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Do we like honest signal givers? Macro and micro expressions of disgust

Zachary R. Glowacki[1] · Mark G. Frank[1] · Wenyao Xu[2] · Srirangaraj Setlur[2] · Chenhan Xu[3] · Christopher R. Glowacki[4]

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Abstract
Signaling theory elaborates how communicative patterns and signals, such as facial expressions, have facilitated interactions hence helped social animals survive. Signaling theory suggests that those sending clearer signals, through the face or otherwise, may be more trustworthy communicators. This would apply even to negative emotional signals such as disgust. In contrast, the overgeneralization hypothesis suggests a clear negative facial expression might overgeneralize to have a deleterious effect on judgments of someone's trustworthiness. We tested this in a study where 64 males and 70 female judges viewed 12 video clips, featuring 6 men and 6 women showing either a macro expression (M = 2.66s duration) or a micro expression (M = 0.34s duration) of disgust, as they spontaneously reacted to a bad-tasting drink. The judges then rated the participants on how trustworthy, authentic believable, and likeable they appeared. A repeated measures MANOVA found all macro expression signal givers to be perceived significantly more trustworthy, authentic, believable, and likeable compared with micro expression signal givers. A significant interaction between length of expression and gender showed when expressing macro expressions, female expressers were perceived equally positive to males, yet when expressing micro expressions, female expressers were perceived significantly less trustworthy, authentic, believable, and likeable than males. This study supports a signaling theory explanation and adds further insight into the role clarity of signals has in signaling theory.

Keywords Disgust · Facial expressions · Social perception · Signaling theory · Nonverbal behavior · Trust

Throughout most of the time our species has been on the earth we have necessarily communicated to each other face to face. Human faces can communicate thoughts (e.g., a roll of the eyes to communicate impatience) as well as emotions (e.g., anger, fear, happiness, etc.; see Hwang & Matsumoto, 2016, for a review). The trustworthiness of these facial signals, and of the individuals who display them, would seem paramount for a social species like ours. However, research shows these judgments depend upon the bias of observers, as well as the facial expressions that were shown prior to the trustworthiness judgment. For example, individuals showing negative facial expressions such as pain or disgust are rated as less trustworthy compared to those showing neutral or happy expressions (Van der Biest et al., 2023). One mechanism put forth to explain why negative facial expressions shown by an individual led to lower ratings of trustworthiness of that individual is the 'emotion overgeneralization hypothesis' (Oosterhof & Todorov, 2008). Specifically, this hypothesis argues that the negativity of the transient negative emotion expressed in the face, once recognized by a perceiver, colors further judgments of this individual by the perceiver, including negative perceptions of dispositional qualities like trustworthiness. This phenomenon is so persistent that even when individuals are compelled to mimic facial expressions resembling disgust—by strategically using chopsticks to shape their expressions—they are

✉ Zachary R. Glowacki
zglowack@buffalo.edu

1 Department of Communication, University at Buffalo, State University of New York, New York, NY, USA

2 Department of Computer Science & Engineering, University at Buffalo, State University of New York, New YorkNY, USA

3 Department of Computer Science, North Carolina State University, Raleigh, NC, USA

4 Department of Veterans Affairs, VA Northern California Healthcare System, Northern California San Jose, USA

perceived as less trustworthy compared to when they display expressions resembling happiness (Ueda et al., 2017). Likewise, individuals who display disgust expressions during a trust game are trusted less, but also trust others less (Kugler et al., 2020).

