2:0 for the good guys: Character information influences emotion perception

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Abstract

Previous research has demonstrated that facial social category cues influence emotion perception such that happy expressions are categorized faster than negative expressions on faces belonging to positively evaluated social groups. We examined whether character information that is experimentally manipulated can also influence emotion perception. Across two experiments, participants learned to associate individuals posing neutral expressions with positive or negative acts. In a subsequent task, participants categorized happy and angry expressions of these same individuals as quickly and accurately as possible. As predicted, a larger happy face advantage emerged for individuals associated with positive character information than for individuals associated with negative character information. These results demonstrate that experimentally manipulated evaluations of an individual's character are available quickly and affect early stages of face processing. Emotion perception is not only influenced by preexisting attitudes based on facial attributes, but also by information about a person that has been recently acquired.

Keywords: character information, emotion perception, happy face advantage, face processing

Every day around the world judges, jurors, and law enforcement officers are tasked with the role of detecting truth and lies, often relying on body language and facial expressions to do so. But are their judgements already biased? Can preexisting beliefs about whether someone is “good” or “bad” alone shift perception of emotional expressions?

Quickly and accurately perceiving others’ emotional expressions is critical in social interactions, but accumulating evidence indicates that emotion perception is biased by social information available from a face (e.g., Aguado, Garcia-Gutierrez, & Serrano-Pedraza, 2009; Hugenberg & Bodenhausen, 2003). For example, the happy face advantage, the finding that happy expressions are recognized more quickly than negative expressions like anger or disgust (Leppänen & Hietanen, 2003), is larger for female than male faces (e.g., Becker, Kenrick, Neuberg, Blackwell, & Smith, 2007; Hugenberg & Sczesny, 2006) and own-race faces when categorized together with other-race faces (e.g., Hugenberg, 2005; Lipp, Craig, & Dat, 2015). Across a number of studies, it has been demonstrated that this bias is due to the evaluative congruence between preexisting attitudes about social attributes and emotional expressions. Social category cues are quickly extracted and evaluated prior to the expression judgement, providing an evaluative context in which the emotional expression is perceived. Positive expressions are recognized more quickly than negative expressions on relatively positively evaluated faces but not on relatively negatively evaluated faces (Bijlstra, Holland, & Wigboldus, 2010; Hugenberg, 2005; Hugenberg & Sczesny, 2006; Lipp et al., 2015). This influence on emotion recognition is not limited to social category cues, but has recently been extended to facial attractiveness as well (Lindeberg, Craig, & Lipp, 2019).

To date, studies have shown that people’s preexisting positive and negative attitudes about social dimensions recognizable on a face can influence emotion perception, but in these studies, the “positive” or “negative” category was always confounded with the visual structural information present on the faces. Whether an influence of social evaluations on emotion perception can be observed while holding visual structural information constant and manipulating only the evaluation of the face is currently unknown. Furthermore, previous studies have focused on the influence of evaluations based on knowledge associated with social categories, whereas the current study addresses the question of whether evaluations based on knowledge about specific individuals moderates emotion categorization.

To test this, we experimentally manipulated the same faces to be evaluated as positive or negative by providing participants with character information. Participants then completed an emotion categorization task to detect the influence of these experimentally created evaluations on emotion perception. In line with the evaluative congruence account, it was predicted that the happy face advantage should be larger for faces associated with positive information than for faces associated with negative information. To determine the robustness of the phenomenon, Experiment 1, conducted in a laboratory setting, was replicated online in Experiment 2.

Experiment 1

Method

Participants. Reliable effects of facial attributes such as sex and race on the happy face advantage have been observed with around 30 participants (e.g., Lipp et al., 2015). Given that the effect of manipulating the valence of faces by personal information might be weaker, we oversampled. Forty-seven undergraduate students (39 female, M = 20.17 years, SD = 3.16 years) participated for partial course credit. Thirty-three participants identified themselves as Caucasian, four as Asian, three as Indian, one as African, and six as “other”.

