Women's Dangerous World Beliefs Predict More Accurate Discrimination of Affiliative Facial Cues

4 authors, including:

Mitch Brown
University of Southern Mississippi
22 PUBLICATIONS   **15** CITATIONS

Christopher Lustgraaf
University of Southern Mississippi
11 PUBLICATIONS   **31** CITATIONS

Steven G. Young
City University of New York - Bernard M. Baru…
53 PUBLICATIONS   **1,090** CITATIONS

Some of the authors of this publication are also working on these related projects:

Project   Social Exclusion and Colaughter View project

Project   Metaphor and Disease View project

Evolutionary Behavioral Sciences

Women's Dangerous World Beliefs Predict More Accurate Discrimination of Affiliative Facial Cues

Donald F. Sacco, Mitch Brown, Christopher J. N. Lustgraaf, and Steven G. Young

Women's Dangerous World Beliefs Predict More Accurate Discrimination of Affiliative Facial Cues

Donald F. Sacco, Mitch Brown,
and Christopher J. N. Lustgraaf
The University of Southern Mississippi

Steven G. Young
Baruch College, City University of New York

Cues indicating environmental threat have been shown to influence women's preferences for physical traits in men. For example, women's beliefs about their vulnerability to aggression are associated with a stronger preference for physical formidability and aggressive dominance in male bodies and faces. In the current study, we extend these previous findings by testing whether dangerous world beliefs predict accuracy in processing facial cues associated with affiliation or deception. In addition, we include a sample of men to determine if these effects generalize to both genders. In the present study, participants viewed a series of images of a target displaying both Duchenne (genuine) and non-Duchenne (posed) smiles and were asked to categorize them as real or fake; participants also completed the Belief in a Dangerous World scale. Results revealed that for women, greater dangerous world beliefs predicted greater accuracy in discriminating real and fake smiles; no relationship was observed between dangerous world beliefs and smile detection accuracy for men. These findings uniquely demonstrate that dangerous world beliefs predict greater accuracy in adaptive face perception; however, this relationship seems to be specific to women.

Keywords: Duchenne smiles, interpersonal threat, face perception, affiliation

Humans have faced numerous threats to survival and reproduction throughout evolutionary history, with one of the most important being the maintenance of physical safety. Not only did ancestral humans face threats from predation, but other humans would have posed similar threats to personal safety (Neuberg, Kenrick, & Schaller, 2011). Although such challenges would have been relatively universal, research suggests that women may have been more vulnerable to violence historically, particularly to violence enacted by male conspecifics (Daly & Wilson, 1988). Men's greater proclivity toward aggression, as well as their greater physical stature and muscle mass (i.e., sexual dimorphism), results in a physical aggressiveness advantage (e.g., Frayer & Wolpoff, 1985; Sell, Hone, & Pound, 2012). In response to this threat of violence, it has been hypothesized that women would have benefited from psychological adaptations designed to mitigate the negative impact of male-enacted violence (e.g., homicide, sexual assault, resource competition), as indexed by their interpersonal preferences (Snyder et al., 2011).

One consistent pattern that has emerged in the literature is women's greater preference for male dominance as concerns with self-protection threat become salient. For example, women's self-reported fear of crime predicts a stronger preference for dominant and formidable male body types (Snyder et al., 2011). In addition, acute activation of self-protection motives leads women to exhibit stronger preferences toward morphologically dominant male faces (Sacco, Lustgraaf, Brown, & Young, 2015). This preference for greater physical dominance in men is considered an adaptive trade-off. Specifically, although dominant men may poten-

Donald F. Sacco, Mitch Brown, and Christopher J. N. Lustgraaf, Department of Psychology, The University of Southern Mississippi; Steven G. Young, Baruch College, City University of New York.

