Gender Differences in the Form and Function of Naturally Occurring Smiles

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Abstract

Through their nuanced ability to reinforce, reassure, and judge, smiles accomplish many tasks in daily interactions. A recent approach proposes that there are at least three distinct types of smiles: reward, affiliation, and dominance, which are predicted to take different physical forms and serve unique functions in social communication. Although American women are socialized to smile more often than men, it is possible that gender differences in smile behavior depend upon social context. For instance, since it is more acceptable for men to convey status, men may produce smiles with more pronounced dominance features than women. Conversely, since women are socialized to convey harmlessness, women may produce smiles with stronger affiliation features than men. To test these hypotheses, we filmed participant pairs interacting while watching humorous videos relevant to the tasks of reward, affiliation, and dominance. We extracted all visible smiles and quantified their physical features using automated face coding software. As expected, female participants smiled more often in the affiliation context and less in the dominance context and displayed smiles with more affiliation features than males overall. Furthermore, participants' smiles in the dominance context contained more features characteristic of dominance when they were interacting with an opposite-gender partner. This study—the first to examine naturally-elicited smiles in reward, affiliation, and dominance contexts—suggests the relationship between gender and smiling norms is nuanced and depends on the smiler's communicative intent.

Keywords: Gender, Smiles, Nonverbal communication, Affiliation, Dominance

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Smiling norms are different for women and men in most Western cultures. Women tend to smile more often than men (Hall 1984; Hall & Halberstadt 1986; Henley 1977; LaFrance & Hecht 1999), and this difference arises in adolescents as young as 11 years old (Wondergem & Friedlmeier 2012). Gender differences in smiling partly reflect general emotional display rules, which encourage women to be more emotionally expressive than men (Brody & Hall 2000). Smiling also reflects gender differences in *which* states and intentions are appropriate to express: in particular, women are expected to support and affiliate with others, for instance by expressing warmth, happiness, and embarrassment (Smith et al. 2015; Keltner 1995). They are also expected to express fear, shame, sadness, and other so-called powerless emotions (Timmers et al. 2003). Men, on the other hand, are encouraged to display powerful states like anger and pride and to dampen all other expressions of emotion (Fischer 2001).

Previous research has uncovered gender differences in the expression, perception, and experience of many emotions (Bradley et al. 2001; Brody & Hall 2000; Fujita et al. 1991; Hall 1978), however, it is most consistently found that women smile more often than men (Hall 1984; Hall & Halberstadt 1986). Despite this reliable finding, researchers have yet to understand whether men and women differ in how and why they smile. There exists good reason to expect gender differences in the form and function of smiles. Smiles are complex and variable and can serve a wide variety of social functions. They can be the face of a myriad of emotions beyond happiness, including discomfort, disgust, misery, pride, and embarrassment (Ekman et al. 1980; Ekman 2009; Keltner 1995; Woodzicka & LaFrance 2001). Smiles also take on a variety of morphological forms (Rychlowska et al. 2017) that have unique effects on the recipient (Martin et al. 2018).

In the present study, we sought to extend the analysis of gender differences previously found in the expression of emotions to differences in the expression of the varying forms and functions of the smile. More specifically, since women are socialized to express deferential and supportive emotions, we predicted that they express smiles conveying affiliation intentions, particularly in interactions intended to reinforce social bonds and signal harmlessness, more often than men. At the same time, since men are socialized to express powerful emotions, we predicted that they express smiles that convey dominance, particularly in interactions intended to establish superiority, more often than women.

Gender differences in emotion expression

Men and women in the U.S. are socialized to express themselves differently. Compared to men, women express more powerless and affiliation emotions, such as sadness, fear, and embarrassment (Cornelius & Averill 1983; Keltner 1995). Meanwhile, compared to women, men more readily express powerful and dominance emotions, like anger and pride (Fischer 2001). Eagley (1987) explains this pattern using *social role theory*, which argues that gendered behavior is the result of *gender role beliefs*, or expectations for the role of each gender in society. These beliefs are reinforced through the socialization of each gender to their gender-typical role (Eagley 2012). Even today, women are consistently steered towards roles and occupations which prioritize emotional work, and men more often have jobs with an authoritative role (Frith & Kitzinger 1998; Gayle et al. 2012; Cottingham et al. 2015).

Individuals experience a backlash when they do not act in accordance with social guidelines. For example, women expressing anger are perceived as lower in status than women expressing sadness, but the opposite is the case for men (Brescoll and Uhlmann 2008). This retaliation against unconventional gender behavior may be partially explained by the *attribution*

model, which argues that atypical behavior is often attributed to internal characteristics of the individual rather than understood as circumstantial (Kelley 1973). Unsurprisingly, individuals fear that their counter-stereotypic expressions will result in judgement or rejection from their peers (Davis et al. 1992). For example, when asked to imagine expressing anger at a co-worker, women considered the action to have a greater normative cost for themselves than for males (Egerton 1988).

Previous research has consistently demonstrated that women smile more often than men (Hall 1984; Hall & Halberstadt 1986; Henley 1977; LaFrance & Hecht 1999), which could be attributed to the expectation for women to adhere to their social role. However, the smile is a complex expression that varies in its form and function. Therefore, it is possible that men and women differ in their use of various smile forms. If different smile forms serve different social functions, then individuals are likely to more consistently utilize forms that accomplish their gendered social goals.

The multiple forms and social functions of smiles

Smiles are a heterogeneous category. Not only can a smile result from many different underlying states, but the impact of that smile can differ widely depending on the appearance of the smile, the context in which it is used, and the relationship between the expressor and the recipient. A recent social functional approach seeks to classify smiles by focusing on the relationship between the physical form of the smile and its intended effect on the ongoing social interaction (Rychlowska et al. 2017; Martin et al. 2017). Born from the behavioral ecology view (Fridlund 2014) and related social functional theories (Keltner & Haidt 1999), this approach conceptualizes smiles as a means for an individual to change their environment favorably. Recent work has identified three distinct physical forms smiles can take to accomplish three

distinct social tasks: reward, affiliation, and dominance (Rychlowska et al. 2017; Martin et al. 2017; Niedenthal et al. 2010). Figure A provides some prototypical examples of these three smile types, taken from participant videos.

The first proposed social functional smile is the reward smile, often referred to as a “genuine” smile because it is most strongly associated with positive affect (Martin et al. 2017). The reward smile is thought to reinforce desired behavior (Heerey 2014; Furl et al. 2012) because it is pleasurable to both produce (Kraft & Pressman 2012) and perceive (Otterbring 2017). Reward smiles expressed by babies activate dopamine-associated regions of their mother’s brains, which in turn reinforces their caretaking behaviors (Strathearn et al. 2008). The reward smile resembles the “play face” of chimpanzees, a relaxed and wide smile that helps sustain positive, playful interaction (Parr & Waller 2006). This smile prototypically involves lip corners pulled up and back, exposing the teeth and often creating a “crow’s feet” in the outer corners of each eye. Experimentally, the reward smile is composed of the symmetrical activation of facial action unit 12 (lip corner puller).