Stimulus materials and apparatus. Photographs of eight male Caucasian models, each displaying a happy, angry, and neutral expression, were selected from the Radboud Faces Database (Langner et al., 2010; Models 5, 7, 9, 15, 23, 24, 33, and 71) and resized to

238 × 358 pixels. The experiment was run on a LED monitor with a resolution of 1,920 × 1,080 pixels and a refresh rate of 120 Hz, controlled by DMDX (Forster & Forster, 2003).

Procedure. Participants were tested individually or in small groups of no more than three, separated by partitions to minimize distraction. Participants were instructed to learn information about people. Eight short sentences providing character information, four negative (e.g., "*This is John. John was recently arrested and charged with drink driving after he crashed into another car holding a family of four"*) and four positive (e.g., "*This is Daniel. Daniel just spent his summer holiday volunteering with children in need in Indonesia"*), were paired with the models displaying a neutral expression. The valence associated with a particular model was counterbalanced across participants. The faces and information were presented for at least 6 s after which participants could press the space bar to move to the next screen. After the learning phase, we tested participants' memory of the association between the faces and character information. For each face, participants were asked to indicate whether the person depicted did something good or bad using the left and right shift keys. Response mapping was counterbalanced across participants. Participants received feedback as to whether their responses were "correct" or "wrong". This learning/test phase was completed three times in total.

After the learning phase, participants completed an emotion categorization task with pictures of the eight models displaying happy and angry expressions. Participants were instructed to categorize the facial expressions as happy or angry as quickly and accurately as possible, using the left and right shift keys. Response mapping was counterbalanced across participants. The task consisted of eight practice trials and 96 test trials. Face stimuli were presented one at a time in a randomized sequence in blocks of eight; each picture was thus presented six times. Before each face appeared, a fixation cross was presented centred on the screen for 500 ms, immediately followed by the face which was presented for 3,000 ms or until a response was made. The intertrial interval was 1,000 ms.

After completing the emotion categorization task, participant's memory of the association between the faces and the valence of the character information was tested again. Participants also rated the neutral faces on pleasantness on a 7-point Likert scale in a randomized sequence to evaluate the effectiveness of the valence manipulation. The procedures were approved by the Curtin University Human Research Ethics Committee.

Analysis. Errors (i.e., incorrect button presses), invalid responses (i.e., trials with response times faster than 100ms), and outliers (i.e., response times which deviated from an individuals' mean by more than 3 *SD*s) were excluded from the response time analysis (3.92% of trials). Additionally, participants with an error rate higher than 25% or a mean response time more than 3 *SDs* above the mean response time across all participants were excluded from analyses (no participant met exclusion criteria in Experiment 1). Mean response times and error rates were subjected to separate 2 (Character: positive vs. negative) × 2 (Expression: happy vs. angry) repeated measures analyses of variance (ANOVAs) with follow-up pairwise comparisons. Preliminary analyses including and excluding non-Caucasian participants yielded the same pattern of results for Experiments 1 and 2, so the results are reported including all participants. Participant gender was included as a between-subjects factor in preliminary analyses for Experiment 1 and 2, and did not moderate the theoretically relevant Character × Expression interaction and therefore, the results are reported collapsed across this factor.

Results

Manipulation check. To evaluate the effectiveness of the valence manipulation, we analyzed the accuracy of the good/bad judgements using a 2 (Character: positive vs. negative) × 4 (Block: 1 - 4) repeated measures ANOVA. This yielded a main effect of block, $F(3, 44)$ =

18.60, *p* <. 001, η_p^2 = .56, which demonstrated that performance improved from Block 1 (accuracy 73.14%) to Block 2 (85.11%), *t*(46) = 4.29, *p* <. 001, and from Block 2 to Block 3 (92.55%), *t*(46) = 3.79, *p* <. 001. Importantly, there was no difference between Block 3 (before the emotion categorization task) and Block 4 (after the emotion categorization task, 90.69%), *t*(46) = 1.10, *p* = .279. There was no main effect of character, *F*(1, 46) = 0.02, *p* = .881, η_p^2 < .01, or Character × Block interaction, *F*(3, 44) = 0.79, *p* = .508, η_p^2 = .05, indicating that participants learnt the positive and negative associations equally well. Faces associated with positive information (*M* = 4.16, *SD* = 0.95) were rated as more pleasant than faces associated with negative information (*M* = 3.52, *SD* = 0.79), *t*(46) = 4.34, *p* < .001, indicating that the explicit face valence was manipulated successfully.