Correspondence concerning this article should be addressed to Donald F. Sacco, Department of Psychology, The University of Southern Mississippi, Owings-McQuagge Hall, 118 College Drive 5025, Hattiesburg, MS 39406. E-mail: donald.sacco@usm.edu

tially inflict harm on the women who prefer them (Sell et al., 2009), they may also serve as a source of protection. Essentially, the risk associated with dominant (and potentially threatening) men may ultimately be preferable given their capability of providing women in high-threat environments with increased access to resources and protection from extrapair violence (Trivers, 1972).

Although these preference shifts are adaptive, they are unlikely to reflect the only strategy for finding interaction partners who can offer viable protection without also posing a threat. For instance, although those in need of protection are known to seek affiliation (e.g., Schachter, 1959), they are also vulnerable to exploitation. Therefore, turning to others for safety requires caution and prudence (e.g., Young, Slepian, & Sacco, 2015). With this in mind, we tested the hypothesis that women with greater dispositional dangerous world concerns should demonstrate greater accuracy in their social perception of others along critical dimensions of social evaluation as means to identify safe interaction partners. For example, given an ostensibly innate ability to detect aggression in male faces (see Sell et al., 2009), women who believe their environment to be dangerous should become more attuned to cues in others that communicate approachability (i.e., trust and safety), versus potential exploitation. By identifying probable safe interaction partners, women can align themselves with others less likely to exploit them. One such cue may be women's ability to differentiate true positive affect, as indexed by Duchenne smiles, versus deceptive smiles that may be suppressing one's disingenuous and exploitive intentions (i.e., "fake" smiles; Lustgraaf, Sacco, & Young, 2015). Indeed, Duchenne smiles serve as accurate indices of cooperation (Krumhuber et al., 2007), whereas non-Duchenne smiles have the potential to mask underlying motives and emotions (Biland, Py, Allione, Demarchi, & Abric, 2008). Thus, it would be adaptive for women to demonstrate greater accuracy at discriminating Duchenne from non-Duchenne smiles, as their environment is perceived as increasingly dangerous to identify interaction partners who are less likely to be dangerous and/or exploitative.

To test this hypothesis, we had men and women view faces of a male target displaying either Duchenne or non-Duchenne smiles and categorize each smile as "real" or "fake." Participants then completed an individual difference measure to assess the extent to which they think their environment communicates threat. We hypothesized that women higher in dangerous world beliefs would demonstrate greater accuracy in discriminating Duchenne from non-Duchenne smiles. For male participants, however, we did not predict a relationship between Belief in a Dangerous World Scale (BDWAltemeyer, 1988) scores and smile discrimination, given that past research has not consistently documented a relationship between individual differences in dangerous world beliefs and social perception in men.

Method

Participants

One hundred fifty-one participants (M_{age} = 37.87 years, SD = 11.86) completed study procedures through Amazon's Mechanical Turk survey tool. Because two participants did not provide gender information, the final sample was comprised of 149 participants (62 men, 87 women).

Materials

Smile discrimination stimuli. In this task, participants saw a single Caucasian male target identity on each trial. Importantly, the target in this task was an individual trained actor who was familiar with the Facial Action Coding System (FACS; Ekman, Friesen, & Hager, 2002) and was instructed to contract single facial action units (AU) indicative of smiling. This actor generated a series of Duchenne and non-Duchenne smiles at various intensities. In addition, half of the non-Duchenne smiles involved deliberate manipulation of the eyes (as indexed by contractions of the orbicularis oculi), whereas the other half did not. The images were coded by a trained FACS coder to validate smile authenticity and inauthenticity and this research found Duchenne smiles to appear more authentic than non-Duchenne (Del Giudice & Colle, 2007). The current study used 10 Duchenne and 10 non-Duchenne smile stimuli (five of which involved manipulation of the eyes and five did not; see Figure 1 for sample stimuli). Each of these stimuli were presented in a ran-

Figure 1. Example of Duchenne (left) and non-Duchenne smile (right). See the online article for the color version of this figure.

