A happy face advantage with male Caucasian faces – it depends on the company you keep

Ottmar V. Lipp, School of Psychology and Speech Pathology, Curtin University, Perth, WA, 6845, Australia

Belinda M. Craig, School of Psychology, The University of Queensland, Brisbane, Qld, 4072, Australia

Mylyn C. Dat School of Psychology, The University of Queensland, Brisbane, Qld, 4072, Australia

Keywords: Emotional expressions, happy face advantage, emotion categorization, face processing

CORRESPONDING AUTHOR:

Ottmar V. Lipp, PhD,

Curtin University, School of Psychology and Speech Pathology

WA, 6845, Australia.

E-mail: Ottmar.Lipp@curtin.edu.au

AUTHOR BIOS:

Professor Ottmar V. Lipp is a Professor in the School of Psychology and Speech Pathology, Curtin University. His research focuses on emotion and attention and their interactions.

Ms Belinda Craig is a PhD student working with Professor Lipp in the area of face processing.

Her special interest is on context effects on the processing of facial expressions of emotion.

Ms Mylyn Dat is an undergraduate student who collected most of the data presented here as part of a research practicum. She is interested in the psychology of emotion and in face processing.

DECLARATION OF CONFLICT OF INTEREST:

The author(s) declared no potential conflicts of interests with respect to the authorship and/or publication of this article.

FINANCIAL DISCLOSURE/FUNDING:

The author(s) disclosed receipt of the following financial support for the research and/or authorship of this article: This work was supported by Grant DP110100460 from the Australian Research Council to Ottmar Lipp.

A happy face advantage with male Caucasian faces – it depends on the company you keep

Abstract

Happy faces are categorized faster as ‘happy’ than angry faces as ‘angry’, the happy face advantage. Here we show across three experiments that the size of the happy face advantage for male Caucasian faces varies as a function of the other faces they are presented with. A happy face advantage was present if the male Caucasian faces were presented among male African American faces, but absent if the same faces were presented among female faces, Caucasian or African American. The modulation of the happy face advantage for male Caucasian faces was observed even if the female Caucasian/male African American faces had neutral expressions. This difference in the happy face advantage for a constant set of faces as a function of the other faces presented indicates that it does not reflect on a stimulus dependent bottom up process, but on the evaluation of the expressive faces within a specific context.

Article text:

The happy face advantage (Leppänen & Hietanen, 2003) refers to the observation that happy faces are categorized faster as 'happy' than, for instance, angry faces as 'angry'. It has been interpreted in a number of ways, including as an evolved affiliative bias (Becker, Anderson, Mortensen, Neufeld, & Neel, 2011) or a special case of a more general positivity bias (Robinson et al., 2004) – the finding that pleasant stimuli are categorized faster as 'pleasant' than unpleasant stimuli as 'unpleasant' at least when low in rated arousal (Purkis, Lipp, Edwards, & Barnes, 2009). It could also be an instantiation of the 'fast same effect' (Farell, 1985) – participants may solve the happy/other expression categorization by assessing whether a given face is happy ("same" judgment) or not ("different" judgment). Alternatively, it could be due to differences in low level perceptual features which render happy expressions more recognizable (see Calvo & Nummenmaa, 2008).

Early studies of the happy face advantage reported it as a general phenomenon (but see, Hugdahl, Iversen, & Johnsen, 1993). More recently, differences in the size of the happy face advantage across posers differing in ethnicity (Hugenberg, 2005) or gender (Hugenberg & Sczesny, 2006) have been investigated. Hugenberg (2005) found the happy face advantage to be larger for Caucasian male than for African American male faces and Hugenberg and Sczesny (2006) found the happy face advantage to be larger for female than for male faces (see also Aguado et al., 2009; Becker, Kenrick, Neuberg, Blackwell, & Smith, 2007). Becker et al. (2007) suggested the influence of poser gender on emotion recognition was due to sex cues like masculine angular jawlines and low set eyebrows resembling anger and feminine rounded jawlines and higher eyebrows resembling happiness. Becker et al. (2007) concluded that face morphology drives the effect and provided evidence against a gender stereotype explanation, demonstrating that using clothing to render an androgynous face male or female did not influence emotion recognition. In contrast, Hugenberg (2005) and Hugenberg and Sczesny (2006) offered a spreading activation account to explain the influence of sex as well as race cues on the happy face advantage. Faster categorization of happy female faces was said to reflect on the relatively positive evaluation of female faces priming the categorization of affectively congruent happy expressions and relatively negative evaluations of male or other race faces priming categorization of negative angry and sad expressions. Both accounts share the assumption that the happy face advantage reflects on characteristics of the particular faces presented, be they perceptual or evaluative in nature.

However, there seems to be evidence for a role of context on the influence of sex and race cues in the happy face advantage. Bijlstra, Holland, and Wigboldus (2010) reported two experiments in which Caucasian Dutch participants categorized positive and negative expressions (happy vs. angry and happy vs. sad) or two negative expressions (sad vs. angry) on either male Caucasian Dutch and Moroccan Dutch faces (Experiment 1) or male and female Caucasian Dutch faces (Experiment 2). Bijlstra et al. showed support for both the spreading activation account in the tasks that involved positive and negative expressions (happy vs. angry and happy vs. sad) and support for a stereotype based account in the tasks that only involved negative emotions (sad vs. angry). Of interest to the present research, they also showed some evidence for a role of context where the other faces present in the task may influence the size of the happy face advantage for male Caucasians. Across experiments, a happy face advantage for male Caucasian faces was evident if presented among male Moroccan faces, but not if presented among female Caucasians. This pattern of results is inconsistent with a stimulus driven perceptual feature or a spreading activation account of the happy face advantage. This conclusions is preliminary, however, as Bijlstra et al. used different participants and different male Caucasian faces across experiments. It is not clear whether the same pattern of results would emerge if a constant set of male Caucasian happy and angry faces were presented either among male African American or female Caucasian happy and angry faces.

Experiment 1 aimed to test this using the same male Caucasian faces and the same participants across two tasks. It was predicted that a happy face advantage would be observed in a task also using male African America stimuli, but not in a task also using female Caucasian stimuli. Determining whether such contextual influences on the happy face advantage for male Caucasian faces exist is important as it would suggest that the mechanisms proposed to explain how cues like race and gender influence emotion perception require refinement.

Experiment 1

Method

Participants. Twenty-nine Caucasian undergraduate student volunteers (12 male[1], *M* = 19.6 years, range 17-41) completed two categorization tasks for course credit. In each task, participants were asked to categorize faces as happy or angry depending on the emotion displayed.