This finding seems at odds with signaling theory (Dawkins & Krebs, 1978; Connelly et al., 2011). Signaling theory, which originated in evolutionary biology, is a theoretical framework that examines communication between individuals/animals and explains how they communicate with one another. The central premise of signaling theory is that any signaling/communicative system between social animals must have honest signals to be effective. An honest signal, in this theory, means the signal accurately represents the situation being communicated; for example, it effectively conveys the size of the animal emitting the call, the presence of a predator, or the strength and skill needed to secure food through advanced hunting abilities (Zahavi, 1975; Grafen, 1990). A communication system can withstand a certain number of dishonest signals (those that mislead or misrepresent), however, too many dishonest signals render the communication system useless (Dawkins & Krebs, 1978). It is unsurprising, then, that individuals within the same signaling system will penalize a dishonest signaler once their deceit is revealed. In the animal world, a small bird that produces a call suggesting it is much larger is more likely to be attacked than a small bird that emits a call consonant with its size (Akçay et al., 2013). Therefore, a signaling system would seem to put a premium on honest signals (and signalers), as they and their messages could be trusted more than others. This reasoning assumes that clarity is a necessary, though not sufficient, component of an honest signal. Without clarity, a signal cannot be interpreted as honest or dishonest, nor can the intentions or feelings behind it be understood. Other factors outside the individual can affect the interpretation of the signal. For example, expressions that align with the emotional context of the situation in which they appear are more likely to be perceived as genuine (Zloteanu & Krumhubler, 2021). Additionally, participants judged ingroup members' expressions as being more genuine than outgroup members' expressions (Hess et al., 2022). Despite this complex interplay between the type of expression, contextual factors, and social group dynamics in affecting perceptions of authenticity, it does not nullify the fact that signaling theory would predict that those who show clearer, more unmistakable signals will be not only easier to read but will be seen as *more* trustworthy, even when signaling a negative state such as disgust.

Darwin (1872/1998) was the first to argue that the reason we express emotions is that, as social animals, we must signal our behavioral intentions to smooth social interactions. An expression of anger communicates the intention to attack, which can cause the target of the anger expression to alter their behavior to dissipate the expresser's emotion, hence reduce the likelihood of an attack. This specific sort of interaction would have survival value for both parties, as in the ancient world any sort of injury from a conflict could become infected and lethal (see Frank & Shaw, 2016, for a review). Other 'basic' emotions (Ekman, 2007) have their own communicative value, including contempt (to indicate status), disgust (to indicate potential toxic substance and risk of illness), fear (to indicate danger), happiness (to indicate approachability), sadness (to indicate assistance required), to surprise (to indicate novelty; Frank & Shaw, 2016). Facial expressions of emotion are thus considered honest signals (Ekman, 2007).

However, the current data from the overgeneralization hypothesis contradicts a prediction from signaling theory. We believe it might be due to the nature of facial expressions of emotion themselves. In day-to-day life, facial expressions of emotion are not simply reflexive read-outs of emotional states. Individuals can actively suppress the expression of emotions they are physiologically experiencing, as well as pose the expressions of emotions that they are not physiologically experiencing (e.g., smiling when they do not feel happy, posing a disgust expression to tease someone about their excellent cooking). Facial expressions can be suppressed or feigned because two separate areas of the brain, complete with their own neural pathways, can each separately innervate the facial muscles (Hwang & Matsumoto, 2016; Rinn, 1984). The extrapyramidal motor system produces ballistic like pulses that originate from the various limbic structures when an emotion is elicited; whereas the pyramidal motor system produces on-line impulses that originate from the cortical motor strip (see Rinn, 1984, for a review). Research has noted that facial expressions of emotion originating in the limbic system are involuntary reactions that typically last between ½ and 5 s in duration (Ekman & Friesen, 1982), whereas those originating in the cortical motor strip are voluntary reactions that typically are much more variable in duration (Frank et al., 1993). However, at times these separate impulses can conflict, such as when an involuntary emotion is experienced, but the individual desires to voluntarily conceal that expression. The effort to conceal the emotional expression can dampen the duration of the expression to micro-momentary speeds of less than ½ a second, what is known as a 'micro expression' (Ekman & Friesen, 1969; Frank & Svetieva, 2015; Haggard & Isaacs, 1966).

Micro expressions are often not detected consciously with the naked eye, but can be subconsciously detected through electrodermal responses (Svetieva & Frank, 2016) - although individuals can be trained to better detect them in real time (Hurley, 2012). Macro expressions – what we

can consider a clear signal - are recognized at rates greater than 80% from still photos (Hwang & Matsumoto, 2016), although spontaneous emotions from video are detected and recognized at lower rates (e.g., 60–70%; Matsumoto & Willingham, 2006). This difference in detectability between micro and macro expressions may resolve the apparent contradiction between the overgeneralization hypothesis and signaling theory. If a signal is very clear, even if it is a negative emotion, it may be seen as an honest signal, and hence a more trustworthy signal, leading to the inference of a more trustworthy signaler or person. If the negative emotion signal is not clear or ambiguous, such that it is perceived more at a gut level, it may enable overgeneralization of this gut feeling, leading to the inference of a less trustworthy signaler or person. Therefore, assessing the trustworthiness of various individuals and signals would seem to disentangle this apparent contradiction.