domized order, and participants were asked to indicate whether they believed the person was displaying a real smile or fake smile (see Sacco, Merold, Lui, Lustgraaf, & Barry, 2016, Study 2, for similar procedures). To assess smile discrimination accuracy consistent with past research (Bernstein, Young, Brown, Sacco, & Claypool, 2008), we used a signal detection framework (Green & Swets, 1966). Specifically, we coded any trial as a hit in which participants categorized a Duchenne smile as real, and false alarms (FAs) as any trial in which a non-Duchenne smile was categorized as real. We used hits and FAs to compute each participant's discriminability (d'), in which higher values are indicative of a greater ability to accurately discriminate real smiles from fake smiles, as well as each participant's criterion (β), where higher values are indicative of participants' requiring more evidence to report that a smile is "real."

BDW. The BDW scale (Altemeyer, 1988) consists of 12 questions tapping the degree to which individuals believe the world to be a dangerous place (e.g., "Things are getting so bad, even a decent law-abiding person who takes sensible precautions can still become a victim of violence and crime"). Participants responded to each question using a 5-point Likert-type scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). The reliability of this measure in the current sample was acceptable ($\alpha = .92$).

Procedure

As part of a typical MTurk protocol, participants first provided informed consent by clicking on a box before starting the session. Following consent, participants completed the smile discrimination task, followed by the BDW scale, and a brief demographics form

(e.g., age, gender). Following all study procedures, participants were redirected to an online debriefing form, thanked for their participation, and provided with an access code to receive compensation.

Results

Smile Discrimination Sensitivity

To test the hypothesis that women's dangerous world beliefs are associated with greater sensitivity in discriminating Duchenne from non-Duchenne smiles, we conducted a custom univariate analysis of covariance (ANCOVA) with participant d' scores as the dependent measure ($M = 1.03$, $SD = .88$), participant gender as a categorical independent variable, and participants' average BDW as a covariate. This model allowed us to test for the critical interaction between BDW and gender in predicting smile discrimination accuracy. This model yielded a main effect for neither sex nor dangerous world beliefs ($Fs < 1$, $ps > .56$). As hypothesized, however, there was a significant interaction between participant gender and BDW scores, $F(1, 145) = 4.06$, $p = .046$, $\eta_p^2 = 0.027$ (see Figure 2). To better understand this interaction, we separately correlated BDW score with participants' d' scores for women and men. For women, there was the predicted, albeit marginally significant, positive correlation between BDW scores and d', $r(85) = .194$, $p = .072$; thus, as women's BDW increased, so too did their accuracy in discriminating between Duchenne and non-Duchenne smiles. For men, no relationship between BDW and smile discrimination accuracy emerged, $r(60) = -0.144$, $p = .265$. Notably, the correlations between
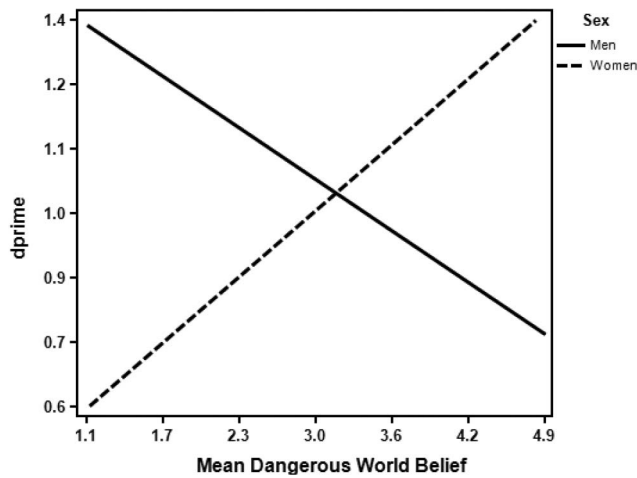
Figure 2. Relationship of men and women's dangerous world beliefs to smile discrimination accuracy.

dangerous world beliefs and smile discriminability were opposite in direction for men and women, and the magnitude of these correlations was significantly different ($Z = 2.01$, $p = .044$).