Affiliation smiles, the second proposed smile type (Martin et al. 2017), lubricate interactions by easing social tension, signaling harmless intentions, acknowledging the recipient, or expressing appeasement states like embarrassment (Keltner 1995). These smiles are functionally similar to the *silent bared teeth (SBT) display* performed by low-status primates, which reduces antagonistic behavior in the higher-status recipient (Waal & Luttrell 1988; Parr & Waller 2006). Interestingly, the function of SBT display in primates varies based on the social structure of the species. More specifically, rhesus macaques and similarly hierarchical species use this display as a gesture of appeasement, whereas stump-tail macaques and more egalitarian species frequently use it as a non-threatening greeting (Flack & Waal 2007). Although some

argue that these smiles are manipulative or disingenuous (Heerey 2014), the social functional approach recognizes that affiliation smiles are not misleading and instead provide an honest signal of benign intentions. This smile can be identified by tightly closed lips that are pressed in and upwards (Martin et al. 2017)—think of a smile you flash at a passing stranger to acknowledge them and signal your nonthreatening intentions. More specifically, the affiliation smile is composed of the symmetrical activation of facial action unit 12 (lip corner puller), as well as the activation of facial action units 1 (inner brow raise), 2 (outer brow raise), and 24 (lip pressor; Shelde & Hertz 1994).

Thirdly, dominance smiles are proposed to assert superiority over their recipient in order to increase or maintain social standing (Martin et al., 2017). This smile type was first identified by Darwin, who labeled it as the “derisive or sardonic smile” (Darwin 1916), but also relates to descriptions of the “scheming” smile and the expression of pride (Ohman et al. 2001; Tracy & Robins 2004). And in everyday language, people use the label “smug smile” or “smirk.” Individuals tend to express this smile type in more hierarchically structured environments wherein they can assert dominance without provoking further aggression. However, they are also found in everyday interactions—even in egalitarian relationships—and can convey disapproval of the recipient or personal pride (Wood et al. 2017). Despite being a relatively unthreatening expression, dominance smiles can cause an increase in heart rate and salivary cortisol in the recipient, reflecting its ability to give indirect negative feedback (Martin et al. 2018). Recent work suggests dominance smiles are morphologically related to displays of disgust and contempt and tend to be asymmetric (Martin et al. 2017). Asymmetric smiles, in which only one side of the face is activated, can add ambiguity and negativity to the otherwise friendly signal of a smile. The prototypical dominance smile involves asymmetrical activation of facial action units 12 (lip

corner puller), as well as the activation of facial action units 9 (nose wrinkler) and 10 (upper lip raiser).

Do gender norms influence how and why people smile?

The social functional account of smiles posits that although the tasks of reward, affiliation, and dominance are universal, smile types vary in frequency across cultures and groups, reflecting the social tasks individuals often encounter. An important social shaper of expressive behavior is gender (Wood et al. 2017).

As was previously stated, women smile more often than men. A noteworthy exception exists, however, when smiles function as an expression of dominance. Ansfield (2007) had groups of individuals watch amusing and distressing films and found that men smiled more often than women only when watching distressing films, despite reporting more distress. Ansfield reasoned that, just as women typically smile more than men in order to conform to gendered expectations, men smiled more in order to repress expressions of sadness and to project masculinity by “laughing in the face of danger”. Accordingly, raters perceived female participants who expressed more amusement than distress as stronger, less feminine, and displaying more dominance. These findings support our notion that gender differences are not constricted to the use of different facial expressions like smiling, but to the social role that each gender is expected to fulfill. In other words, men may be more likely to smile than women in contexts which elicit their learned desire to express dominance.

However, emotional expression is not singularly impacted by gendered expectations for the *producer*, but can also be moderated by key contextual factors, notably the gender of the *recipients*. Prior research reports conflicting findings relevant to whether individuals conform more heavily to gender norms when they are in the presence of individuals of the same gender or

different gender. Some findings imply that individuals perform more stereotypically when interacting with members of their own gender (Buhrke & Fuqua 1987). More specifically, male groups tend to establish stable social hierarchies whereas women are more concerned with community and affiliation (Aries 1976). In a mixed gender group, then, we might expect both men and women to conform to each other and become less gender-stereotypical in their nonverbal behavior. At least in certain contexts, women smile less often, express less verbal affirmation, and act more assertively when interacting with men versus women (LaFrance et al. 2003; Athenstaedt et al. 2004; Maccoby 1990). And men smile more, express more warmth, and discuss their feelings more often when with women vs. men (Aries 1976; Athenstaedt et al. 2004; Davidson et al. 2016).

But these findings contradict theories concerning the inherent power dynamics, which predict people will conform to their gender roles more readily in a mixed gender setting. According to *status characteristics theory*, indicators of status such as gender, race, education, age, and physical attractiveness inform the behavior of group members by offering those with a culturally privileged status more social power (Berger 1977). Additionally, *expectation states theory* argues that gender differences in communication occur mainly where status is relevant (Berger et al. 1980). Therefore, as gender status is more relevant in mixed gender groups, we might anticipate that individuals would conform *more* to their gender roles when interacting with a person with a different gender. These theories are supported by findings that indicate that both men and women act more deferentially towards men (Ellyson et al. 1992; Sayers & Sherblom 1987; Brower et al. 1979) and act more assertively towards women (Ellyson et al. 1992; Killen & Naigles 1995). Furthermore, women tend to assume a more authoritative communication style when in a leadership role or when participating in more stereotypically feminine tasks (Johnson

1994; Yamada et al. 1983), which further supports the status characteristics theory, since the shift in power dynamics seems to give women the freedom to act less deferentially and more assertively.

The present work examines how participants interacting with a partner alter their smiling behavior as a function of both the demands of a social interaction—whether the task is to convey reward, affiliation, or dominance—and the gender composition of dyad. Pairs of previously unacquainted participants watched and discussed humorous video clips that elicited feelings related to reward, affiliation, and dominance. Because different kinds of smile expressions can be described in terms of the relative activations of features (facial action units) that are typical for that expression, we analyzed both the number of spontaneous smiles and the features present within them. We used the strength of the features present within each smile as a measure of its corresponding level of reward, affiliation, and dominance.

We predicted gender differences in social signaling to map onto the social functional framework for smiles. More specifically, we expected that women would smile more often while in a context that is conducive for affiliation (rather than dominance or reward), and that men would smile more often while in a context that pertains to the task of dominance (versus affiliation or reward). We also expected that women would use more pronounced affiliation features when smiling, and that men would use more pronounced dominance features when smiling. If it is the female's mandated task to maintain and preserve social bonds, then a smile containing affiliation features would best support that goal. Conversely, if it is the male's task to navigate the social hierarchy, then a smile with dominance features would be an effective tool.

We did not have a clear prediction about how each gender adjusts their level of affiliation and dominance features when interacting with a male versus a female partner, given the

contradictions in prior work and theory. If participant smiles contain more pronounced dominance features with men and affiliation features with women, it would support the notion that gender dynamics are particularly salient within groups composed of the same sex (Aries 1976). However, if they instead express less dominance with men and more dominance with women, it would suggest that power dynamics better inform the use of gendered expression (Berger et al. 1980).

Method

We employed a video viewing paradigm designed and utilized in a related study on laughter (Wood 2019). Pairs of participants sat opposite one other, each in front of their own computer screen, and watched three sets of humorous videos, each of which were composed of 20 YouTube videos previously selected to elicit feelings associated with reward, affiliation, or dominance. The participants first watched the videos alone and selected ones which, to them, best fit the description for each category. They were then filmed interacting with their partner while watching these selected videos. Figure B provides a bird's eye view of the experimental set-up. We used Qualtrics software (Qualtrics, Provo, UT) for all video presentation and survey questions.