We chose to test this idea with the emotion of disgust because it is both straightforward to elicit in a laboratory setting (e.g., Ekman, 2007) and widely recognized as a universal expression across humans and non-human primates (Case et al., 2020). Additionally, disgust is associated with a distinct pattern of brain activity unique to this emotion (Rymarczyk et al., 2019). Previous literature examined the effect of expressions of disgust (e.g., Kugler et al., 2020; Van der Biest et al., 2023) on trustworthiness and has shown that this facial expression can function to prevent disease, indicate social hierarchy, and convey social judgments such as immorality (Curtis, 2011). For example, an individual who conveys disgust after trying some novel food may signal to others that this food is contaminated or poisonous or simply unpalatable. To then give up those potential nutrients the onlooker must trust and believe the expresser of disgust and thus the believability of this individual would be essential to assess.

Another element of the signal that would need to be assessed is the authenticity of it. Individuals can send clear signals, even if they don't really believe what they are signaling (e.g., smiling when not happy; Matsumoto & Willingham, 2006). It would seem logical that a clear signal would better suggest an individual truly feels what they are signaling, compared to a subtle, harder to read signal which suggests maybe the individual doesn't believe what they are saying, or is wavering (as in deception scenarios where liars are more likely to show micro expressions; Frank & Svetieva, 2015). Moreover, people can distinguish between genuine and deliberate facial expressions, with genuine expressions being perceived as more authentic (Zloteanu & Krumhuber, 2021). The clarity and authenticity of disgust expressions, and the person displaying the expressions, can therefore be critical in conveying both nutritional caution and social standing, influencing how others perceive and interact with the expresser.

Finally, it may be the case that there is some halo effect caused by the expression so that individuals who show negative emotion expressions are simply seen as less likeable. Research has shown that for positive emotions, those individuals showing Duchenne smiles (genuine expressions of happiness involving the muscles around the eyes) are perceived as more sincere, likable, and trustworthy compared to non-Duchenne smiles (false smiles; Frank et al., 1993). Further research found that enhanced and exaggerated facial expressions (i.e., smiles) lead to more positive social interactions and higher likeability ratings. Aligning with signaling theory, these finding may suggest that genuine, cleared expressions are reliable signals of positive traits, enhancing social interactions and perceptions. Similarly, signaling theory may suggest genuine, clear expressions of a negative emotion could ironically make the individual more likeable, as the perceiver 'would know where they stand' with this individual based upon the clarity. Or it could be seen as a clear expression of negativity, thus making the person look more negative and hence less likable, which is what the overgeneralization hypothesis might predict. However, likeability based on the clarity of the signal is an empirical question and if found, would support signaling theory.

Taken together, previous work which has examined emotional expressions and their signals have routinely measured the trustworthiness, authenticity, believability, and likability of individuals expressing emotions (Ekman, 2007; Frank et al., 1993; Zloteanu & Krumhuber, 2021). This could provide additional context, particularly in understanding negative emotions like disgust, to understand its impact on social perceptions and judgments. We do not know the relative effect on trustworthiness, authenticity, or believability caused by individuals showing a clear, easily readable macro expression of disgust, compared to a more furtive micro expression of disgust (define as ½ a second or less in duration; see Frank & Svetieva, 2015; Hurley, 2012; Hwang & Matsumoto, 2016; and Wezowski & Penton-Voak, 2024). On one hand, those displaying macro expressions of disgust might appear less favorable due to the negativity of the emotion, with overgeneralizations predicting they would be judged more negatively. In contrast, those showing micro expressions of disgust might either go unnoticed or, if recognized, be perceived as polite, leading to more positive judgments. On the other hand, macro expressions could convey clearer signals of feelings or intentions, which, according to signaling theory, might result in perceptions of openness, honesty, trustworthiness, and positivity. Meanwhile, individuals displaying micro expressions might be seen as less transparent, potentially perceived as furtive, less trustworthy, and overall, less positive.

Therefore, we propose a conditional hypothesis:

H1: If the overgeneralization hypothesis is correct, individuals who display macro expressions of disgust will be rated as less trustworthy compared to individuals who display micro expressions of disgust; if signaling theory is correct, then individuals who display macro expressions of disgust will be rated as more trustworthy compared to individuals who display micro expressions of disgust.