Criterion for Categorizing Smiles as Real or Fake

To determine the relationship between participant gender, BDW, and criterion for reporting a smile as real (i.e., a higher criterion indicates setting a higher threshold of evidence for categorizing a smile as real), we conducted a custom univariate ANCOVA with participant β scores as the dependent measure, participant gender as a categorical independent variable, and participants' average BDW as a covariate. This model revealed no significant effects (all Fs < 1, ps > .78). This suggests that the criterion for categorizing a smile as real or fake was functionally equivalent across participants.

Discussion

Past research has found that adaptive social preferences in others are guided by evolutionarily salient goals (Neuberg et al., 2011). One commonly documented finding is a positive relationship between women's self-protection concerns and their preference for more masculine male body types and faces (Sacco et al., 2015; Snyder et al., 2011). Because women

would have likely experienced greater threat from men due to men's higher overall aggression and greater muscle mass, women could offset this threat by preferring dominant and formidable male partners who may protect them from potential environmental threats.

Although such preference shifts would be adaptive, we argue that women should also demonstrate increased accuracy in detecting relatively safe versus unsafe social targets. By knowing who is a safe and cooperative conspecific, versus a potentially threatening or exploitive conspecific, women would potentially be best able to affiliate with others who offer safety and protection. In the current study, we used a target's smile (whether genuine or posed) to operationalize relative safety or lack thereof. Past research has consistently demonstrated that individuals display spontaneous Duchenne smiles when experiencing positive affect, as well as when interested in affiliation or cooperation (Mehu, Grammer, & Dunbar, 2007). Conversely, individuals often display posed, non-Duchenne smiles when attempting to mask underlying negative emotions or facilitate exploitation of another (Lustgraaf et al., 2015). In many cases, the difference between these two types of "emotional" displays are rather subtle, making it potentially challenging to accurately infer another's intentions based simply on facial cues alone. Nonetheless, we hypothesized that

women with chronically active self-protection concerns would show an adaptive enhancement in their ability to accurately determine the authenticity (or inauthenticity) of another's smile. Consistent with our hypothesis, as women's dispositional dangerous world beliefs increased, so too did their accuracy in discriminating Duchenne from non-Duchenne smiles; no such relationship between dangerous world beliefs and smile discrimination accuracy was documented for male participants.

The current results extend past findings by demonstrating that self-protection threat, assessed dispositionally, influences not only preferences for certain social targets, but also one's ability to accurately discriminate between categories of social targets. These results are also consistent with research showing that priming men and women with acute self-protection threat leads to enhanced discrimination accuracy for trustworthy and untrustworthy faces, as well as Duchenne versus non-Duchenne smiles (Young et al., 2015). However, unlike this previous study, we did not find similar effects for both men and women. One potential explanation for these divergent findings with respect to male participants in this previous study versus the current study may be the fact that we measured self-protection threat as a dispositional factor, whereas Young and colleagues (2015) experimentally activated self-protection concerns. Thus, it may be that when self-protection threat is made temporarily salient, it is adaptive for both men and women to demonstrate more accurate processing of social cues. However, in the absence of acute activation, it is possible that women's dispositional concerns are more related to an enhanced ability to identify safe, versus unsafe, social targets than are men's, particularly due to the fact that women would have been more vulnerable to physical threat from men in ancestral environments. Nonetheless, given the inconsistency of the current findings for men with past research, and the fact that the interaction between participant gender and BDW was driven by a marginal relation between women's dangerous world beliefs and smile discrimination accuracy, it would be valuable for future research to determine the robustness of these findings.