Participants

Participants were 122 undergraduate students at UW-Madison enrolled in Introductory Psychology, with a relatively equal number of women ($N = 62$) and men ($N = 60$). Sixty-five percent of the participants identified as White, 24% as Asian, 5% as Black or African American, and 8% as Hispanic or Latino/Latina. The mean age was 18.7 years. Students participated in exchange for extra credit. Pairs of previously unacquainted participants completed the study together. Participants were paired based on their availability, resulting in quasi-random same-

and different-gender pairs. Thus, the study had three between-dyad conditions: all-female, all-male, and mixed gender. We advertised the study as three different studies: one calling for women, another for men, and the third with the gender unspecified. Although we aimed to get mixed gender groups from the third posting, if both participants identified as male or female, we categorized them as such. Participants without study partners completed a separate task not reported here and were not included in the final sample.

YouTube Clip Stimuli

We utilized 120 clips compiled and tested in prior work (Wood 2019). 50 of these clips came from an emotion-eliciting stimulus database (Cowen and Keltner 2017), and the rest came from YouTube. Clips had to be understandable and humorous without audio. Research assistants selected clips intended to elicit feelings of reward, affiliation, or dominance (40 of each). They identified clips as rewarding when they were humorous in a straightforward sense, affiliative if they also elicited feelings of care and empathy, and dominant if they also elicited ridicule or a feeling that the person or people got “what they deserved”. In this paper, we will refer to videos which were relevant to the task of dominance as the “dominance context”, videos which were relevant to the task of reward as the “reward context”, and videos which were relevant to the task of affiliation as the “affiliation context”.

Procedure

Participants arrived at the laboratory in pairs and were escorted to a laboratory room with two computers positioned back-to-back, which allowed participants to face each other and view each other’s expressions throughout the study. After the participants took a seat opposite one another, the experimenter began by telling them that, “we are interested in how people understand and talk about humor”. They then left the participants to perform an icebreaker

activity for seven minutes. The activity was designed to be relaxing and lighthearted, affording the participants an opportunity to get familiar with one another in order to maximize future social interaction. Specifically, after sharing their names, hometowns, and majors, participants took turns answering questions provided to them on a sheet of paper. Questions included, “What is your favorite line from any movie?” and, “What would be the worst ‘buy one get one free’ sale of all time?”

When seven minutes had elapsed, the experimenter re-entered the room and informed the participants that they would be “watching 3 playlists that each contain 20 very short videos...In each playlist, you’ll be asked to pick at least 5 videos (out of 20) that fit a description”. Experimenters informed participants that the videos selected would later be shared with their dyad partner. After watching each video, participants answered ‘true’ or ‘false’ to one of the following prompts:

- I feel happiness, amusement, or joy towards the person/object in this video. (**Reward**)
- I feel warmth, friendliness, or care towards the person/object in this video. (**Affiliation**)
- I feel derision, disdain, or mocking towards the person/object in this video. (**Dominance**)

After viewing the videos and making their responses, participants then (re-)watched their 30 selected videos together (5 videos per social function per participant). If participants selected more than five videos for a specific social function, the software randomly picked five of them. A KVM switch was used to display the same content on both monitors, allowing participants to view clips simultaneously while still positioned opposite one another so that they could see each other’s faces. Participants’ faces were video and audio recorded during this section of the experiment with cameras mounted on the screens. After activating the cameras, the experimenter left the room and participants watched the videos in three blocks, one per social function. At the

start of each video, participants audibly reported that video's identification number, which was specified on the screen. While watching the videos, participants freely conversed, describing why they picked each video, how they thought it fit the associated social task, and/or other reactions to the video. Once finished, participants reported demographics, their English-speaking proficiency, whether or not they watched the videos in their entirety, and whether or not they previously knew their partner. They were then debriefed and thanked for their time. The entire study procedure took approximately an hour to complete.

Smile Measurement

A research assistant individually identified every smile that the participants expressed, which three other research assistants, who were blind to experimental hypotheses, verified. Expressions that all three research assistants unanimously identified as smiles were then extracted as video clips. We estimated the facial actions present in the smiles using the Computer Expression Recognition Toolbox (CERT; Littlewort et al. 2011). CERT is a software tool trained to process the intensity of 19 different facial actions from the Facial Action Unit Coding System or FACS (Ekman & Friesen 1978), as well as nine facial expressions, with 90% accuracy.

For each smile instance, we calculated the average activation of facial action units (AUs) or features associated with reward, affiliation, or dominance (Rychlowska et al., 2017): AU 1 (inner brow raiser), AU 2 (outer brow raiser), AU 9 (nose wrinkler), AU 10 (upper lip raiser), AU 12 (lip corner puller), AU 12 asymmetry (the difference in smile intensity for each side of the face), AU 20 (lip stretcher), and AU 24 (lip pressor). Both affiliation and reward smiles involve the symmetrical activation of AU 12, however affiliation smiles are also comprised of AU 1, AU 2, and AU 24 (Shelde & Hertz 1994). Dominance smiles, however, involve the asymmetrical activation of AU 12, as well as activation of AU 9 and AU 10.

Results

All analyses were conducted in the R environment using the lme4 package. Complete analysis code and output are available in the Online Resource.

Frequency of smiles

First, we regressed smile counts on dummy-coded participant gender, dummy-coded partner gender, dummy-coded video context variable, the three-way interaction, and all two-way interactions. We then relevelled the variables to examine the simple effects. Because our outcome is a within-subject count variable, we used a generalized linear mixed-effects model with a Poisson distribution and nested participants within dyads with a by-participant random intercept. Below we report all statistically significant effects, but the supplementary materials report all model outputs.

Female participants smiled more than male participants in the affiliation context. To begin, the three-way interaction between participant gender, partner gender, and the affiliation context versus reward context dummy contrast was significant, $z = -2.43$, $p = .02$. The three-way interaction is best understood by visually comparing the two-way interactions in the affiliation and reward panels of Figure C. Female participants generally smiled more than male participants in the affiliation context, and this pattern was significantly different from the interaction in the reward context.

Two significant two-way effects further support the claim that females smiled more than males in the affiliation context. When the partner was female, the effect of participant gender on smiling frequency was different in the affiliation video context compared to both the dominance video context, $b = -.46$, $SE = 0.13$, $z = -3.59$, $p < .001$, and reward video context, $b = -.43$, $SE = 0.12$, $z = -3.52$, $p < .001$. Specifically, in the affiliation context with a female partner, female

participants ($M = 11.23$, $SD = 5.27$) smiled more than male participants ($M = 8.05$, $SD = 7.91$), $b = .45$, $SE = 0.18$, $z = 2.56$, $p = .011$. The effect of participant gender for the affiliation context was not significant when the partner was male, and there was not a simple effect of participant gender in the dominance or reward contexts.

Male participants smiled less in the affiliation context compared to reward and dominance. Several simple effects indicate males smiled less in the affiliation context than in the other two contexts. Male participants with female partners smiled less often in the affiliation context ($M = 8.05$, $SD = 7.91$) than while in the dominance context ($M = 10.11$, $SD = 9.98$), $b = .23$, $SE = 0.11$, $z = 2.11$, $p = .035$. Similarly, male participants with female partners smiled less often while in the affiliation context than in the reward context ($M = 11.63$, $SD = 8.93$), $b = .37$, $SE = 0.11$, $z = 3.52$, $p < .001$.