Apparatus, Stimuli, and Procedure. The expressions were of eight male Caucasian, eight female Caucasian, and eight male African American posers drawn from the NimStim database (Tottenham et al., 2009; Poses AN_O and HA_O of models 1, 2, 3, 5, 6, 20, 21, 23, 24, 28, 38, 39, 40, 41, 43) and the Montreal Set of Facial Displays of Emotion (Beaupré & Hess, 2005; Poses 1 and 2 of models 20, 22, 23, 25, 27, 28, 30, 32, 33). One task comprised the male

---

[1] Preliminary analyses including the factor Participant Sex or the factor Task Sequence did not yield any significant effects for these factors in this or the subsequent experiments. Hence, results are reported collapsed across these factors.

and female Caucasian faces and the second the male Caucasian and male African American faces[2]. Faces were cropped of hair, set to gray scale, and dropped in a gray background 187 x 240 pixels in size. Both tasks comprised 96 trials and faces were presented centered in three blocks of 32 trials on a CRT monitor with a resolution of 1024 x 768 pixels and an 85 Hz refresh rate. Each face was preceded by a 500 ms fixation cross and presented for 2000 ms or until a response was made by pressing the left or right shift key. Faces were presented in a random sequence with the restriction that no more than 4 consecutive faces were of the same sex/ethnicity or emotion. Match of emotion to key and task order were counterbalanced across participants and each task was preceded by 12 practice trials. Stimulus display and categorization time recording were controlled by the DMDX experimental software (Forster & Forster, 2003).

Statistical Analyses. Categorization times and error rates were subjected to independent 2 x 2 x 2 (Task [Caucasian female vs. African American male] x Face [male Caucasian vs. female Caucasian/African American] x Emotion [happy vs. angry]) factorial repeated measures ANOVAs with Bonferroni corrected follow up analyses. Errors were defined as incorrect button presses and converted to error percentages. Trials with categorization times that deviated from an individuals' mean by more than three standard deviations were excluded as outliers (1.45% of trials).

Results

The categorization times displayed in Figure 1 indeed indicate a happy face advantage for male Caucasian faces when presented among male African American faces, but not when presented among female Caucasian faces. The omnibus analysis confirmed this impression yielding a main effect for Emotion, $F(1,28) = 16.16$, $p < .001$, $\eta_p^2 = .366$, and a Task x Face x

---

[2] The intensity of the emotional expressions used in the current study did not differ in a manner that provides an explanation for the patterns of results observed – see supplementary information for detail.

Emotion interaction, $F(1,28) = 35.80$, $p < .001$, $\eta_p^2 = .561$. The interaction reflects a significant happy face advantages for male Caucasian faces among African American males, but for female Caucasian faces among male Caucasian faces, both $F(1,28) > 18.0$, $p < .001$, $\eta_p^2 > .390$. The other comparisons were not significant, both $F < 1$. This pattern of results was confirmed in two 2 x 2 (Face [male Caucasian vs. female Caucasian/African American] x Emotion [happy vs. angry]) factorial repeated measures ANOVAs conducted for the two tasks separately. A Face x Emotion interaction emerged in each analysis, both $F(1,28) > 11.50$, $p < .003$, $\eta_p^2 > .290$, with the happy face advantage for male Caucasian faces significant when presented among male African American faces, $F(1,28) = 18.13$, $p < .001$, $\eta_p^2 = .393$, but not when presented among female Caucasian faces, $F(1,28) = 0.35$, $p = .558$, $\eta_p^2 = .012$.

The pattern of results for error percentages[3] mirrors that for categorization times with main effects for Face, $F(1,28) = 7.43$, $p = .011$, $\eta_p^2 = .210$, and Emotion, $F(1,28) = 6.25$, $p = .019$, $\eta_p^2 = .182$, and a Task x Face x Emotion interaction, $F(1,28) = 22.40$, $p < .001$, $\eta_p^2 = .444$. In the African American task, participants committed more errors when categorizing male Caucasian angry faces than male Caucasian happy faces and more errors when categorizing male African American happy faces than male African American angry faces, both $F(1,28) > 6.25$, $p < .020$, $\eta_p^2 > .180$. In the Caucasian female task, participants committed more errors when categorizing female Caucasian angry faces than female Caucasian happy faces, $F(1,28) = 11.07$, $p = .002$, $\eta_p^2 = .283$, whereas there was no difference when categorizing male Caucasian faces, $F < 1$. Slower categorization times were associated with higher error rates excluding the possibility of a speed accuracy trade off.

---

[3] For Figures of the error percentages, please refer to the supplementary materials.

Discussion

Experiment 1 confirmed the impression gleaned from the literature that the happy face advantage for male Caucasian faces is context specific – it emerges if the faces are presented in the context of male other race faces, but not if they are presented in the context of female Caucasian faces. Thus, the happy face advantage is not solely stimulus driven. The question now arises as to which invariant characteristic of the context faces, sex, ethnicity or an interaction between the two, mediates the emergence/attenuation of the happy face advantage for male Caucasian faces. Experiment 2 was designed to test the hypothesis that context face ethnicity is critical for the emergence of the happy face advantage for male Caucasian faces presented among male African American faces. This proposal was tested by presenting the male Caucasian faces among female African American faces. If the modulation of the happy face advantage for male Caucasian faces reflects an 'other race effect' like the well documented recognition deficit seen for male and female other race faces (Meissner & Brigham, 2001; Wallis, Lipp & Vanman, 2012) then a happy advantage should emerge regardless of the gender of the other race faces.

Experiment 2

Method

Participants. Thirty-two Caucasian participants (21 female, *M* = 19.1 years, range 17-23) completed three emotion categorization tasks. Data from six participants were excluded. Three failed to complete all tasks due to experimenter error and three made more than 25% errors in at least one of the three tasks.

Apparatus, Stimuli, and Procedure. Two tasks replicated those used in Experiment 1 whereas the third employed pictures of female African Americans drawn from the NimStim set of facial expressions (Tottenham et al., 2009; Poses AN_O and HA_O of models 1, 11, 12, 13,

14) and Montreal Set of Facial Displays of Emotion database (Beaupré & Hess, 2005; Poses 1 and 2 of models 35, 36, 37, 38) together with the male Caucasian faces. As the main interest was whether the race of the female posers would affect the emergence of the happy face advantage among male Caucasians, all participants completed the two tasks involving female posers first with task order counterbalanced across participants and the task with male African American posers last. All other procedural details were the same as in Experiment 1. Outliers constituted 1.40% of trials.