These results also build on a growing body of research indicating that numerous individual differences are associated with emotion-recognition accuracy. Manera, Grandi, and Colle (2013) found susceptibility to negative emotionality (indexed by individual differences in emotional contagion) predicted greater accuracy in detecting Duchenne smiles, an adaptive response for identifying conspecifics less likely to elicit negative mood. When considering this acuity to avoid emotionally costly conspecifics, our results converge by demonstrating how self-protection motives ensure acuity for avoiding physically costly conspecifics. Furthermore, results provide further evidence of sex differences in accuracy. Women are quicker and more accurate at recognizing emotions through facial expressions (Hall & Matsumoto, 2004; Hampson, van Anders, & Mullin, 2006). Given communicative properties of smiles, acuity toward them should concurrently produce greater accuracy at identifying safe individuals, particularly when motivated by safety. Our results synthesize the individual and sex differences literature by demonstrating interactive effects of emotional perception.

Future research would benefit by assessing participants' actual behavioral reactions to targets communicating cooperative, versus deceptive, intentions in the context of self-protection threat. For example, it is possible that individuals higher in dangerous world beliefs would engage a more efficient behavioral approach response to those displaying Duchenne smiles combined with a more efficient avoidant behavioral response to those displaying non-Duchenne smiles (Dijksterhuis & Bargh, 2001). Alternatively, women higher in dangerous world beliefs might be more likely to defect in a prisoner's dilemma game if their partner was displaying a non-Duchenne rather than Duchenne smile, to avoid social exploitation (Frank, Gilovich, & Regan, 1993).

Conclusion

Past research has shown that women dispositionally higher in self-protection threat concerns or primed with acute self-protection threat concerns demonstrate a stronger preference for physically formidable male body types and dominant male faces (Sacco et al., 2015; Snyder et al., 2011). In the current study, we found that women's dispositional self-protection concerns predict enhanced accuracy when discriminating between targets displaying genuine signals of

trust and affiliation (Duchenne smiles) versus targets displaying deceptive affect (non-Duchenne smiles). It is possible that such enhanced accuracy would help women avoid dangerous conspecifics and facilitate affiliation with safe conspecifics, which would be particularly important as perceptions of environmental danger are elevated.

References

Altemeyer, B. (1988). *Enemies of freedom: Understanding right-wing authoritarianism.* San Francisco, CA: Jossey-Bass.

Bernstein, M. J., Young, S. G., Brown, C. M., Sacco, D. F., & Claypool, H. M. (2008). Adaptive responses to social exclusion: Social rejection improves detection of real and fake smiles. *Psychological Science, 19,* 981–983. http://dx.doi.org/10.1111/j.1467-9280.2008.02187.x

Biland, C., Py, J., Allione, J., Demarchi, S., & Abric, J. C. (2008). The effect of lying on intentional versus unintentional facial expressions. *European Review of Applied Psychology, 58,* 65–73. http://dx.doi.org/10.1016/j.erap.2008.04.001

Daly, M., & Wilson, M. (1988). *Homicide.* New York, NY: Aldine de Gruyter.

Del Giudice, M., & Colle, L. (2007). Differences between children and adults in the recognition of enjoyment smiles. *Developmental Psychology, 43,* 796–803. http://dx.doi.org/10.1037/0012-1649.43.3.796

Dijksterhuis, A., & Bargh, J. A. (2001). The perception-behavior expressway: Automatic effects of social perception on social behavior. *Advances in Experimental Social Psychology, 33,* 1–40. http://dx.doi.org/10.1016/S0065-2601(01)80003-4

Ekman, P., Friesen, W. V., & Hager, J. C. (2002). *Facial action coding system.* Salt Lake City, UT: A Human Face.

Frank, R. H., Gilovich, T., & Regan, D. T. (1993). The evolution of one-shot cooperation: An experiment. *Ethology & Sociobiology, 14,* 247–256. http://dx.doi.org/10.1016/0162-3095(93)90020-I

Frayer, D. W., & Wolpoff, M. H. (1985). Sexual dimorphism. *Annual Review of Anthropology, 14,* 429–473. http://dx.doi.org/10.1146/annurev.an.14.100185.002241

Green, D. M., & Swets, J. A. (1966). *Signal detection theory and psychophysics.* New York, NY: Wiley.