Female participants smiled less in the dominance context compared to reward and affiliation. Several simple effects indicate females smiled less in the dominance context than in the other two contexts. Female participants with female partners smiled more often while in the reward ($M = 10.52$, $SD = 4.54$) or affiliation ($M = 11.23$, $SD = 5.27$) contexts compared to when they were in the dominance context ($M = 8.93$, $SD = 4.67$) ; respectively, $b = .16$, $SE = 0.07$, $z = 2.40$, $p = .016$; $b = -.23$, $SE = 0.07$, $z = -3.40$, $p < .001$. And female participants with male partners smiled more often while in the reward ($M = 10.84$, $SD = 6.90$) rather than in the dominance ($M = 8.05$, $SD = 5.13$) context, $b = 0.30$, $SE = 0.11$, $z = 2.80$, $p = .005$.

Facial action units involved in smiles

Next we regressed the mean activation of each relevant facial action unit (AU) for each smile on the three-way interaction between participant gender, partner gender, and video context, along with all lower-order effects. Again, we nested participants within dyad and included a by-

participant random intercept. Since AUs are continuous variables, we used general linear mixed-effects modeling. For each of the eight AU outcome variables, we relevelled the three dummy-coded predictor variables to get estimates for all simple effects. For the sake of space, we report only effects that were statistically significant after we applied the Benjamini-Hochberg procedure to control the false discovery rate. See supplementary materials for complete model estimates.

Below we organize the many significant effects by themes. First, we report patterns that suggest overall participant gender differences in smiling, then we report patterns that suggest overall effects of video viewing context, then we report gender differences that are specific to video viewing context or depend on the partner's gender.

Female participants had more outer brow raise (AU 2) than male participants.

Several simple effects indicate that female participants expressed more outer brow raise, which is an affiliation feature, than male participants while in all three video contexts. Participants with a female partner had less of an outer brow raise while in the reward context if they were male ($M = -0.52$, $SD = 0.25$) vs. female ($M = -0.21$, $SD = .34$), $t(86.30) = -3.42$, $adj. p = .001$. Likewise, participants with a male partner had less outer brow raise while watching in the reward context if they were male ($M = -0.45$, $SD = 0.30$) vs. female ($M = -.10$, $SD = 0.50$), $t(79.54) = -3.22$, $adj. p = .002$. Participants with female partners showed less outer brow raise while in the affiliation context if they were male ($M = -0.49$, $SD = 0.24$) vs. female ($M = -0.20$, $SD = 0.39$), $t(95.36) = -3.79$, $adj. p < .001$. Participants with a male partner had less outer brow raise while in the affiliation context if they were male ($M = -0.47$, $SD = .38$) vs. female ($M = -0.06$, $SD = .38$), $t(80.99) = -2.98$, $adj. p < .01$. And participants with a male partner showed less outer brow raise while in the dominance context if they were male ($M = -0.44$, $SD = 0.37$) vs. female ($M = -0.10$,

$SD = 0.38$), $t(83.98) = -2.82$, $adj. p = .006$. Across social contexts, female participants' smiles tended to involve more outer brow raise, which is associated with affiliation intentions. This suggests women conveyed more appeasement than men, regardless of social context.

Female participants expressed more lip stretch (AU 20) than male participants.

Several simple effects provide evidence that female participants expressed more lip stretch, a feature that is involved in both reward and affiliation smiles, than male participants while in the reward context. Participants with a male partner had less lip stretch while in the reward context if they were male ($M = 1.57$, $SD = 0.29$) vs. female ($M = 2.00$, $SD = 0.47$), $t(81.44) = -3.12$, $adj. p < .003$. Participants with a female partner had less of a lip stretch while in the reward context if they were male ($M = 1.61$, $SD = 0.35$) vs. female ($M = 1.85$, $SD = 0.41$), $t(93.56) = -3.09$, $adj. p < .003$. Regardless of partner gender, female participants expressed more lip stretch, a feature of both reward and affiliation smiles, than male participants. This finding shows that women expressed more smiles—specifically those which support and appease—than men.

Female participants expressed more lip corner pull (AU 12) than male participants.

A two-way interaction indicates that for those with a female partner, the pattern of participant gender on lip corner pull changed depending on whether they were in the dominance or reward context, $t(880.10) = -3.28$, $adj. p = .001$. The bilateral lip corner pull is a feature of both affiliation and reward smiles. While in the reward context, those with a female partner had less lip corner pull if they were male ($M = 1.20$, $SD = 0.68$) vs. female ($M = 1.53$, $SD = 0.58$), $t(99.83) = -2.35$, $adj. p = .021$. While in the dominance context, those with a female partner had no more lip corner pull if they were male ($M = 1.26$, $SD = 0.86$) vs. female ($M = 1.24$, $SD = 0.66$), $t(105.88) = -0.22$, $adj. p = .830$. Across both dominance and reward contexts, female

participants expressed more lip corner pull. This finding similarly conveys that women expressed more smiles which serve affiliation and reward functions than men.

Participants had more lip corner pull in the reward video context than in the dominance or affiliation context. Several simple effects indicate that participants expressed more lip corner pull, which is involved in both affiliation and reward smiles, in the reward context than in the dominance or affiliation context. More specifically, female participants with female partners had more lip corner pull when they were in the reward ($M = 1.53$, $SD = 0.58$) vs. dominance ($M = 1.24$, $SD = 0.66$) context, $t(879.61) = 4.01$, $adj. p = .0001$. Male participants with male partners smiled with more lip corner pull in the reward ($M = 1.33$, $SD = 0.42$) vs. affiliation ($M = 1.09$, $SD = 0.61$) context, $t(872.00) = 3.06$, $adj. p = .002$. Both men and women had more lip corner pull while in the reward context, suggesting that both genders smiled more often in a manner which reinforces relationships when the context fits that goal.

Participants' smiles were more asymmetric (AU 12 lateralization) when they had an opposite-gender partner in the dominance context. A series of simple and interaction effects speak to a general pattern of smiles conveying more dominance (i.e. AU 12 lateralization) in the dominance context when participants had opposite-gender partners, and can be better understood by examining Figure D. A two-way interaction indicates that in the dominance context, the pattern of participant gender on asymmetrical smiling changed depending on the gender of their partner, $t(165.28) = -3.57$, $adj. p < .001$. Specifically, while in the dominance context, those with a female partner smiled more asymmetrically if they are male ($M = 0.38$, $SD = 0.25$) vs. female ($M = 0.21$, $SD = 0.18$), $t(178.92) = 2.61$, $adj. p < .010$. While in the dominance context, those with a male partner smile less asymmetrically if they were male ($M = 0.29$, $SD = 0.20$) vs. female ($M = 0.47$, $SD = 0.32$), $t(152.97) = -2.44$, $adj. p = .016$. Another simple effect converges

with this pattern: female participants in the dominance context smiled more asymmetrically if their partner was male ($M = 0.47$, $SD = 0.32$) instead of female ($M = 0.21$, $SD = 0.18$), $t(147.26) = 3.46$, *adj. p* < .001.