Results

Figure 2 summarizes the categorization times obtained in Experiment 2 indicating a happy face advantage for female faces regardless of ethnicity and for male Caucasian faces only if presented among male African American faces. The 3 x 2 x 2 (Task [female Caucasian vs. female African American vs. male African American] x Face [male Caucasian vs. female Caucasian/female African American/male African American] x Emotion [happy vs. angry]) factorial repeated measures ANOVA confirmed this impression yielding main effects for Task, $F(2,24) = 6.33$, $p = .006$, $\eta_p^2 = .345$, and Emotion, $F(1,25) = 14.10$, $p = .001$, $\eta_p^2 = .361$, as well as Task x Face, $F(2,24) = 5.02$, $p = .015$, $\eta_p^2 = .295$, and Task x Face x Emotion interactions, $F(2,24) = 11.35$, $p < .001$, $\eta_p^2 = .486$. The three way interaction reflects faster categorization of happy than of angry expressions for female Caucasian, $F(1,25) = 22.80$, $p < .001$, $\eta_p^2 = .477$, and female African American faces, $F(1,25) = 6.42$, $p = .018$, $\eta_p^2 = .204$, and for male Caucasian faces presented among male African American faces, $F(1,25) = 18.03$, $p < .001$, $\eta_p^2 = .419$. The difference for male Caucasian faces presented among female African American faces was not significant, $F(1,25) = 1.74$, $p = .199$, $\eta_p^2 = .065$. Separate 2 x 2 (Face x Emotion) ANOVAs for each of the three tasks yielded Face x Emotion interactions for the tasks involving female

Caucasian and male African American faces, both $F(1,25) > 11.90$, $p < .003$, $\eta_p^2 > .320$. Replicating Experiment 1, the happy face advantage for male Caucasian faces was significant when presented among male African American faces, $F(1,25) = 18.03$, $p < .001$, $\eta_p^2 = .419$, but not when presented among female Caucasian faces, $F(1,25) = 0.02$, $p = .889$, $\eta_p^2 = .001$. The analysis of the task involving female African American faces yielded a main effect for Emotion, $F(1,25) = 10.11$, $p = .004$, $\eta_p^2 = .288$, however, follow up analyses confirmed that the happy face advantage was significant only for female African American faces, $F(1,25) = 6.42$, $p = .018$, $\eta_p^2 = .204$, and not for male Caucasian faces, $F(1,25) = 1.74$, $p = .199$, $\eta_p^2 = .065$.

Analysis of the error rates[3] yielded a Task x Face x Emotion interaction, $F(2,24) = 8.32$, $p = .002$, $\eta_p^2 = .409$. Participants committed fewer errors categorizing happy than angry female Caucasian faces, $F(1,25) = 10.59$, $p = .003$, $\eta_p^2 = .298$, and categorizing happy than angry male Caucasian faces presented among male African American faces, $F(1,25) = 6.19$, $p = .020$, $\eta_p^2 = .198$. All other comparisons were not significant after correction for multiple comparisons.

Discussion

The happy face advantage for male Caucasian faces was absent if the faces were presented among female faces, Caucasian or African American, but present when presented among male African American faces. The race of the female faces did not seem to affect the outcome suggesting that the emergence of a happy face advantage when male Caucasian faces are presented among male African American faces does not reflect on a general 'other race effect'. This differs from the 'other race effect' in face recognition as memory for other race faces is impaired regardless of face gender (Wallis et al., 2012). It does, however, resemble the gender specific 'other race effect' seen in fear conditioning where fear conditioned to faces of other race males, but not other race females is resistant to extinction (Navarrete et al., 2009). One of the interpretations offered by Navarrete et al. (2009) for this finding proposes an evolved heuristic that associates male outgroup faces with enhanced danger based on a long history of intergroup conflicts mainly perpetrated by males. The difference in a priori danger associated with male and female other race faces may mediate the difference in resistance to the extinction of fear.

Hugenberg (2005) proposed a similar mechanism as an explanation for the finding that, in Caucasian participants, a happy face advantage emerged for male Caucasian faces whereas the opposite pattern was found for male African American faces[4]. The negative evaluation associated with male African American faces was said to facilitate categorization of negative emotional expressions whereas the positive evaluation associated with male Caucasian faces, own race faces, was said to facilitate the categorization of the happy facial expression.

The current findings suggest that evaluation of male Caucasian faces may be task specific and relative to the other faces presented, be they African American or Caucasian (Hugenberg, 2005; Hugenberg & Sczesny, 2006). These relative evaluations moderate the speed of categorizing emotional expressions on male Caucasian faces. This may be, as some models of social categorization and stereotyping suggest, because white males are implicitly the default in western cultures (e.g. Eagly & Kite, 1987; Zarate & Smith, 1990). Both race and sex have been proposed as ‘primitive social categories’, but whether a face is categorized by race or sex may depend on the faces presented along with the male Caucasian faces. This then influences the relevant associations elicited in response to a male Caucasian face. For example, positive evaluation of male Caucasian faces may only be elicited when the race dimension is salient due to the faces being viewed among other race faces. Presenting these same male Caucasian faces

[4] That the latter finding was not evident in the current study reflects the use of photographic rather than computer generated faces and the use of a larger face set (Craig, Mallan, & Lipp, 2012)

among female faces may make the gender dimension salient rendering the male Caucasian face more negative and hence attenuating the happy face advantage.

This modulation of the happy face advantage should occur regardless of the emotions expressed on the other category faces. However, at this point it is unclear whether the other faces must be emotional or whether the mere presence of a neutral female or other race face is sufficient to elicit evaluations along either race or gender dimensions. Experiment 3 was designed to investigate this. The same emotional male Caucasian faces were presented among either female or other race neutral faces. It was predicted that the mere presence of a neutral African American or female face should also elicit the same pattern observed in Experiments 1 and 2.

Experiment 3

Method

Participants. Thirty-four Caucasian participants (21 female, $M = 19.24$ years, range, 17-22) completed two emotion categorization tasks. Data from six participants were excluded as they committed more than 25% errors in at least one of the tasks.

Apparatus, Stimuli, and Procedure. Participants were presented with the emotional male Caucasian faces used in Experiments 1 and 2 as well as with pictures of neutral poses of the male Caucasian and female Caucasian faces and neutral male African American faces (poses CA_C for the NimStim faces and ‘neutral’ for the MSFDE faces). Participants completed the tasks in counterbalanced order and categorized the faces by pressing the upward (‘neutral’) and left or right (‘happy’ or ‘angry’ counterbalanced) arrow keys on a QWERTY keyboard. Faces were presented in 12 blocks of 12 faces, each comprising two happy, two angry and two neutral male Caucasian faces and six neutral female Caucasian or male African American faces. All faces within a block were of different individuals. Of all trials, 1.50% were excluded as outliers.