Emotion categorization times. As depicted in Figure 1a, the manipulated face valence influenced how quickly emotional expressions were categorized. Happy faces were categorized faster than angry faces, *F*(1, 46) = 11.16, *p* = .002, η_p^2 = .20, but this main effect was qualified by the predicted Character × Expression interaction, *F*(1, 46) = 6.09, *p* = .017, η_p^2 = .12. Follow-up comparisons demonstrate a happy face advantage for the faces associated with positive character information, *t*(46) = 4.00, *p* < .001, but not for the faces associated with negative character information, *t*(46) = 0.64, *p* = .524.

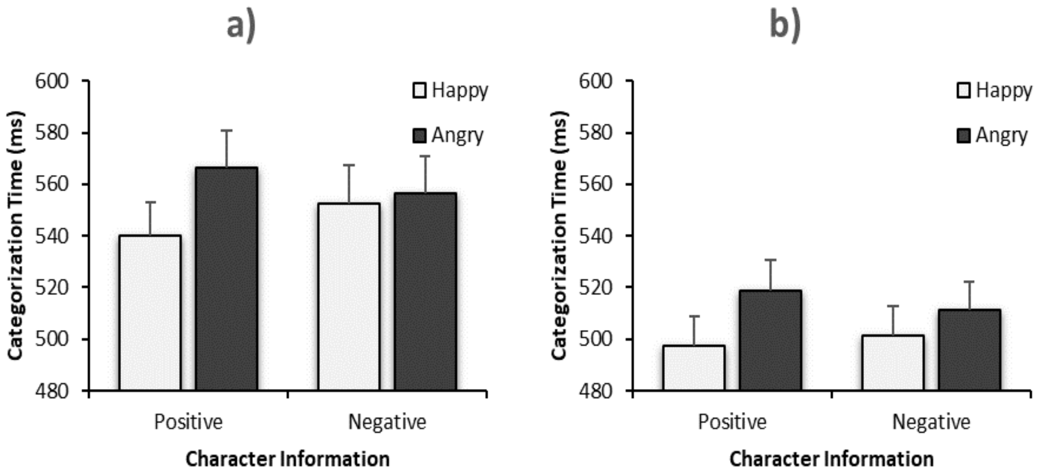

Figure 1. Categorization times for happy and angry expressions as a function of the character information provided in Experiment 1 (a) and Experiment 2 (b). Error bars represent 1 *SEM*.

Accuracy. Analysis of error rates yielded no significant main effects or interaction, all Fs(1, 46) < 3.23, ps > .079, η_p^2 < .07. Numerically, the pattern of error rates is consistent with the categorization times (Table 1).

Table 1.

Mean error percentages for categorizing happy and angry expressions as a function of the character information provided in Experiments 1 and 2.

Experiment	Happy	Angry
Experiment 1		
Positive	3.37 (3.32)	4.34 (4.51)
Negative	3.55 (4.43)	4.43 (5.02)
Experiment 2		
Positive	5.05 (4.76)	6.01 (5.31)
Negative	5.45 (5.75)	3.37 (4.21)

Note. Values in parentheses represent 1 *SD*.

Experiment 2

Method

Participants. Fifty-four participants (28 female, *M* = 38.35 years, *SD* = 10.89 years) were recruited from Amazon Mechanical Turk and received 3.60 USD for completing the experiment. Forty-one participants identified themselves as White/Caucasian, five as Black/African American, two as Hispanic, five as Asian, and one as "other".