A significant three-way interaction indicates that this pattern does not exist in the reward context, $t(895.89) = 5.61$, *adj. p* < .001. Specifically, a two-way interaction indicates that for those with female partners, the pattern of video context on asymmetrical smiling changed depending on whether the participant was male or female, $t(901.09) = -3.55$, *adj. p* < .001. Male participants with a female partner smiled less asymmetrically while in the reward ($M = 0.26$, $SD = 0.22$) vs. dominance ($M = 0.38$, $SD = 0.25$) context, $t(899.94) = -2.79$, *adj. p* = .005. At the same time, female participants with a female partner smiled more asymmetrically while in the reward ($M = 0.28$, $SD = 0.23$) vs. dominance ($M = 0.21$, $SD = 0.18$) context, $t(904.58) = 2.27$, *adj. p* = .024.

A two-way interaction demonstrates a reversal of this pattern for those with a male partner, $t(889.03) = 4.45$, *adj. p* < .001. More specifically, male participants with a male partner smiled *more* asymmetrically while in the reward ($M = 0.33$, $SD = 0.24$) vs. dominance ($M = 0.29$, $SD = 0.20$) context, $t(895.29) = 2.38$, *adj. p* = .017. Female participants with a male partner smiled *less* asymmetrically while in the reward ($M = 0.31$, $SD = 0.20$) vs. dominance ($M = 0.47$, $SD = 0.32$) context, $t(884.94) = -3.79$, *adj. p* < .001.

A two-way interaction indicates that for male participants, the pattern of video context on asymmetrical smiling differed depending on the gender of their partner, $t(898.62) = 3.64$, *adj. p* < .001. Male participants with a female partner smiled less asymmetrically while in the reward ($M = 0.26$, $SD = 0.22$) vs. dominance ($M = 0.38$, $SD = 0.25$) context, $t(899.94) = -2.79$, *adj. p* =

.005. Male participants with a male partner smiled more asymmetrically while in the reward ($M = 0.33$, $SD = 0.24$) vs. dominance ($M = 0.29$, $SD = 0.20$) context, $t(895.29) = 2.38$, $adj. p = .017$.

Female participants with a male partner smiled less asymmetrically while in the reward ($M = 0.31$, $SD = 0.20$) vs. dominance ($M = 0.47$, $SD = 0.32$) context, $t(884.94) = -3.79$, $adj. p < .001$. A two-way interaction reversed this effect for female participants with female partners, $t(901.09) = -3.55$, $adj. p < .001$. Female participants with a female partner smiled *more* asymmetrically while in the reward ($M = 0.28$, $SD = 0.23$) vs. dominance ($M = 0.21$, $SD = 0.18$) context, $t(904.58) = 2.27$, $adj. p = .024$.

Unexpectedly, this opposite-gender partner effect on smile asymmetry extended beyond the dominance context to the affiliation context, at least for female participants. While in the affiliation context, female participants smiled more asymmetrically if their partner is male ($M = 0.49$, $SD = 0.31$) vs. female ($M = 0.23$, $SD = 0.21$), $t(137.66) = 2.60$, $adj. p = .010$. But the two-way interaction indicates that for female participants, the pattern of partner gender on asymmetrical smiling changed depending on whether they were in the affiliation or reward video context, $t(906.96) = 3.30$, $adj. p = .001$. While in the reward context, female participants smiled asymmetrically to a similar extent, regardless of if their partner was male ($M = 0.31$, $SD = 0.20$) or female ($M = 0.28$, $SD = 0.23$), $t(131.29) = -0.02$, $adj. p = .981$. A three-way interaction indicates that this interaction was not the case for male participants, $t(904.10) = 3.91$, $adj. p = .0001$.

To summarize the key findings for smile asymmetry (AU 12 lateralization), participants smiled more asymmetrically with the opposite-gender, compared to same-gender, partners, largely in the dominance context. Since smile asymmetry is a hypothesized feature of smiles

communicating dominance, these findings suggest participants avoided conveying outright dominance in a same-gender context.

Female participants smile with more lip pressor (AU 24), a common feature of affiliation smiles, in the dominance context than in the affiliation or reward context. A three-way interaction indicates that for female participants, the pattern of video context changed depending on the gender of their partner, but that this pattern was not replicated for male participants, $t(871.19) = -2.59$, *adj. p* = .009. A two-way interaction supports this claim by indicating that for female participants, the effect of video context on lip pressing changed depending on the gender of their partner, $t(867.76) = 2.74$, *adj. p* = .006. Female participants with a female partner did less lip pressing while in the reward ($M = -0.19$, $SD = 0.09$) vs. dominance ($M = -0.18$, $SD = 0.10$) context, $t(873.92) = 2.68$, *adj. p* = .008. Female participants with a male partner did not do less lip pressing while in the reward ($M = -0.16$, $SD = 0.09$) vs. dominance ($M = -0.18$, $SD = 0.10$) context, $t(864.62) = 1.46$, *adj. p* = .146. This interaction between partner gender and video condition did not exist for male participants, $t(873.62) = -1.01$, *adj. p* = .271.

This two-way interaction repeats itself for the affiliation and dominance contexts. A second two-way interaction supports that for female participants, the pattern of video context on lip pressing changed depending on the gender of their partner, $t(871.11) = 2.78$, *adj. p* = .006. Female participants with a female partner did more lip pressing while in the dominance ($M = -0.18$, $SD = 0.10$) context than while in the affiliation ($M = -0.17$, $SD = 0.09$) context, $t(869.50) = 2.09$, *adj. p* = .037. However, female participants with a male partner did less lip pressing while in the dominance ($M = -0.18$, $SD = 0.10$) context than while in the affiliation ($M = -0.16$, $SD = 0.10$) context, $t(871.77) = -1.95$, *adj. p* = .052.

Furthermore, a third two-way interaction indicates that for those with a female partner, the pattern of video context on lip pressing changed depending on whether they are male or female, $t(876.06) = 2.61$, $adj. p = .009$. Female participants with a female partner did less lip pressing while in the affiliation ($M = -0.17$, $SD = 0.09$) context than while in the dominance ($M = -0.18$, $SD = 0.10$) context, $t(869.57) = 2.09$, $adj. p = .037$. Male participants with a female partner did more lip pressing while in the affiliation context ($M = -0.16$, $SD = 0.08$) than while in the dominance context ($M = -0.19$, $SD = 0.08$), $t(877.57) = -1.89$, $adj. p = .059$.

A final two-way interaction indicates that this pattern repeats itself in the dominance and reward contexts, $t(875.32) = 3.02$, $adj. p = .003$. More specifically, female participants with a female partner did less lip pressing while in the reward ($M = -0.19$, $SD = 0.09$) vs. dominance ($M = -0.18$, $SD = 0.10$) context, $t(873.92) = -2.68$, $adj. p = .008$. Meanwhile, male participants with a female partner did more lip pressing while in the reward ($M = -0.17$, $SD = 0.08$) vs. dominance ($M = -0.19$, $SD = 0.08$) context, $t(875.77) = 1.96$, $adj. p = .051$. Female participants with a female partner smiled with more lip pressing, an affiliation feature, while in the dominance context than in the affiliation or reward contexts. These findings convey that women with a female partner expressed more appeasement in contexts which called for domineering behavior than in contexts which elicit reinforcing or soothing expressions.

Male participants had less lip stretch than female participants in the dominance context. A simple effect shows that participants with female partners had less lip stretch, which is associated with both affiliation and reward smiles, if they were male vs. female. Participants with female partners had less lip stretch while in the dominance context if they were male ($M = 1.69$, $SD = 0.37$) vs. female ($M = 1.88$, $SD = 0.41$), $t(99.14) = -2.84$, $adj. p = .006$. This finding

shows that while in a context which elicits competitive behavior, men engaged in less rewarding or appeasing facial expressions.