Results

Figure 3 summarizes the emotion categorization times for happy, angry, and neutral male Caucasian faces and for neutral female Caucasian or male African American context faces. The happy face advantage seemed to be evident for male Caucasian faces in both tasks, albeit smaller among female Caucasian faces. A 2 x 2 (Task [Caucasian female vs. African American male] x Emotion [happy vs. angry]) factorial ANOVA of the categorization times for the emotional male Caucasian faces confirmed this impression yielding a main effect for Emotion, $F(1,27) = 46.54$, $p < .001$, $\eta_p^2 = .633$, and a Task x Emotion interaction, $F(1,27) = 4.33$, $p = .047$, $\eta_p^2 = .138$. The post hoc comparisons confirmed that the happy face advantage was significant among the neutral female, 21 ms, *SD* = 51.3, $F(1,27) = 4.51$, $p = .043$, $\eta_p^2 = .143$, and neutral African American faces, 57 ms, *SD* = 58.8, $F(1,27) = 26.27$, $p < .001$, $\eta_p^2 = .493$, but larger among the latter than the former, $F(1,27) = 4.33$, $p = .047$, $\eta_p^2 = .138$. Analysis of the error rates[3] yielded a main effect for Emotion, $F(1,27) = 25.07$, $p < .001$, $\eta_p^2 = .481$, with fewer errors committed when categorizing happy male Caucasian faces.

General Discussion

Across three experiments, the current study demonstrates that the happy face advantage for male Caucasian faces is modulated by the faces among which the male Caucasian faces are presented. It is present if the male Caucasian faces appear among emotional African American faces, but not among emotional female faces, regardless of the race of the female faces. This suggests that the other faces presented in the task create a context that affects the processing of the emotion expressed by the male Caucasian faces. This observation extends prior reports of context effects on emotional expression perception (for a review see Wieser & Brosch, 2012).

Rather than reflecting on characteristics of the face, such as sex or age, or on characteristics of the poser like body posture, the current results indicate that the broader task context created by the other faces presented on different trials can influence the manner in which an emotional expression is perceived. The results of Experiment 3 indicate that the creation of this context does not require that the other faces are emotionally expressive. Rather the mere presence of female Caucasian or male African American faces is sufficient to modulate the happy face advantage for male Caucasian faces.

The finding that the modulation of the happy face advantage on male Caucasian faces is observed regardless of whether the other, context faces presented within a task are emotional or neutral suggests that it does not reflect on cross trial priming by the preceding emotional face (see Righart & de Gelder, 2008). Rather, it seems to reflect on a change in the evaluation of the male Caucasian faces due to their presentation among female or male African American faces. Female faces are both morphologically and stereotypically more strongly associated with happiness (Hess, Adams, Grammer, & Kleck, 2009) and positivity (Hugenberg & Sczesny, 2006) than are male faces. This relatively more positive evaluation of the female faces may render the evaluation of male Caucasian faces presented amongst female faces less positive and hence not sufficient to prime the faster categorization of happiness. Male African American faces, on the other hand, are associated with physical threat (Cottrell & Neuberg, 2005) and evaluated less positively than male Caucasian faces (Hugenberg, 2005). Presenting the male Caucasian faces among male African American faces may render their evaluation relatively more positive facilitating the evaluation of happy expressions. This interpretation can also account for the finding that a happy face advantage emerged for male Caucasian faces presented among neutral female faces in Experiment 3. Not presenting the happy female faces may have reduced the (relative) negative evaluation of the ‘other faces’ (male Caucasians) presented amongst them and enabled the observation of a happy face advantage that would be present if the male Caucasian faces were presented alone and not embedded in a context of female faces.

Taken together, the current results clearly indicate that the perception of facial expressions of emotion is a complex process which is affected by a multitude of factors both within and outside the face. These variables include information about the poser as can be derived from the face and posture (Wieser & Brosch, 2012) as well as verbal information that contextualizes the face or alters the extent to which it actually does signal danger (Rowles, Lipp, & Mallan, 2012). The current results suggest that the company in which a particular face is presented is another contextual factor which influences emotion processing.

Rather than reflecting the operation of an evolutionary old and rather automatic bottom up process (Öhman, 2009), the differentiation of happy and angry faces seems to be a more complex process that is affected by a number of variables. Given the complexity of the social world that ancient and contemporary humans inhabit, this level of flexibility seems advantageous in comparison to a more simplistic all or nothing mode of response. Moreover, it should be added that this flexibility does not come at a great cost. The processing differences as evident in the current research were in the order of 40 ms and expression recognition was completed within 700 ms of stimulus presentation.

References

Aguado, L., Garcia-Gutierrez, A., & Serrano-Pedraza, I. (2009). Symmetrical interaction of sex and expression in face classification tasks. *Attention, Perception & Psychophysics, 71*(9), 9-25. doi: 10.3758/APP.71.1.9

Beaupré, M. G., & Hess, U. (2005). Cross-cultural emotion recognition among Canadian ethnic groups. *Journal of Cross-Cultural Psychology*, *26*, 355-370. doi: 10.1177/0022022104273656

Becker, D. V., Anderson, U. S., Mortensen, C. R., Neufeld, S. L., & Neel, R. (2011). The face in the crowd effect unconfounded: Happy faces, not angry faces, are more efficiently detected in single- and multiple-target visual search tasks. *Journal of Experimental Psychology: General*, *140*, 637-659. doi: 10.1037/a0024060

Becker, D. V., Kenrick, D. T., Neuberg, S. L., Blackwell, K. C., & Smith, D. M. (2007). The confounded nature of angry men and happy women. *Journal of Personality and Social Psychology, 92*(2), 179-190. doi: 10.1037/0022-3514.92.2.179

Bijlstra, G., Holland, R. W., & Wigboldus, D. H. J. (2010). The social face of emotion recognition: Evaluations versus stereotypes. *Journal of Experimental Social Psychology, 46*, 657-663. doi: 10.1016/j.jesp.2010

Calvo, M. G., & Nummenmaa, L. (2008). Detection of emotional faces: Salient physical features guide effective visual search. *Journal of Experimental Psychology: General*, *137*, 471-494. doi: 10.1037/a0012771

Cottrell, C. A., & Neuberg, S. L. (2005). Different emotional reactions to different groups: A socio-functional threat-based approach to "prejudice". *Journal of Personality and Social Psychology, 88*, 770-789. doi: 10.1037/0022-3514.88.5.770

Craig, B. M., Mallan, K. M., & Lipp, O. V. (2012). The effect of poser race on the happy categorization advantage depends on stimulus type, set size, and presentation duration. *Emotion, 12*(6), 1303-1314. doi: 10.1037/a0028622

Eagly, A.H., & Kite, M.E. (1987). Are stereotypes of nationalities applied to both women and men? *Journal of Personality and Social Psychology, 53,* 451-462.