Stimulus materials, procedure, and analysis. Experiment 2 was identical to Experiment 1 except as follows. The experiment was run online using Millisecond's Inquisit 4 Web (Inquisit, 2015) which resulted in some minor stylistic changes throughout the experiment. Error feedback was provided during the practice trials in the emotion categorization task to ensure participants learnt the response mapping in the absence of the experimenter. The *S* and *L* keys were used as the response keys and reminders of which key was assigned to "happy" or "angry" judgements were displayed throughout the task on the corresponding sides of the screen. Errors, invalid responses, and outliers, as defined for Experiment 1, comprised 4.90% of trials and were excluded from analysis of the response times. Data were analysed as described above. Two participants with a mean response time more than 3 *SDs* above the mean across all participants (*M* = 978 and 1,037 ms respectively) were excluded from analyses. Preliminary analyses including these participants yielded the same pattern of results.

Results

Manipulation check. As in Experiment 1, performance on the memory task improved across blocks, $F(3, 51) = 20.74$, $p < .001$, $\eta_p^2 = .55$, with an increase in accuracy from Block 1 to Block 2, $t(53) = 4.39$, $p < .001$, and from Block 2 to Block 3, $t(53) = 4.13$, $p < .001$. Again, there was no difference between Blocks 3 and 4, before and after the emotion categorization task, *t*(53) = 1.43, *p* = .159. The Character × Block interaction, *F*(3, 51) = 3.26, *p* = .029, η_p^2 = .16, reflected that participants learned the negative information (accuracy 80.09%) better than the positive information (68.98%) in Block 1, *t*(53) = 2.61, *p* = .012. There was no difference in accuracy in Blocks 2 (positive: 88.89%, negative: 82.87%), *t*(53) = 1.72, *p* = .091, Block 3 (positive: 92.13%, negative: 93.98%), *t*(53) = 0.73, *p* = .470, or Block 4 (positive: 90.74%, negative: 91.67%), *t*(53) = 0.33, *p* = .742. Faces associated with positive information (*M* = 4.11, *SD* = 1.09) were again rated as more pleasant than faces associated with negative information (*M* = 3.50, *SD* = 0.95), *t*(53) = 3.68, *p* = .001, confirming that the manipulation of explicit face valence was successful.

Emotion categorization times. As depicted in Figure 1b, the manipulated valence of the faces affected the emotion categorization speed. Happy faces were categorized faster than angry faces, *F*(1, 51) = 15.74, *p* < .001, η_p^2 = .24, and this main effect was again qualified by the predicted Character × Expression interaction, *F*(1, 51) = 8.25, *p* = .006, η_p^2 = .14. A happy face advantage was evident for both the faces associated with positive, *t*(51) = 4.22, *p* < .001, and negative character information, *t*(51) = 2.69, *p* = .010, however, the happy face advantage was larger for the faces associated with positive character information.

Accuracy. The error rates (see Table 1) show a pattern similar to the categorization times. The Character × Expression interaction, *F*(1, 51) = 4.98, *p* = .030, η_p^2 = .09, emerged as participants were more accurate categorizing angry than happy faces associated with negative character information, *t*(51) = 2.11, *p* = .040, but not with positive character information, *t*(51) = 1.08, *p* = .286.

Combined analysis. To summarize the findings from Experiments 1 and 2, we conducted fixed effects mini meta-analyses for the emotion categorization times and error rates separately using the Metafor package 1.9-9 (Viechtbauer, 2010) in R 3.5.1 (R Core

Team, 2018). For the categorization times, a happy face advantage was evident for faces associated with positive, mean weighted d_z = 0.58, 95% CI [0.36-0.79], *SE* = 0.11, *z* = 5.30, *p* < .001, and negative character information, mean weighted d_z = 0.23, 95% CI [0.03-0.43], *SE* = 0.10, *z* = 2.27, *p* = .023, but the advantage was larger for faces associated with positive character information, d_z = 0.37, 95% CI [0.17-0.58], *SE* = 0.10, *z* = 3.60, *p* < .001. The combined effect for the error rates was not significant for faces associated with positive, mean weighted d_z = 0.16, 95% CI [-0.03-0.36], *SE* = 0.10, *z* = 1.63, *p* = .104, or with negative character information, mean weighted d_z = -0.06, 95% CI [-0.26-0.14], *SE* = 0.10, *z* = -0.54, *p* = .588.