Hall, J. A., & Matsumoto, D. (2004). Gender differences in judgments of multiple emotions from facial expressions. *Emotion, 4,* 201–206. http://dx.doi.org/10.1037/1528-3542.4.2.201

Hampson, E., van Anders, S. M., & Mullin, L. I. (2006). A female advantage in the recognition of emotional facial expressions: Test of an evolutionary hypothesis. *Evolution and Human Behavior, 27,* 401–416. http://dx.doi.org/10.1016/j.evolhumbehav.2006.05.002

Krumhuber, E., Manstead, A. S., Cosker, D., Marshall, D., Rosin, P. L., & Kappas, A. (2007). Facial dynamics as indicators of trustworthiness and cooperative behavior. *Emotion, 7,* 730–735. http://dx.doi.org/10.1037/1528-3542.7.4.730

Lustgraaf, C. N. J., Sacco, D. F., & Young, S. G. (2015). Smiling and social perception: Evolutionary, neuroscientific, and social cognitive considerations. In A. Freitas-Magalhaes (Ed.), *Emotional expression: The brain and the face* (Vol. 7, pp. 115–147). Lisbon, Portugal: Leya Escrytos.

Manera, V., Grandi, E., & Colle, L. (2013). Susceptibility to emotional contagion for negative emotions improves detection of smile authenticity. *Frontiers in Human Neuroscience, 7.* http://dx.doi.org/10.3389/fnhum.2013.00006

Mehu, M., Grammer, K., & Dunbar, R. I. (2007). Smiles when sharing. *Evolution and Human Behavior, 28,* 415–422. http://dx.doi.org/10.1016/j.evolhumbehav.2007.05.010

Neuberg, S. L., Kenrick, D. T., & Schaller, M. (2011). Human threat management systems: Self-protection and disease avoidance. *Neuroscience and Biobehavioral Reviews, 35,* 1042–1051. http://dx.doi.org/10.1016/j.neubiorev.2010.08.011

Sacco, D. F., Lustgraaf, C. N. J., Brown, M., & Young, S. G. (2015). Activation of self-protection threat increases women's preferences for dominance in male faces. *Human Ethology Bulletin, 4,* 23–31.

Sacco, D. F., Merold, S. J., Lui, J. H., Lustgraaf, C. J., & Barry, C. T. (2016). Social and emotional intelligence moderate the relationship between psychopathy traits and social perception. *Personality and Individual Differences, 95,* 95–104. http://dx.doi.org/10.1016/j.paid.2016.02.031

Schachter, S. (1959). *The psychology of affiliation.* Palo Alto, CA: Stanford University Press.

Sell, A., Cosmides, L., Tooby, J., Sznycer, D., von Rueden, C., & Gurven, M. (2009). Human adaptations for the visual assessment of strength and fighting ability from the body and face. *Proceedings of the Royal Society of London, Series B: Biological Sciences, 276,* 575–584. http://dx.doi.org/10.1098/rspb.2008.1177

Sell, A., Hone, L. S., & Pound, N. (2012). The importance of physical strength to human males. *Human Nature, 23,* 30–44. http://dx.doi.org/10.1007/s12110-012-9131-2

Snyder, J. K., Fessler, D. M., Tiokhin, L., Frederick, D. A., Lee, S. W., & Navarrete, C. D. (2011). Trade-offs in a dangerous world: Women's fear of crime predicts preferences for aggressive and formidable mates. *Evolution and Human Behavior,*

32, 127–137. http://dx.doi.org/10.1016/j.evolhum behav.2010.08.007

Trivers, R. L. (1972). Parental investment and sexual selection. In B. Campbell (Ed.), *Sexual selection and the descent of man* (pp. 136–179). Chicago, IL: Aldinc.

Young, S. G., Slepian, M. L., & Sacco, D. F. (2015). Sensitivity to perceived facial trustworthiness is increased by activating self-protection motives. *Social Psychological and Personality Science, 6,* 607–613. http://dx.doi.org/10.1177/19485506 15573329