Female participants with male partners smiled with less upper lip raise (AU 10) in the dominance than in the affiliation context. Female participants with a male partner showed less lip raise, which is a feature of dominance smiles, when they were in the dominance ($M = 0.10$, $SD = .18$) vs. affiliation ($M = 0.13$, $SD = 0.15$) context, $t(873.04) = -2.70$, $adj. p = .007$. This finding conveys that while in a dominance context, women interacting with a man expressed less dominance than when they were in a context which elicits affiliation behaviors.

There was an interaction between participant gender and video condition, $t(904.83) = 3.09$, $adj. p = .002$. Female participants with a male partner smiled less asymmetrically while in the reward ($M = 0.31$, $SD = 0.20$) vs. affiliation ($M = 0.49$, $SD = 0.31$) context, $t(909.79) = -3.63$, $adj. p < .001$. Male participants with a male partner did not smile less asymmetrically while in the reward ($M = 0.33$, $SD = 0.24$) vs. affiliation ($M = 0.37$, $SD = 0.23$) context, $t(895.83) = 0.36$, $adj. p = .717$.

Discussion

In this study, we examined gender differences in smiling. More specifically, we asked whether men and women differ in their use of reward, dominance, and affiliation features while smiling in order to comply with their prescribed social role. We measured both the number of smiles and the facial action units involved in smiles as a function of the interaction between a dyad's gender composition and the video context (whether the participants were discussing a humorous video relevant to the task of reward, affiliation, or dominance). The smile number results largely support our hypotheses concerning gendered use of dominance and affiliation. Female participants smiled more often in the affiliation context than male participants. Male

participants smiled more often in the reward and dominance context than in the affiliation context, whereas female participants smiled less often in the dominance context than in the affiliation or reward context.

Our facial action unit findings depict a more complex pattern. Overall, the finding that females used more outer brow raise, lip stretch, and lip corner pull in their smiles, and smiled more often in the affiliation context than male participants, provides support for our hypothesis concerning gender differences in displays of affiliation. These facial action units were previously found to be a feature of affiliation smiles, suggesting that female participants smile with more affiliation than male participants. The outer brow raise, or eyebrow “flash,” is especially common in expressions directed at babies, and makes the producer seem more approachable (Shelde & Hertz 1994). These results support the notion that, because of their role as emotional caretakers in our society, women employ the use of affiliation smiles and features to a larger extent than men.

Male participants displayed more lip stretch than female participants in dominance contexts, despite the general inclination for female participants to express more lip stretch. Additionally, male participants smiled more often in the dominance context than in the affiliation context. In other words, it appears that although women generally tended to smile more often than men, this pattern changed within contexts that are more concerned with establishing social hierarchies, implying that the smile is not only equipped to serve traditionally male goals, but that men are more compelled to smile than women when doing so complies with and assists their social role.

Unexpectedly, participant smiles were more asymmetrical in the dominance context when their partner was of the opposite gender. This finding throws a wrench in the *status*

characteristics theory, which predicts that women would use a dominance expression to a larger extent with women than with men (Berger 1977). At the same time, this finding also contradicts the notion that each gender acts more stereotypically while with members of the same sex (Aries 1976), as men expressed more smiles which theoretically convey dominance while with a female partner than with a male partner.

The nature of this experiment was inherently affiliative, as participants were encouraged to bond with one another through an initial set of ice-breaker questions, and interacted over a set of humorous videos. It may be that, through social comparison, each gender experiences more social threat and competition when interacting with someone of the same gender. Due to the bonding nature of this experimental paradigm, participants may have reacted to this social threat by emphasizing the goal of this specific context: to affiliate. This interpretation would also explain why female participants engaged in more lip pressing, a feature of affiliation, in dominance contexts when they had a female partner. If the general nature of this experiment caused them to emphasize affiliation goals with a socially comparable partner, then it would make sense that they engaged with more appeasing expressions while watching videos which instead call for dominance behavior.

Alternatively, the tendency for participants to smile more asymmetrically with a partner of the opposite gender could be explained by both the *status characteristics theory* and a shift in gender norms. Within the mixed gender condition of our experiment, there is an inherent power differential in favor of male participants, which is particularly salient within the dominance context. Therefore, given the saliency of power dynamics due to the differences in gender identity and the background dominance context, men are free to act assertively. However, according to the status characteristics theory, women in this context should be more compelled to

act deferentially, when in actuality they acted more assertively with male partners than with female partners. Perhaps this reflects shifting gender norms in the U.S. It is important to note that our subjects are college students living in a primarily liberal city. Perhaps, in a context where gender is salient, our female participants are reacting to their assertive male partners by enhancing their use of dominance tactics in order to combat, whether subconsciously or consciously, the gender power dynamics inherent in society.

Finally, it may be that the unique situation of a mixed gender pair has an inherently sexual dynamic. The asymmetrical smile in this context could have functioned as a coy smile, or a flirtatious expression. As the majority of our subjects were probably heterosexual, this mixed dyad setting may have elicited an unusually high level of coy smiles, which were intended to be flirtatious rather than straightforwardly portraying dominance.

Unexpectedly, female participants displayed less lip pressing in the affiliation or reward context than in the dominance context. Although lip pressing is categorized as a feature of an affiliation smile, it may be that its use reflects a need to inhibit expression rather than explicitly express affiliation. Lip pressing hides the teeth, dampening the otherwise high-arousal smile expression. Taken with the finding that women smiled less often in the dominance context than in either the affiliation or reward context, the tendency for women to engage in more lip pressing during the dominance context might actually be their method of inhibiting expression in a context that violates gender norms.

It is possible that we found exaggerated gender effects due to the nature of the lab environment. Individuals tend to conform to gender expectations to a larger extent when they are more aware of observation (Hyde 2005; LaFrance et al. 2003). More specifically, women smile more and men less often when the presence of a camera is more salient or obvious, as well as

during face-to-face interaction (LaFrance & Hecht 2000; Hall et al. 2001). Given the fact that our participants were facing each other, were explicitly made aware of being recorded on several occasions, and were in a laboratory environment, we should be careful when generalizing the gender differences found within this context to smiles truly produced “in the wild”.

Future work should examine whether there are differences in same vs. mixed gender groups depending on if those groups are dyads or a larger group. It may be that larger groups provide a setting for men to participate more in the establishment of a “pecking order”. It may also be that mixed gender dyads provide a setting that is more inherently sexual than larger mixed gender dyad. Future research should also seek examine possible differences in the use of various smile types among different racial and ethnic minorities. Black men, in particular, often act in a particularly deferential manner to counter negative stereotypes about Black male aggression (Santino 1983), and may therefore have an increased need to use affiliation smiles.

This experiment adds to growing evidence that the smile serves a variety of functions (Martin et al. 2018; Martin et al. under review; Rychlowska et al. 2017) and is the first to study the variation of naturally occurring smiles. It is also the first experiment to examine gender differences within different smile types, despite the plethora of studies that have examined gender differences in smile rates overall. This work suggests U.S. men will smile relatively more when the smile serves their goal of elevating themselves in the social hierarchy. At the same time, it suggests women use smiles more often than men to create and nurture relationships with others. Finally, this study provides preliminary evidence that individuals interacting with the opposite gender utilize a more flirtatious form of smiles than those interacting with the same gender. Ultimately, this work deepens our understanding of how gender norms shape people’s use of nonverbal signals of affiliation and dominance.