Farell, B. (1988). Comparison requirements and attention in identical-nonidentical stimulus discriminations. *Journal of Experimental Psychology: Human Perception and Performance, 14*, 707-715.

Forster, K. I., & Forster, J. C. (2003). DMDX: A Windows display program with millisecond accuracy. *Behavior Research Methods, Instruments & Computers, 35*, 116-124. doi: 10.3758/BF03195503

Hess, U., Adams Jr., R. B., Grammer, K., & Kleck, R. E. (2009). Face gender and emotion expression: Are angry women more like men? *Journal of Vision, 9*(12), 1-8. doi: 10.1167/9.12.19

Hugdahl, K., Iversen, P. M., & Johnsen, B. H. (1993). Laterality for facial expressions: Does the sex of subjects interact with the sex of the stimulus face? *Cortex*, *29*, 325–331.

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. doi: 10.1037/1528-3542.5.3.267

Hugenberg , K., & Sczesny , S. (2006). On wonderful women and seeing smiles: Social categorization moderates the happy face response latency advantage. *Social Cognition, 24*, 516-539. doi: 10.1521/soco.2006.24.5.516

Leppänen, J. M., & Hietanen, J. K. (2003). Affect and face perception: Odors modulate the recognition advantage of happy faces. *Emotion, 3*(4), 315-326. doi: 10.1037/1528-3542.3.4.315

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*, 3-35. doi: 10.1037//1076-8971.7.1.3

Navarrete, C. D., Olsson, A., Ho, A. K., Mendes, W. B., Thomsen, L., & Sidanius, J. (2009). Fear extinction to an out-group face: The role of target gender. *Psychological Science, 20*, 155-158. doi: doi: 10.1111/j.1467-9280.2009.02273.x

Öhman, A. (2009). Of snakes and faces: An evolutionary perspective on the psychology of fear. *Scandinavian Journal of Psychology*, *50*, 543-552. doi: 10.1111/j.1467-9450.2009.00784.x

Purkis, H. M., Lipp, O. V., Edwards, M. E., & Barnes, R. (2009). An increase in stimulus arousal has differential effects on the processing speed of pleasant and unpleasant stimuli. *Motivation and Emotion, 33*, 353-361. doi: 10.1007/s11031-009-9144-2

Righart, R., & de Gelder, B. (2008). Rapid influence of emotional scenes on encoding of facial expressions: an ERP study. *Social Cognitive and Affective Neuroscience, 3*, 270-278. doi: 10.1093/scan/nsn021

Robinson, M. D., Storbeck, J., Meier, B. P., & Kirkeby, B. S. (2004). Watch out! That could be dangerous: Valence-arousal interactions in evaluative processing. *Personality and Social Psychology Bulletin, 30*, 1472-1484. doi: 10.1177/0146167204266647

Rowles, M. E., Lipp, O. V., & Mallan, K. M. (2012). On the resistance to extinction of fear conditioned to angry faces. *Psychophysiology, 49*, 375-380. doi: 10.1111/j.1469-8986.2011.01308.x

Tottenham, N., Tanaka, J. W., Leon, A. C., McCarry, T., Nurse, M., Hare, T. A.,…Nelson, C. (2009). The NimStim set of facial expressions: Judgments from untrained research participants. *Psychiatry Research, 168*, 242–249. doi:10.1016/j.psychres.2008.05.006

Wallis, J., Lipp, O. V., & Vanman, E. J. (2012). Face age and sex modulate the other-race effect in face recognition. *Attention, Perception, & Psychophysics, 74*, 1712-1721. doi: 10.3758/s13414-012-0359-z

Wieser, M. J., & Brosch, T. (2012). Faces in context: A review and systematization of contextual influences on affective face processing. *Frontiers in Psychology, 3*(471). doi: 10.3389/fpsyg.2012.00471

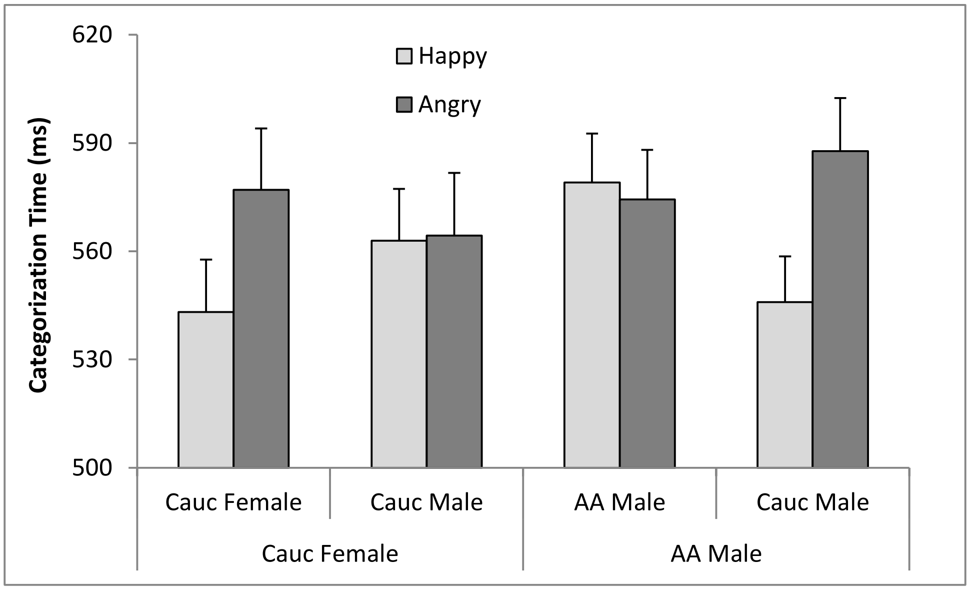
Zarate, M. A., & Smith, E. R. (1990). Person categorization and stereotyping, *Social Cognition*, *8*, 161-185. doi: 10.1521/soco.1990.8.2.161

Figure captions:

