set as the reference level, we found perceivers to be less accurate in recognising emotions from outgroup faces, ($\beta = -0.301$, $SE = 0.036$, $p < .001$, $OR = 0.740$). We then proceeded with examining whether specific looking patterns would be associated with emotion recognition accuracy.

Effect of visual processing on emotion recognition

To test whether emotion recognition accuracy is related to different looking strategies, we performed a Generalized Linear Mixed Model (GLMM) with recognition accuracy (correct coded as 1 and incorrect as 0) as outcome variable, looking time at the AOI as a fixed-effect predictor and Participant, Emotion, and Block as nested random effect predictors. We only looked at the AOIs that differed in looking time between ingroup and outgroup faces (i.e. Eye Area, Nose, or Mouth), This initial model did not converge for any of the AOIs, possibly because we were trying to make inferences on too many different levels given the data and that the units of measurements differed across the predictors. We then scaled the outcome variable and included the random effects unnested to reach model convergence. We report the results per AOI below.

For the Eye Area, there was no significant effect of looking time on emotion recognition accuracy, $\beta = -0.022$, $SE = 0.020$, $p = 0.270$. These data thus provide no evidence that the amount of time perceivers spent looking at the Eye Area affected how accurately they recognised the emotion on the face.

For the Nose, there was also no significant effect of looking time on the AOI on emotion recognition accuracy, $\beta = 0.013$, $SE < 0.019$, $p = 0.488$. There was thus no evidence that the amount of time perceivers spent looking at the Nose affected their emotion recognition accuracy.

Finally, we examined whether looking time at the Mouth had an effect on emotion recognition accuracy. This time, we found a significant negative effect of looking time on accuracy ($\beta = -0.066$, SE = 0.019, $p < 0.001$, $OR = 0{,}936$), indicating that longer looking time at the mouth was associated with lower emotion recognition accuracy. The odds ratio of 0.936 indicates that for each additional standardised unit increase in looking time at the mouth, the odds of accurate emotion recognition decreased by 6.4%. We conclude that looking at the Mouth has a small effect on emotion recognition accuracy.

In sum, most of the facial areas that perceivers focused on were not associated with emotion recognition accuracy, only a longer looking time at the mouth is related to better emotion recognition.

Discussion

The current study investigated visual processing during perception of ingroup and outgroup emotional facial expressions. We found that ingroup faces were processed differently from outgroup faces. Specifically, perceivers spent more time looking at the eyes and nose of ingroup faces, and at the mouth of outgroup faces. However, visual processing patterns were only weakly linked to emotion recognition accuracy, except that looking longer at the mouth was associated with less accurate emotion recognition. This work connects the cross-cultural emotion recognition literature with research on face perception of ethnic ingroup versus outgroup faces.

Our findings align with the Other Race Effect, showing that ingroup faces are processed differently than outgroup faces. Perceivers tended to look longer at the eye area of ingroup faces, potentially indicating greater motivation to understand ingroup members (Kawakami et al., 2014; Wu et al., 2012). Viewers also looked longer at the nose of ingroup faces, likely reflecting more holistic processing for ingroup faces (Hugenberg & Corneille, 2009; Michel et al., 2006). Additionally, our study highlights the mouth as a less explored area in face perception research, showing that differential visual processing during emotion decoding for ingroup and outgroup faces is also reflected in looking time at the mouth. Together, these findings demonstrate that differential visual processing between ingroup and outgroup faces observed in prior studies on face perception and memory also occur during emotion decoding.

Unlike previous research on the Other Race effect, which primarily used White and Black faces, the present study used Asian faces as outgroup faces. We showed that differential visual processing of ingroup versus outgroup faces is also found for this outgroup category. This suggests that visual processing differences between ingroup and outgroup faces are not limited to specific ethnic groups or tasks, as the same patterns are observed across different contexts.

Contrary to our expectation, differential looking behaviour at the eyes and nose did not significantly impact emotion decoding accuracy. This may reflect the small effect sizes of these differences. In contrast, looking time at the mouth did have an effect on emotion recognition accuracy.