References

- Ansfield, M. E. (2007). Smiling When Distressed: When a Smile Is a Frown Turned Upside Down. *Personality and Social Psychology Bulletin*, 33, 763–775. doi:10.1177/01467206297398.
- Aries, E. (1976). Interaction Patterns and Themes of Male, Female, and Mixed Groups. *Small Group Behavior*, 7, 7-18. doi:10.1177/10464967600700102
- Athenstaedt, U., Haas, E., & Schwab, S. (2004). Gender Role Self-Concept and Gender-Typed Communication Behavior in Mixed-Sex and Same-Sex Dyads. *Sex Roles*, 50, 37–52. doi: 10.1023/B:SERS.0000011071.68830.48
- Berger, J. (1977). *Status characteristics and social interaction: An expectation-states approach*. New York. doi:10.1177/0146167206297398
- Berger, J., Rosenholtz, S. J., & Zelditch, M. (1980). Status Organizing Processes. *Annual Review of Sociology*, 6, 479-508. <https://doi.org/10.1146/annurev.so.06.080180.002403>
- Bradley, M. M., Codispoti, M., Sabatinelli, D., & Lang, P. J. (2001). Emotion and motivation. II: Sex differences in picture processing. *Emotion*, 1, 300–319. doi: 10.1037/1528-3542.1.3.300.
- Brescoll, V. L., & Uhlmann, E. L. (2008). Can an Angry Woman Get Ahead? *Psychological Science*, 19, 268-275. doi: 10.1111/j.1467-9280.2008.02079.x.
- Brody, L. R. (2000). The socialization of gender differences in emotional expression: Display rules, infant temperament, and differentiation. *Gender and emotion*, 24-47. doi: 10.1017/cbo9780511628191.003
- Buhrke, R. A., & Fuqua, D. R. (1987). Sex differences in same- and cross-sex supportive friendships. *Sex Roles*. 17, 339-35. doi: 10.1007/bf00288457
- Cornelius, R. R., & Averill, J. R. (1983). Sex differences in fear of spiders. *Journal of Personality and Social Psychology*, 45, 377-383. doi: 10.1037/0022-3514.45.2.377
- Cottingham, M. D., Erickson, R. J., & Diefendorff, J. M. (2015). Examining Men’s Status Shield and Status Bonus: How Gender Frames the Emotional Labor and Job Satisfaction of Nurses. *Sex Roles*, 72, 377-389. doi: 10.1007/s11199-014-0419-z

- Cowen, A. S., & Keltner, D. (2017). Self-report captures 27 distinct categories of emotion bridged by continuous gradients. *Proceedings of the National Academy of Sciences*, 114. 10.1073/pnas.1702247114
- Darwin, C. (1916). The expression of the emotions in man and animals. doi: 10.5962/bhl.title.4820
- Davidson, M. J., Barrett, M., & Davidson, M. (2016). *Gender and communication at work*. Farnham, Surrey: Gower. doi: 10.4324/9781315583839-11
- Davis, M. A., Larosa, P. A., & Foshee, D. P. (1992). Emotion work in supervisor-subordinate relations: Gender differences in the perception of angry displays. *Sex Roles*, 26, 513–531. doi: 10.1007/bf00289872
- Eagly, A. H. (1987). Sex differences in social behavior: A social-role interpretation. *Contemporary Sociology*, 18, 343. doi: 10.2307/2073813
- Ekman, P. & Friesen, W.V. (1978). *Facial action coding system*. Palo Alto: Consulting Psychologist Press.
- Ekman, P., Friesen, W. V. & Ancoli, S. (1980). Facial signs of emotional experience. *Journal of Personality and Social Psychology* 39, 1125–1134. doi: 10.1037/h0077722
- Ekman, P. (2009). Telling lies: Clues to deceit in the marketplace, politics, and marriage. London, England: W. W. Norton. 53, 287-288. doi: 10.1080/00029157.2011.10404358
- Ellyson, S. L., Doviio, J. F., & Brown, C. E. (1992). The Look of Power: Gender Differences and Similarities in Visual Dominance Behavior. *Gender, Interaction, and Inequality*, 50-80. doi: 10.1007/978-1-4757-2199-7_3
- Fischer, A. H. (2001). *Gender and emotion social psychological perspectives*. Paris: Cambridge University Press.
- Flack, J. C., & Waal, F. D. (2007). Context modulates signal meaning in primate communication. *Proceedings of the National Academy of Sciences*, 104, 1581–1586. doi: 10.1073/pnas.0603565104
- Fridlund, A. J. (2014). *Human facial expression: An evolutionary view*. San Diego: Academic Press.
- Frith, H., & Kitzinger, C. (1998). “Emotion work” as a participant resource: A feminist analysis of young women’s talk-in-interaction. *Sociology*, 32, 299–320. doi:[10.1177/0038038598032002005](https://doi.org/10.1177/0038038598032002005)
- Fujita, F., Diener, E., & Sandvik, E. (1991). Gender differences in negative affect and well-being: The case for emotional intensity. *Journal of Personality and Social Psychology*, 61, 427–434. doi: 10.1037/0022-3514.61.3.427
- Furl, N., Gallagher, S., & Averbeck, B. B. (2012). A Selective Emotional Decision-Making Bias Elicited by Facial Expressions. *PLoS ONE*, 7. doi: 10.1371/journal.pone.0033461

- Gayle, G., Golan, L., & Miller, R. A. (2012). Gender Differences in Executive Compensation and Job Mobility. *Journal of Labor Economics*, 30, 829-872. doi: 10.1086/666615
- Hall, J. A. (1978). Gender effects in decoding nonverbal cues. *Psychological Bulletin*, 85, 845-25. doi: 10.1037/0033-2909.85.4.845
- Hall, J. A. (1984). *Nonverbal sex differences: Communication accuracy and expressive style*. Baltimore: Johns Hopkins University Press.
- Hall, J. A., & Halberstadt, A. G. (1986). Smiling and gazing. In J. S. Hyde & M. C. Inn (Eds.), *The psychology of gender: Advances through meta-analysis* (pp. 136–185). Baltimore: Johns Hopkins University Press.
- Hall, J. A., Lebeau, L. S., Reinoso, J. G., & Thayer, F. (2001). Status, gender, and nonverbal behavior in candid and posed photographs: A study of conversations between university employees. *Sex Roles*, 44, 677. <https://doi.org/10.1023/A:1012298230455>
- Harris, C., & Alvarado, N. (2005). Facial expressions, smile types, and self-report during humour, tickle, and pain. *Cognition & Emotion*, 19, 655–669. doi: 10.1080/02699930441000472
- Heerey, E. A. (2014). Learning from social rewards predicts individual differences in self-reported social ability. *Journal of Experimental Psychology: General*, 143, 332-339. doi: 10.1037/a0031511
- Henley, N. (1977). *Power, sex, and nonverbal communication*. Englewood Cliffs, NJ: Prentice Hall.
- Hyde, J. S. (2005). The gender similarities hypothesis. *American Psychologist*, 60, 581–592. doi: 10.1037/0003-066x.60.6.581
- Johnson, C. (1994). Gender, Legitimate Authority, and Leader-Subordinate Conversations. *American Sociological Review*, 59, 122. doi: 10.2307/2096136
- Kelley, H. H. (1973). The processes of causal attribution. *American Psychologist*, 28(2), 107–128. doi: 10.1037/h0034225
- Keltner, D. (1995). Signs of appeasement: Evidence for the distinct displays of embarrassment, amusement, and shame. *Journal of Personality and Social Psychology* 68, 441-54. doi: 10.1093/acprof:oso/9780195179644.003.0007
- Keltner, D., & Haidt, J. (1999). Social Functions of Emotions at Four Levels of Analysis. *Cognition and Emotion*, 13(5), 505–521. doi:10.1080/026999399379168