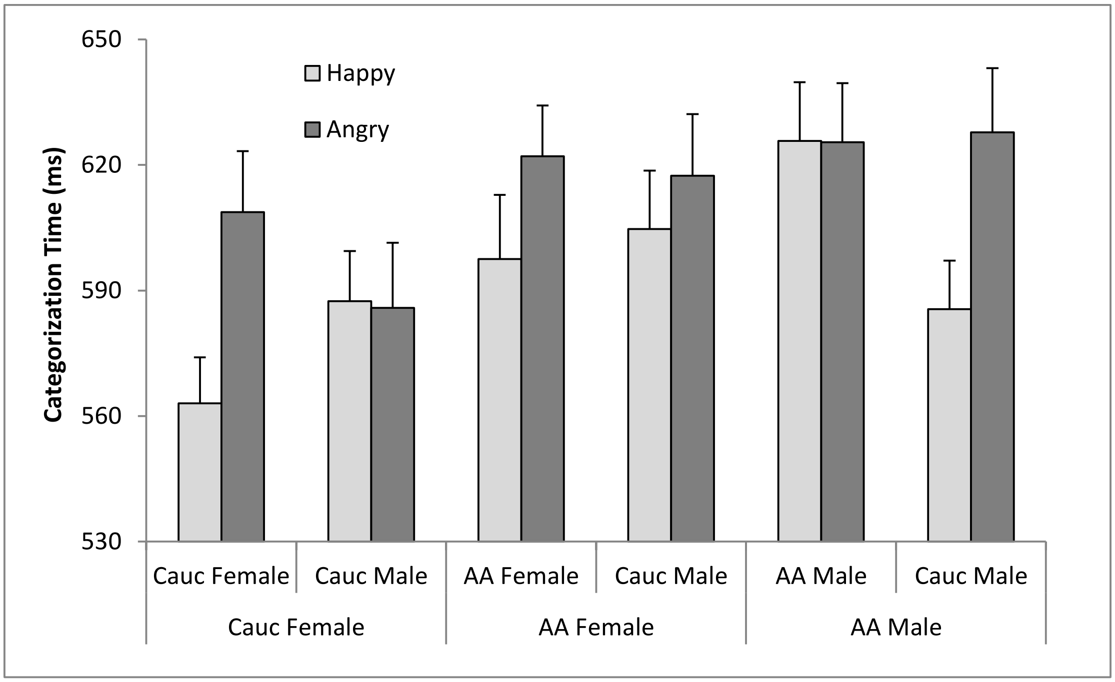
Figure 1. Mean categorization time for female Caucasian, male Caucasian, and male African American happy and angry faces in Experiment 1 (error bars represent standard errors of the mean).

Figure 2. Mean categorization time for female Caucasian, male Caucasian, female African American, and male African American happy and angry faces in Experiment 2 (error bars represent standard errors of the mean).

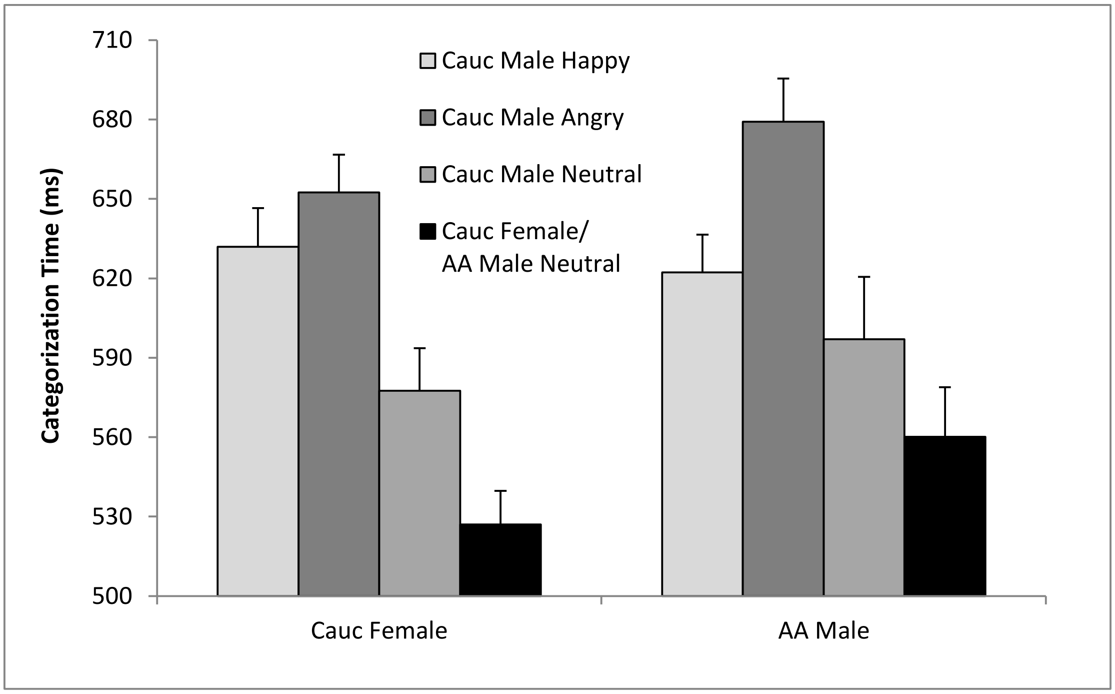
Figure 3. Mean categorization time for male Caucasian happy, angry, and neutral faces and for female Caucasian and male African American neutral faces in Experiment 3 (error bars represent standard errors of the mean).



Happy
Angry
Categorization Time (ms)
620
590
560
530
500
Cauc Female
Cauc Male
AA Male
Cauc Male
Cauc Female
AA Male



650
620
590
560
530
Happy
Angry
Categorization Time (ms)
Cauc Female
Cauc Male
AA Female
Cauc Male
AA Male
Cauc Male
Cauc Female
AA Female
AA Male



710
680
650
620
590
560
530
500
Categorization Time (ms)
Cauc Male Happy
Cauc Male Angry
Cauc Male Neutral
Cauc Female/
AA Male Neutral
Cauc Female
AA Male