To further examine this phenomenon within signaling theory, findings described earlier have argued for the importance of also assessing authenticity, believability, and liking. Moreover, it may also be these reflect a halo effect for trustworthiness. For example, expert witnesses who are more likeable are also perceived as more trustworthy, particularly by female jurors (Brodsky et al., 2009). It would then make sense to hypothesize that if signaling theory is correct, then macro expressions of disgust will be perceived not only as more trustworthy, but also more authentic, believable, and likeable due to their clear and honest signaling of emotion (Zloteanu & Krumhuber, 2021).

Therefore, we predict:

H2a: Individuals who display macro expressions of disgust will be rated as more authentic than individuals who display micro expressions of disgust.

H2b: Individuals who display macro expressions of disgust will be rated as more believable than individuals who display micro expressions of disgust.

Given the overgeneralization hypothesis suggests a general negative facial expression should produce a more general negative judgment of the individual, we substituted a more specific person-based judgment term to capture whether this negative halo occurred. Thus, we did not ask them to make a positive or negative judgment, which seems vague, but instead asked them to judge how likeable each the stimulus subject was.

H2c: Individuals who display macro expressions of disgust will be rated as more likeable than individuals who display micro expressions of disgust.

Lastly, research has shown that the gender of the expresser can affect perceptions of nonverbal signals (Hall & Matsumoto, 2004). Although much of the literature on gender differences has focused on the encoding and accurate decoding of emotion expressions, few have examined the impressions created by clear or unclear emotional signals (LaFrance & Vial, 2016). Previous work had shown that female faces expressing pain and happiness were rated as more trustworthy on average compared to male faces, although this same study showed no differences between the genders when expressing disgust (Van der Biest et al., 2023). Given the literature is unclear how these disgust signals will be perceived when shown by a female versus a male, we will not hypothesize but instead ask:

RQ1: Will the gender of expressers affect judges' perceptions of micro and macro expressions of disgust?

RQ2: Will the gender of the judges affect perceptions of micro and macro expressions of disgust by males and females?

Method

Participants

One hundred and thirty-four participants were recruited from a large northeastern university in the United States. The sample included 52.2% females and 47.8% males, with ages ranging from 18 to 28 years ($M = 19.8$, $SD = 1.94$). The sample self-identified as 61.2% Caucasian, 12.7% Asian American, 11.2% African American, and the remaining 14.9% being Latino/a, Indian, and other. All participants received research credit in exchange for their participation. Informed consent was obtained, and all procedures were approved by the University's Institutional Review Board. Given previous work (Van der Biest et al., 2023) showed a large effect size for their trustworthiness ratings ($\eta 2 = 0.19$) a more conservative *g power* analysis using a moderate effect size, $\alpha = 0.05$ and power = 0.80 suggested 128 participants was sufficient. The sample size, determined through a rigorous *G* power* analysis, ensured sufficient statistical power for a repeated measures MANOVA. While drawn from a university community, it reflects the USA's ethnic balance, with slightly higher Asian and slightly lower Caucasian representation. Efforts to enhance diversity included gender balance and varied backgrounds, aligning with psychological research standards of feasibility and rigor (Simmons et al., 2011).

Design

This study employed a 2 × (2) x (2) mixed model MANOVA design where the gender of the judge (*male; female*) was a between-subject independent variable (IV), and the gender of the expresser (*male; female*) and type of disgust expression displayed (*micro; macro*) were the within-subject IVs. Our dependent variables (DV) constituted four trait

impressions (*trustworthy*, *authentic*, *believable*, and *likable*) each rated on a 1 (not at all) to 10 (extremely) scale. Each participant was exposed to 12 total video clips (6 men and 6 women, shown in random order), all spontaneously reacting to a drink they tasted.

Materials

Video Stimulus The stimulus participants came from a study examining faces and brain activity (brain activity will not be discussed further). Participants in this study were administered 4 drinks that were either bitter or sweet. After sampling each drink, participants were instructed by the interviewer to speak out loud that "this drink tastes good" or "this drink tastes bad" regardless of actual taste- although not all spoke the assigned phrase verbatim. Because one drink was extremely bitter and was unanimously rated as a terrible tasting drink, participants both lied and told the truth about each drink's taste. This interaction took place over four drinks and was between 3 and 5 min in total duration. These stimulus subjects were not instructed how to behave, save the above utterances. All videos were spontaneous expressions (not posed), presumed to be driven by the taste of the drink. There were 123 total participants from this dataset.