Specifically, longer looking time at the mouth was associated with less accurate emotion recognition. This might reflect the fact that the lower face carries less diagnostic information for emotion differentiation compared to the upper face (Beaudry et al., 2014; Schurgin et al., 2014). This finding aligns with research investigating individuals with autism spectrum disorder (ASD), who have been found to have impaired emotion recognition in their judgments of neurotypical emotion expressions and tend to fixate more on the mouth areas (Neumann et al., 2006; Wolf et al., 2008). Our findings provide further evidence that too much attention to the mouth may be a less effective strategy for emotion recognition.

The association between looking at the mouth and emotion recognition had a small effect size, indicating limited practical relevance. This may be partly explained by individual differences in visual processing strategies during emotion decoding, as multiple different gaze patterns can result in successful emotion decoding (Yitzhak et al., 2022). Moreover, emotion recognition may involve higher-level perceptual and conceptual processes, which can be influenced by both goal-driven and stimulus-driven strategies (Schurgin et al., 2014). Future research may explore these processes to better understand differences in emotion perception from ingroup and outgroup faces.

To conclude, the current study provides insights into visual processing and emotion perception of ingroup and outgroup faces. While confirming previous findings on differential processing of the upper face, our study highlights significant differences in attention to the mouth. This underexplored area warrants further investigation in cross-cultural emotion recognition and face perception research. Despite the differences in visual processing, their association with emotion recognition accuracy was limited, which underscores the complexity of decoding emotional facial expressions. Our findings contribute to the growing bodies of literature on cross-cultural emotion recognition and face perception, enhancing our understanding of how social and cognitive factors intersect in shaping human perception across diverse cultural contexts.

Notes

1. Additional details on the power analysis are reported in the Supplementary Method.
2. Additional analyses with alternative models (e.g. Block as fixed effects) are reported in the Supplementary Results. The findings are consistent with the patterns of results reported in the main manuscript.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Funding

This work was supported by the Dutch Research Council (Nederlandse Organisatie voor Wetenschappelijk Onderzoek) [grant number 406-15-059].

Data availability statement

Data and analyses scripts used for this article are made available online at our OSF project page, which can be accessed through this anonymised link: https://osf.io/5qcnd/.

ORCID

Yong-Qi Cong http://orcid.org/0000-0002-7698-374X
Disa Sauter http://orcid.org/0000-0003-4872-0536
Julia Vacas Ruiz http://orcid.org/0000-0002-9836-3648
Agneta Fischer http://orcid.org/0000-0001-6939-8174

References

Beaudry, O., Roy-Charland, A., Perron, M., Cormier, I., & Tapp, R. (2014). Featural processing in recognition of emotional facial expressions. *Cognition and Emotion*, *28*(3), 416–432. https://doi.org/10.1080/02699931.2013.833500

Brielmann, A. A., Bülthoff, I., & Armann, R. (2013). Looking at faces from different angles: Europeans fixate different features in Asian and Caucasian faces. *Vision Research*, *100*, 105–112. https://doi.org/10.1016/j.visres.2014.04.011

Chen, L. F., & Yen, Y. S. (2007). *Taiwanese facial expression image database*. Brain Mapping Laboratory, Institute of Brain Science, National Yang-Ming University.

Cong, Y.-Q., Yurdum, L., Fischer, A., & Sauter, D. (2025). Emotions are perceived differently from posed and spontaneous facial expressions. *Emotion*. Advance online publication. https://doi.org/10.1037/emo0001473

Dawel, A., Miller, E. J., Horsburgh, A., & Ford, P. (2022). A systematic survey of face stimuli used in psychological research 2000–2020. *Behavior Research Methods*, *54*(4), 1889–1901. https://doi.org/10.3758/s13428-021-01705-3

Eisenbarth, H., & Alpers, G. W. (2011). Happy mouth and sad eyes: Scanning emotional facial expressions. *Emotion*, *11*(4), 860–865. https://doi.org/10.1037/a0022758

Ekman, P., & Friesen, W. V. (1978). Facial action coding system. Palo Alto, CA: Consulting Psychological Press.