Supplementary materials

Assessment of perceived expression intensity

Thirty-eight undergraduate students, 28 females, who identified as Caucasian completed an online questionnaire created with Qualtrics Survey Software. The average age was 20.47, (*SD* = 5.77; range 17-42 years). When viewing the instructions for the questionnaire, participants saw 4 example faces, angry Caucasian female, happy African American female, angry Caucasian male, happy African American male. After providing informed consent and demographic information participants were asked to answer the question “How intense is the emotional expression shown by this person?” for each of the 64 emotional faces used in Experiments 1 and 2. On each trial, participants were presented with a single face above the text of the question and a 7 point Likert scale with the anchors “Not at all”, “Very weak”, “Weak”, “Moderate”, “Strong”, “Very strong”, and “Extreme”. After choosing one of the response alternatives participants moved to the next trial by clicking a button. Faces were organized in 4 blocks, each comprising 16 faces, four of each being Caucasian female, African American female, Caucasian male, and African American male. Half of the faces in each of these sets were angry and the other half were happy. Presentation sequence within a block was randomised and happy and angry expressions of the same model were presented in different blocks. The average expression intensity ratings can be seen in Figure 1. The 2 x 2 x 2 (Race [Caucasian vs. African American] x Sex (female vs. male] x Emotion [happy vs. angry]) omnibus ANOVA yielded main effects for Emotion, $F(1,37) = 67.89$, $p < .001$, $\eta_p^2 = .647$, and Race, $F(1,37) = 9.68$, $p = .004$, $\eta_p^2 = .207$, as well as Emotion x Sex, $F(1,37) = 7.70$, $p = .009$, $\eta_p^2 = .172$, Emotion x Race, $F(1,37) = 48.92$, $p < .001$, $\eta_p^2 = .569$, Sex x Race, $F(1,37) = 19.69$, $p < .001$, $\eta_p^2 = .347$, and Emotion x Sex x Race interactions, $F(1,37) = 14.21$, $p = .001$, $\eta_p^2 = .278$.

Follow-up 2 x 2 (Race [Caucasian vs. African American] x Sex (female vs. male]) analyses for each emotion separately revealed that happy expressions were perceived as more intense when posed by African American posers, $F(1,37) = 74.94$, $p < .001$, $\eta_p^2 = .669$. No other effects reached significance, all F < 1. The intensity of the angry expressions differed between the groups yielding main effects for Race, $F(1,37) = 5.17$, $p = .029$, $\eta_p^2 = .669$, and Sex, $F(1,37) = 10.69$, $p = .002$, $\eta_p^2 = .224$, as well as a Race x Sex interaction, $F(1,37) = 28.82$, $p < .001$, $\eta_p^2 = .438$. Anger was perceived to be more intense on male African American faces than on female African American faces, $F(1,37) = 29.35$, $p < .001$, $\eta_p^2 = .442$, whereas a trend in the inverse direction emerged for Caucasian faces, $F(1,37) = 3.63$, $p = .064$, $\eta_p^2 = .089$.

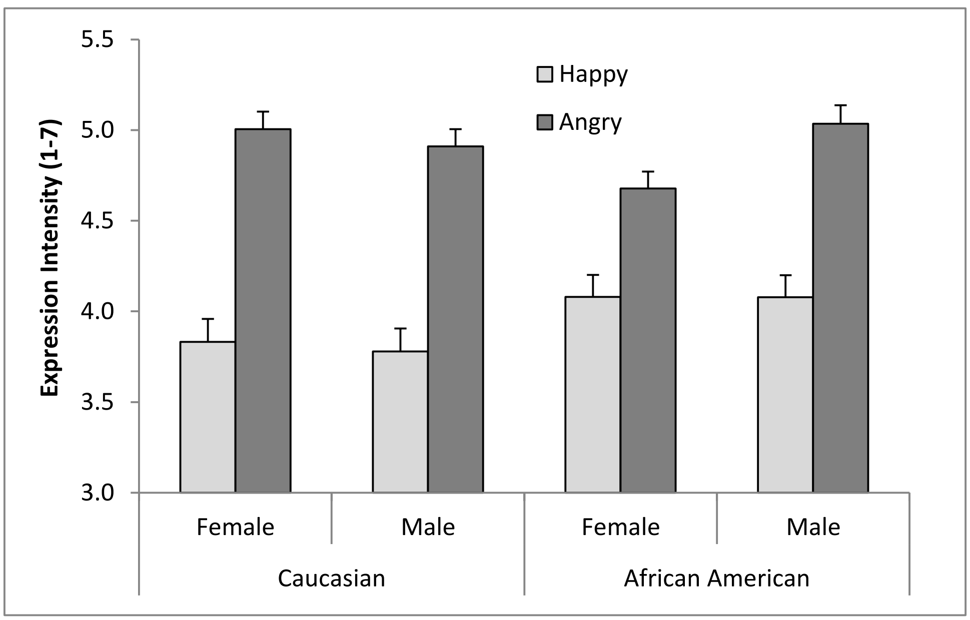


Figure 1. Mean rated expression intensity for female Caucasian, male Caucasian, female African American, and male African American happy and angry faces in Experiments 1 and 2 (error bars represent standard errors of the mean).

To assess whether the patterns of results observed for emotion categorization may reflect on differences in expression intensity, three separate 2 x 2 (Face [male Caucasian vs. female Caucasian/ male African American/female African American] x Emotion [happy vs. angry])

ANOVAs were run. The analysis of the intensity ratings for the Caucasian faces yielded a main effect for Emotion, $F(1,37) = 100.06$, $p < .001$, $\eta_p^2 = .730$, and a marginal main effect for Face, $F(1,37) = 3.08$, $p = .087$, $\eta_p^2 = .077$, but no interaction, F < 1. The analysis of the intensity ratings for the male faces yielded main effects for Emotion, $F(1,37) = 86.67$, $p < .001$, $\eta_p^2 = .701$, and Face, $F(1,37) = 28.09$, $p < .001$, $\eta_p^2 = .432$, as well as a Face x Emotion interaction, $F(1,37) = 5.50$, $p = .024$, $\eta_p^2 = .129$. The interaction reflects that emotions on male African American faces were rated as more intense than on male Caucasian faces, both $F(1,37) > 4.19$, $p < .049$, $\eta_p^2 > .101$, but that this difference was larger for happiness than for anger. The comparison of male Caucasian and female African American faces yielded a main effect for Emotion, $F(1,37) = 50.50$, $p < .001$, $\eta_p^2 = .577$, and a Face x Emotion interaction, $F(1,37) = 37.52$, $p < .001$, $\eta_p^2 = .504$. The interaction reflects that relative to male Caucasian faces happy female African American faces were rated as more intense, $F(1,37) = 26.58$, $p < .001$, $\eta_p^2 = .418$, and angry female African American faces were rated as less intense, $F(1,37) = 13.31$, $p = .001$, $\eta_p^2 = .265$. Taken together the patterns or results obtained for rated expression intensity do not resemble those for emotion categorization and do not provide an explanation for the results observed in Experiments 1 and 2.