General Discussion

Across two experiments, provision of character information to experimentally manipulate evaluations of faces moderated emotion perception. Consistent with the evaluative congruence account (Hugenberg, 2005; Hugenberg & Sczesny, 2006), we observed a happy face advantage for faces associated with positive character information, and a reduced or absent happy face advantage for faces associated with negative character information.

As mentioned above, previous studies of the effect of social category cues on emotion perception cannot completely rule out stimulus artifacts as the faces used are evaluated more or less positively based on interpretation of facial cues. For instance, it is possible that the way females express emotions differs from males or that structural differences between female and male, or own- and other-race faces introduce the observed bias in emotion perception (although see Craig, Koch, & Lipp, 2017; Craig, Zhang, & Lipp, 2017; Lipp et al., 2015). In the present study, the same faces were manipulated to be evaluated positively or negatively across participants and we demonstrate for the first time that the influence of evaluations on emotion recognition is independent of the unique qualities of the face.

This finding is consistent with recent person perception models (Freeman & Ambady, 2011) which propose that top-down knowledge influences recognition of social information like emotional expressions. Although Freeman and Ambady (2011) did not specifically identify character information as a source of top-down knowledge, the current results demonstrate that such information modulates emotion categorization. This finding could be considered a demonstration of how top-down knowledge about a person interacts with bottom-up information to influence emotion perception and is consistent with the model.

The factors that moderate emotion perception seem to be broader than initially thought and not limited to evaluations primed by facial social category cues. The present study supports the premise that it is the overall evaluation of a particular individual, which is determined by the salient evaluative information available at any given time, which influences emotion perception. Moreover, we demonstrate for the first time that this top-down knowledge about an individual's character, and not only knowledge related to their social group, is available early enough to influence emotion perception.

References

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

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*, 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.2010.03.006

Craig, B. M., Koch, S., & Lipp, O. V. (2017). The influence of social category cues on the happy categorisation advantage depends on expression valence. *Cognition and Emotion, 31,* 1493-1501. doi:10.1080/02699931.2016.1215293

Craig, B. M., Zhang, J., & Lipp, O. V. (2017). Facial race and sex cues have a comparable influence on emotion recognition in Chinese and Australian participants. *Attention, Perception & Psychophysics*, *79*, 2212-2223. doi:10.3758/s13414-017-1364-z

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

Freeman, J. B., & Ambady, N. (2011). A dynamic interactive theory of person construal. *Psychological Review, 118*, 247–279. doi:10.1037/a0022327

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

Hugenberg, K., & Bodenhausen, G. V. (2003). Facing prejudice: Implicit prejudice and the perception of facial threat. *Psychological Science*, *14*, 640–643. doi:10.1046/j.0956-7976.2003.psci_1478.x

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

Inquisit. (2015). Inquisit (Version 4) [Computer software]. Retrieved from https://www.millisecond.com

Langner, O., Dotsch, R., Bijlstra, G., Wigboldus, D. H. J., Hawk, S. T., & van Knippenberg, A. (2010). Presentation and validation of the Radboud Faces Database. *Cognition and Emotion, 24*, 1377-1388. doi:10.1080/02699930903485076

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

Lindeberg, S., Craig, B. M., & Lipp, O. V. (2019). You look pretty happy: Attractiveness moderates emotion perception. *Emotion, 19*, 1070-1080. doi:10.1037/emo0000513

Lipp, O. V., Craig, B. M., & Dat, M. C. (2015). A happy face advantage with male Caucasian faces: It depends on the company you keep. *Social Psychological and Personality Science, 6*, 109-115. doi:10.1177/1948550614546047

R Core Team (2018). R: A language and environment for statistical computing [Computer software]. Vienna, Austria: R Foundation for Statistical Computing. Retrieved from https://www.R-project.org

Viechtbauer, W. (2010). Conducting meta-analyses in R with the metafor package. *Journal of Statistical Software, 36*, 1–48. doi:10.18637/jss.v036.i03