Elfenbein, H. A. (2013). Nonverbal dialects and accents in facial expressions of emotion. *Emotion Review*, *5*(1), 90–96. https://doi.org/10.1177/1754073912451332

Elfenbein, H. A., & Ambady, N. (2002). On the universality and cultural specificity of emotion recognition: A meta-analysis. *Psychological Bulletin*, *128*(2), 203–235. https://doi.org/10.1037/0033-2909.128.2.203

Friesen, J. P., Kawakami, K., Vingilis-Jaremko, L., Caprara, R., Sidhu, D. M., Williams, A., Hugenberg, K., Rodríguez-Bailón, R., Cañadas, E., & Niedenthal, P. (2019). Perceiving happiness in an intergroup context: The role of race and attention to the eyes in differentiating between true and false smiles. *Journal of Personality and Social Psychology*, *116*(3), 375–395. https://doi.org/10.1037/pspa0000139

Hess, U., & Hareli, S. (2015). The role of social context for the interpretation of emotional facial expressions. In M. K. Mandal & A. Awasthi (Eds.), *Understanding facial expressions in communication: Cross-cultural and multidisciplinary perspectives*, (pp. 119–141). Springer Science + Business Media. https://doi.org/10.1007/978-81-322-1934-7_7

Hugenberg, K. (2005). Social categorization and the perception of facial affect: Target race moderates the response latency advantage for happy faces. *Emotion*, *5*(3), 267–276. https://doi.org/10.1037/1528-3542.5.3.267

Hugenberg, K., & Corneille, O. (2009). Holistic processing is tuned for in-group faces. *Cognitive Science*, *33*(6), 1173–1181. https://doi.org/10.1111/j.1551-6709.2009.01048.x

Jack, R. E. (2013). Culture and facial expressions of emotion. *Visual Cognition*, *21*(9–10), 1248–1286. https://doi.org/10.1080/13506285.2013.835367

Jack, R. E., Blais, C., Scheepers, C., Schyns, P. G., & Caldara, R. (2009). Cultural confusions show that facial expressions are not universal. *Current Biology*, *19*(18), 1543–1548. https://doi.org/10.1016/j.cub.2009.07.051

Kawakami, K., Williams, A., Sidhu, D., Choma, B. L., Rodriguez-Bailón, R., Cañadas, E., Chung, D., & Hugenberg, K. (2014). An eye for the I: Preferential attention to the eyes of ingroup members. *Journal of Personality and Social Psychology*, *107*(1), 1–20. https://doi.org/10.1037/a0036838

Mega, L. F., & Volz, K. G. (2017). Intuitive face judgments rely on holistic eye movement pattern. *Frontiers in Psychology*, *8*, 1005. https://doi.org/10.3389/fpsyg.2017.01005

Meissner, C. A., & Brigham, J. C. (2001). Thirty years of investigating the own-race bias in memory for faces: A meta-analytic review. *Psychology, Public Policy, and Law*, *7*(1), 3–35. https://doi.org/10.1037/1076-8971.7.1.3

Michel, C., Caldara, R., & Rossion, B. (2006). Same-race faces are perceived more holistically than other-race faces. *Visual Cognition*, *14*(1), 55–73. https://doi.org/10.1080/13506280500158761

Naab, P. J., & Russell, J. A. (2007). Judgments of emotion from spontaneous facial expressions of new Guineans. *Emotion*, *7*(4), 736–744. https://doi.org/10.1037/1528-3542.7.4.736

Neumann, D., Spezio, M. L., Piven, J., & Adolphs, R. (2006). Looking you in the mouth: Abnormal gaze in autism resulting from impaired top-down modulation of visual attention. *Social Cognitive and Affective Neuroscience*, *1*(3), 194–202. https://doi.org/10.1093/scan/nsl030