Figures of error percentages in Experiments 1-3

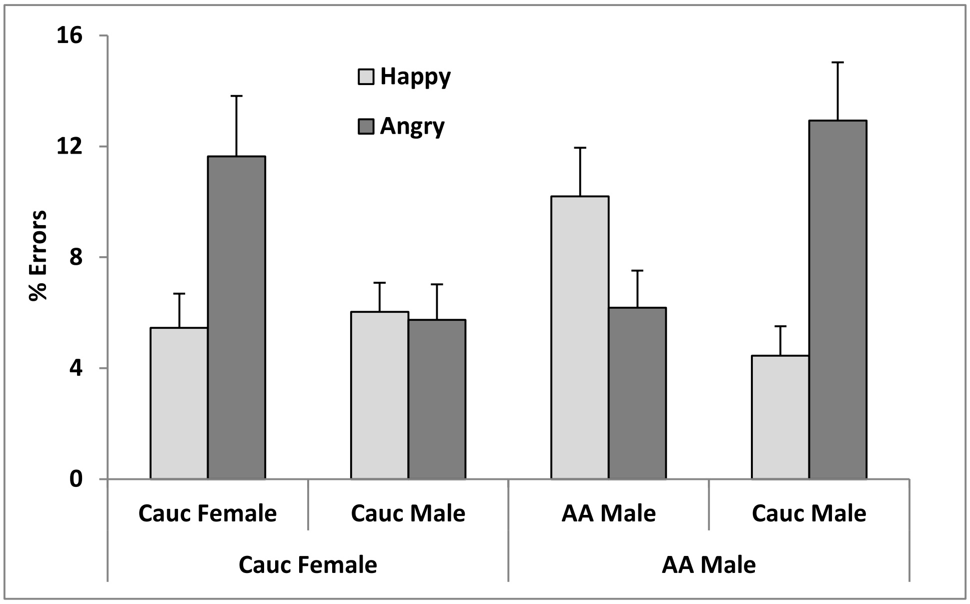


Figure 2. Mean error percentages for female Caucasian, male Caucasian and male African American happy and angry faces in Experiment 1 (error bars represent standard errors of the mean).

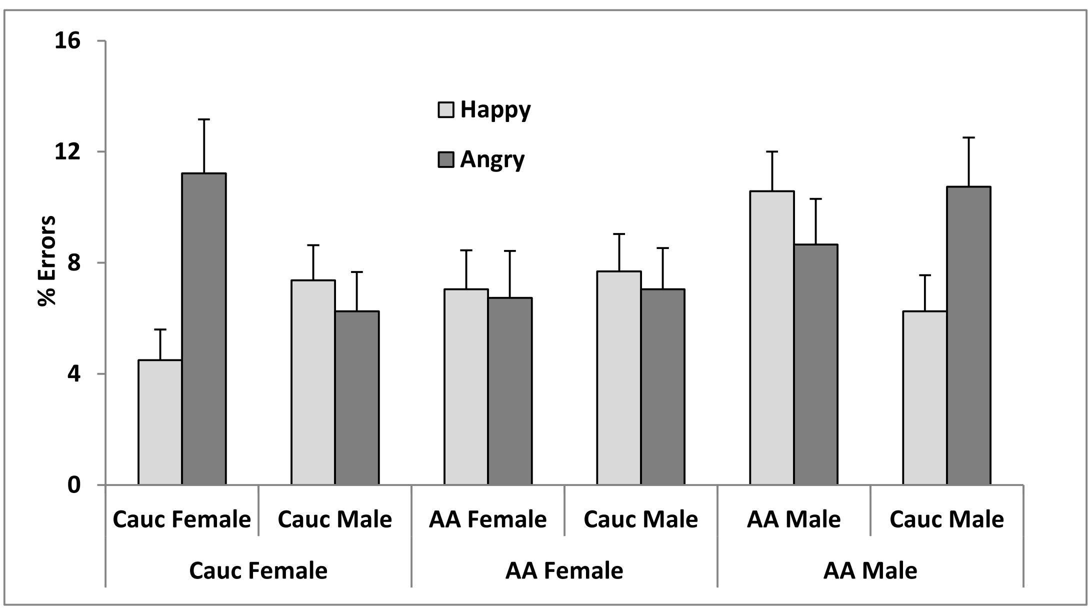


Figure 3. Mean error percentages for female Caucasian, male Caucasian, female African American and male African American happy and angry faces in Experiment 2 (error bars

represent standard errors of the mean).

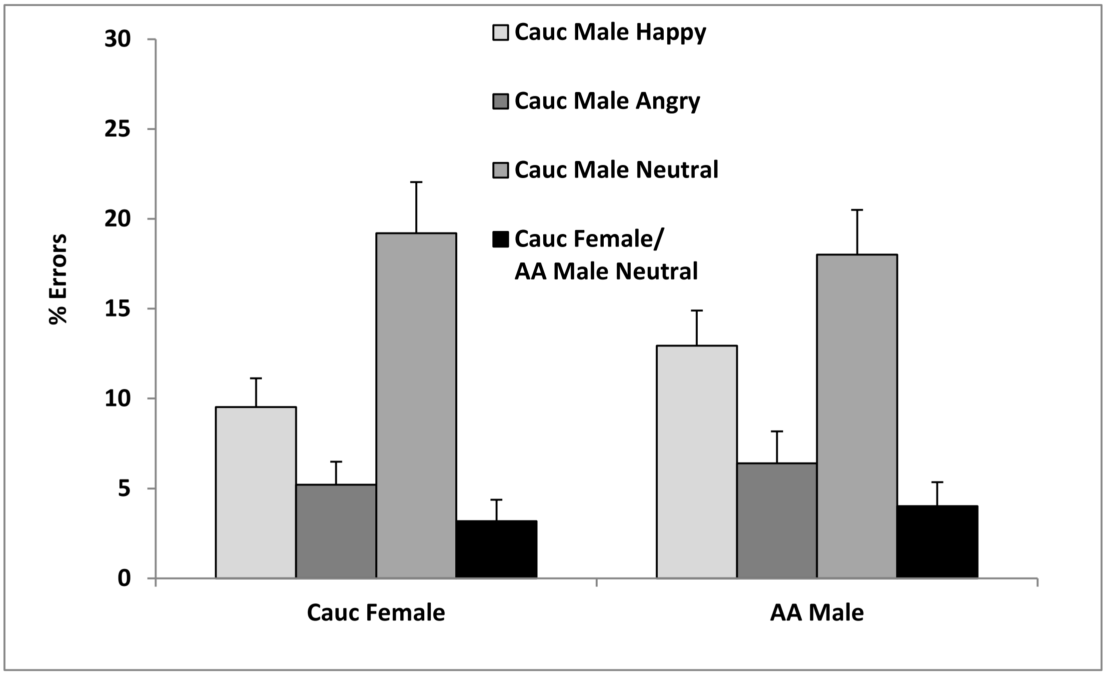


Figure 4. Mean categorization time for male Caucasian happy, angry, and neutral faces and for female Caucasian and male African American neutral faces in Experiment 3 (error bars represent standard errors of the mean).