- Killen, M., & Naigles, L. R. (1995). Preschool children pay attention to their addressees: Effects of gender composition on peer disputes. *Discourse Processes*, 19, 329–346. doi: 10.1080/01638539509544921
- Kraft, T. L., & Pressman, S. D. (2012). Grin and Bear It: The Influence of Manipulated Facial Expression on the Stress Response. *Psychological Science*, 23, 1372–1378. doi: 10.1177/0956797612445312
- LaFrance, M., & Hecht, M. A. (1999). Obligated to smile: The effect of power and gender on facial expression. In P. Philippot, R. S. Feldman, & E. J. Coats (Eds.), *The social context of nonverbal behavior* (pp. 45–70). Cambridge, England: Cambridge University Press.
- Lafrance, M., & Hecht, M. (2000). Gender and smiling: A meta-analysis. *Gender and Emotion*, 118–142. doi: 10.1017/cbo9780511628191.007
- Lafrance, M., Hecht, M. A., & Paluck, E. L. (2003). The contingent smile: A meta-analysis of sex differences in smiling. *Psychological Bulletin*, 129, 305–334. doi: 10.1037/0033-2909.129.2.305
- Littlewort, G., Whitehill, J., Wu, T., Fasel, I., Frank, M., Movellan, J., & Bartlett, M. (2011). The computer expression recognition toolbox (CERT). *Face and Gesture 2011*. doi: 10.1109/fg.2011.5771414
- Maccoby, E. E. (1990). Gender and relationships: A developmental account. *American Psychologist*, 45, 513–52. doi: 10.1037/0003-066x.45.4.513
- Martin, J., Abercrombie, H., Gilboa-Schechtman, E., & Niedenthal, P.M. (2018). Functionally distinct smiles elicit different physiological responses in an evaluative context. *Scientific Reports*, 8. doi: 10.1038/s41598-018-21536-1
- Martin, J., Wood, A., Cox, W., Sievert, S., Nowak, R., & Niedenthal, P. (in prep). Production and perception of social functional smiles rely on similar morphological features.
- Niedenthal, P. M., Mermillod, M., Maringer, M., & Hess, U. (2010). The Simulation of Smiles (SIMS) model: Embodied simulation and the meaning of facial expression. *Behavioral and Brain Sciences*, 33, 417–433. doi: 10.1017/s0140525x10000865
- Öhman, A., Lundqvist, D., & Esteves, F. (2001). The face in the crowd revisited: A threat advantage with schematic stimuli. *Journal of Personality and Social Psychology*, 80, 381–396. doi: 10.1037/0022-3514.80.3.381
- Otterbring, T. (2017). Smile for a while: the effect of employee-displayed smiling on customer affect and satisfaction. *Journal of Service Management*, 28, 284–204. doi: 10.1108/josm-11-2015-0372

- Parr, L. A., & Waller, B. M. (2006). Understanding chimpanzee facial expression: Insights into the evolution of communication. *Social Cognitive and Affective Neuroscience*, *1*, 221-2228. doi: 10.1093/scan/nsi031
- Rychlowska, M., Jack, R. E., Garrod, O. G., Schyns, P. G., Martin, J. D., & Niedenthal, P. M. (2017). Functional smiles: Tools for love, sympathy, and war. *Psychological science*, *28*, 1259-1270. doi: 10.1177/0956797617706082
- Santino, J. (1983). Miles of Smiles, Years of Struggle: The Negotiation of Black Occupational Identity Through Personal Experience Narrative. *The Journal of American Folklore*, *96*, 393-412. doi: 10.2307/540981
- Sayers, F., & Sherblom, J. (1987). Qualification in male language as influenced by age and gender of conversational partner. *Communication Research Reports*, *4*, 88-92.
- Shelde, T., & Hertz, M. (1994). Ethology and psychotherapy. *Ethology and Sociobiology*, *15*, 383-392. doi: 10.1016/0162-3095(94)90010-8
- Smith, J.S., LaFrance, M., Knol, K.H., Tellinghuisen, D.J., & Moes, P.E. (2015). Surprising Smiles and Unanticipated Frowns: How Emotion and Status Influence Gender Categorization. *Journal of Nonverbal Behavior*, *39*, 115-130. doi: 10.1007/s10919-014-0202-4
- Strathearn, L., Li, J., Fonagy, P., & Montague, P. R. (2008). What's in a Smile? Maternal Brain Responses to Infant Facial Cues. *Pediatrics*, *122*, 40-51. doi: 10.1542/peds.2007-1566
- Timmers, M., Fischer, A. H., & Manstead, A. S. R. (2003). Ability versus vulnerability: Beliefs about men's and women's emotional behavior. *Cognition & Emotion*, *17*, 41-63. doi: 10.1080/02699930302277
- Tracy, J. L., & Robins, R. W. (2004). Show Your Pride. *Psychological Science*, *15*, 194-197. doi: 10.1111/j.0956-7976.2004.01503008.x
- Waal, F. B. D., & Luttrell, L. M. (1988). Mechanisms of social reciprocity in three primate species: Symmetrical relationship characteristics or cognition? *Ethology and Sociobiology*, *9*, 101-118. doi: 10.1016/0162-3095(88)90016-7
- Wondergem, T. R., & Friedlmeier, M. (2012). Gender and ethnic differences in smiling: A yearbook photographs analysis from kindergarten through 12th grade. *Sex Roles*, *67*, 403-411. doi: 10.1007/s11199-012-0158-y
- Wood, A., Martin, J., & Niedenthal, P. (2017). Towards a social functional account of laughter: Acoustic features convey reward, affiliation, and dominance. *Plos One*, *12*. doi: 10.1371/journal.pone.0183811
- Wood, A. (2019). Social context influences the acoustic properties of laughter. doi: 10.31234/osf.io/npk8u

Woodzicka, J. A., & LaFrance, M. (2001). Real versus imagined gender harassment. *Journal of Social Issues*, 57, 15–30. doi: 10.1111/0022-4537.00199

Yamada, E. M., Tjosvold, D., & Draguns, J. G. (1983). Effects of sex-linked situations and sex composition on cooperation and style of interaction. *Sex Roles*, 9, 541-553. doi: 10.1007/bf00289793

Tables and Figures

Figure A

(A)

(B)

(C)

(A) Affiliation, (B), reward, and (C) dominance. Expressions were made by participants watching humorous videos clips.

Figure B

Bird's eye view of experimental setup.

Figure C

Impact of participant gender, partner gender, and video context on smile frequency.

Figure D

Influence of participant gender, partner gender, and video context on the degree of smile asymmetry (unilateral activation of AU 12) within participant smiles.