Quesque, F., Coutrot, A., Cox, S., Souza, L. C. d., Baez, S., Cardona, J. F., Mulet-Perreault, H., Flanagan, E., Neely-Prado, A., Clarens, M. F., Cassimiro, L., Musa, G., Kemp, J., Botzung, A., Philippi, N., Cosseddu, M., Trujillo-Llano, C., Grisales-Cardenas, J. S., Fittipaldi, S., … Bertoux, M. (2022). Does culture shape our understanding of others' thoughts and emotions? An investigation across 12 countries. *Neuropsychology*, *36*(7), 664–682. https://doi.org/10.1037/neu0000817

Richler, J. J., Cheung, O. S., & Gauthier, I. (2010). Holistic processing predicts face recognition. *Psychological Science*, *22*(4), 464–471. https://doi.org/10.1177/0956797611401753

Schalk, J. v. d., Hawk, S. T., Fischer, A. H., & Doosje, B. (2011). Moving faces, looking places: Validation of the Amsterdam dynamic facial expression set (ADFES). *Emotion*, *11*(4), 907–920. https://doi.org/10.1037/a0023853

Scheller, E., Büchel, C., & Gamer, M. (2012). Diagnostic features of emotional expressions are processed preferentially. *PLoS One*, *7*(7), e41792. https://doi.org/10.1371/journal.pone.0041792

Schurgin, M. W., Nelson, J., Iida, S., Ohira, H., Chiao, J. Y., & Franconeri, S. L. (2014). Eye movements during emotion recognition in faces. *Journal of Vision*, *14*(13), 14–14. https://doi.org/10.1167/14.13.14

Smith, M. L., Cottrell, G. W., Gosselin, F., & Schyns, P. G. (2004). Transmitting and decoding facial expressions. *Psychological Science*, *16*(3), 184–189. https://doi.org/10.1111/j.0956-7976.2005.00801.x

Stelter, M., Rommel, M., & Degner, J. (2021). (Eye-) tracking the other-race effect: Comparison of eye movements during encoding and recognition of ingroup faces with proximal and distant outgroup faces. *Social Cognition*, *39*(3), 366–395. https://doi.org/10.1521/soco.2021.39.3.366

Thibault, P., Bourgeois, P., & Hess, U. (2006). The effect of group-identification on emotion recognition: The case of cats and basketball players. *Journal of Experimental Social Psychology*, *42*(5), 676–683. https://doi.org/10.1016/j.jesp.2005.10.006

Wolf, J. M., Tanaka, J. W., Klaiman, C., Cockburn, J., Herlihy, L., Brown, C., South, M., McPartland, J., Kaiser, M. D., Phillips, R., & Schultz, R. T. (2008). Specific impairment of face-processing abilities in children with autism spectrum disorder using the let's face it! Skills battery. *Autism Research*, *1*(6), 329–340. https://doi.org/10.1002/aur.56

Wood, A., Rychlowska, M., & Niedenthal, P. M. (2016). Heterogeneity of long-history migration predicts emotion recognition accuracy. *Emotion*, *16*(4), 413–420. https://doi.org/10.1037/emo0000137

Wu, E. X. W., Laeng, B., & Magnussen, S. (2012). Through the eyes of the own-race bias: Eye-tracking and pupillometry during face recognition. *Social Neuroscience*, *7*(2), 202–216. https://doi.org/10.1080/17470919.2011.596946

Yan, X., Andrews, T. J., & Young, A. W. (2016). Cultural similarities and differences in perceiving and recognizing facial expressions of basic emotions. *Journal of Experimental Psychology: Human Perception and Performance*, *42*(3), 423–440. https://doi.org/10.1037/xhp0000114

Yitzhak, N., Pertzov, Y., Guy, N., & Aviezer, H. (2022). Many ways to see your feelings: Successful facial expression recognition occurs with diverse patterns of fixation distributions. *Emotion*, *22*(5), 844–860. https://doi.org/10.1037/emo0000812

Young, S. G., & Hugenberg, K. (2010). Mere social categorization modulates identification of facial expressions of emotion. *Journal of Personality and Social Psychology*, *99*(6), 964–977. https://doi.org/10.1037/a0020400