To make the judgment task manageable, we narrowed down these expressions to a 12-item judgment video. To do so, we first controlled for the specific condition, and thus examined only those videos where the participant drank the bitter drink and said, "this drink tastes bad" (hence all were being honest, thus their signals were honest signals). Second, we selected from the 123 participants only those who had previously provided consent for their videos to be shown to others as part of a judgment study. Third, we selected from those participants just those whose facial expressions showed Facial Action Coding System (FACS; Ekman & Friesen, 1978) Action Units (AUs) 9 and/or 10, presumed to be associated with the emotion of disgust (Ekman, 2007). This left 30 stimulus participants. Fourth, we selected from those 30 individuals who were rated as having moderate static or baseline facial trustworthiness. We did this because research shows individuals do vary in the inherent trustworthiness of their static facial appearance (Oh et al., 2020), and this factor might artifactually bias judgments of the expressions. To do this, we captured still images of the remaining 30 stimulus participants at a moment in which they had no visible facial expression. Those still images were then rated on a 1 (*not at all trustworthy*) to 10 (*extremely trustworthy*) scale by a group of 11 male and female judges. Based on these ratings, we selected a subsample of individuals that were rated as being of mid-level trustworthiness. We ran a series of t-tests on the trustworthiness ratings within that subset to ensure that their static faces were rated equal on trustworthiness and subsequently found they did not differ statistically from each other.

We then selected from this subsample 6 male and 6 female stimulus subjects, and then identified their micro (*M* duration = 0.340 s; ranged from 0.303 to 0.373 s between the male and female stimuli; Shen et al., 2016, Li et al., 2024) and macro (*M* duration = 2.66 s; ranged from 2.29 to 3.03 s between the male and female stimuli; Shen et al., 2016; Li et al., 2024) expressions to produce a final sample of 12 video clips consisting of 6 Caucasian males (3 displaying micro expressions of disgust; 3 displaying macro expressions of disgust) and 6 Caucasian females (3 displaying micro expressions of disgust; 3 displaying macro expressions of disgust). We had three stimulus subjects per condition to enable us to generalize any findings, as previous work suggests facial morphology can interact with facial muscle movement to enhance or detract from the facial expression of emotion (e.g., Wiggers, 1982). We note that the population from which we chose, the remaining sample were all Caucasian expressers. We recognize that implicit bias is an issue in judgment studies (Li et al., 2016; Trawinski et al., 2021) however limiting to one ethnicity to start, reduced some of the variance in the signalers to better allow the initial test of the main variables.

The videos were edited using the *PowerDirector* program that enabled precise edits of the stimulus video, as well as added captions. These captions instructed participants on what they would expect to see from the videos and what to look for when answering questions. After editing the videos, the average duration of each clip was 5–7 s. Participants viewed each clip once, completed the trait measures for that clip, and repeated this process for all remaining video clips. The order of these 12 stimulus videos was randomly determined for each participant.

Materials After each 5–7 s video clip was played, participants rated their trait impressions on a four-item instrument that asked them to rate how trustworthy, believable, authentic, and likable each stimulus appeared to be in their response to a drink. After judging the expressions, all participants answered demographic questions as to their age, gender, level of education, and ethnicity.

Procedure

All participants were given informed consent. Afterward, the instructions informed them "please view the following videos. Each video clip is around 5–7 seconds in length and will consist of an individual tasting a drink and responding by saying 'This drink tastes bad.'" After each clip, you will simply rate the person's reaction on several judgments

Table 1 Pearson correlations on for trait judgments ($n = 134$)

Variable	Trustworthy	Authentic	Believable	Likeable
Trustworthy	-			
Authentic	0.751**	-		
Believable	0.905**	0.767**	-	
Likeable	0.826**	0.672**	0.716**	-

Note. **$p < .01$

of how trustworthy, likable, believable, and authentic they appear. Please make your judgments to the best of your ability." More instructions followed that said: "Please watch the video clip from beginning to end as you will be asked several questions that pertain to each video in its entirety." We then displayed an example video clip for participants to get them familiar with the protocol.

After watching each video, participants rated each clip on the four traits listed above. After all, 12 clips were shown, participants were asked to fill out several demographic questions. Upon completion, participants were debriefed of the true purpose of the study, thanked for their time, and dismissed.

Results

Overall. we were primarily focused on trustworthiness in social interactions, and initially hoped to isolate trustworthiness by itself. We believe empirically examining trust is crucial because trust forms the foundation of effective social interactions and relationships. However, we had to first determine if it offered any unique effects distinct from believability, likeability, and authenticity.

Relationship between trait measures

To ascertain the relationship amongst DVs, we ran a correlation on the ratings of trustworthiness, believability, likeability, and authenticity, and found strong positive relationships across all combinations (all *Pearson r's* > 0.672, $p < .001$; see Table 1). The patterns of results in Table 1 suggest a 'halo effect' where the more trustworthy the stimuli were perceived to be, the more authentic, likeable, and believable they were perceived.

Repeated measure MANOVA

We conducted a repeated measures MANOVA to examine the effect of *gender of expressor*, *expression*, and *gender of judge* on trustworthy, believable, authenticity, likability judgments. We ran a mixed model MANOVA under General Linear Model in SPSS version 29.0, given we had continuous DVs, two categorial IVs, and at least one between subject IV and one within (Murrar & Brauer, 2018). The results of these analyses are presented below in both Table 2; Fig. 1.

We first found a significant multivariate effect on *expression*, Wilks' $\Lambda = 0.54$, $F(4, 129) = 27.99$, $p < .001$, partial $\eta^2 = 0.47$. We found a second significant multivariate effect on *gender of expressor*, Wilks' $\Lambda = 0.86$, $F(4, 129) = 5.17$, $p < .001$, partial $\eta^2 = 0.14$. *Gender of judge* produced a marginally significant main multivariate effect, Wilks' $\Lambda = 0.94$, $F(4, 129) = 2.22$, $p = .070$, partial $\eta^2 = 0.06$. However, the interaction between *gender of judge* and *gender of expressor* were not significant, Wilks' $\Lambda = 0.99$, $F(4, 129) = 0.48$, $p = .070$, partial $\eta^2 = 0.02$. There was also no significant interaction effect between *expression* and *gender of judge*, Wilks' $\Lambda = 0.95$, $F(4, 129) = 1.55$, $p = .191$, partial $\eta^2 = 0.05$. *Gender of expressor* and *expression*, though, produced a significant interaction multivariate effect, Wilks' $\Lambda = 0.81$, $F(4, 129) = 7.47$, $p < .001$, partial $\eta^2 = 0.19$. There was no three-way interaction multivariate effect between *gender of judge*, *gender of expressor*, and *expression*, Wilks' $\Lambda = 0.98$, $F(4, 129) = 0.57$, $p = .682$, partial $\eta^2 = 0.02$.

Subsequent follow-up univariate ANOVAs were conducted to examine the effects of *gender of judge*, *gender of expressor*, and *expression* on each of the dependent variables.

Trustworthy

We found a main effect for *expression*, ($F(1, 133) = 84.90$, $p < .001$, $\eta 2 = 0.391$) such that those showing macro expressions were rated as significantly more trustworthy ($M = 6.27$, $SD = 1.36$) than those showing micro expressions ($M = 5.12$,

Table 2 Mean trait ratings by male and female judges of male and female participants displaying micro and macro expressions of disgust

Gender of judge	Gender of expressor	expression	Trustworthy	Authentic	Believable	Likeable
Male	*Male*	*Macro*	5.94 (1.44)	5.91 (1.48)	6.15 (1.38)	5.86 (1.38)
	Male	*Micro*	5.34 (1.38)	5.44 (1.52)	5.45 (1.63)	5.36 (1.36)
	Female	*Macro*	6.11 (1.31)	5.93 (1.66)	6.27 (1.55)	5.72 (1.33)
	Female	*Micro*	4.80 (1.63)	4.74 (1.70)	4.59 (1.77)	4.94 (1.46)
Female	*Male*	*Macro*	6.39 (1.54)	6.24 (1.59)	6.67 (1.55)	6.41 (1.63)
	Male	*Micro*	5.49 (1.38)	5.26 (1.51)	5.50 (1.52)	5.80 (1.45)
	Female	*Macro*	6.63 (1.67)	6.57 (1.74)	6.81 (1.70)	6.56 (1.46)
	Female	*Micro*	4.86 (2.01)	4.61 (2.02)	4.50 (2.03)	5.21 (1.79)

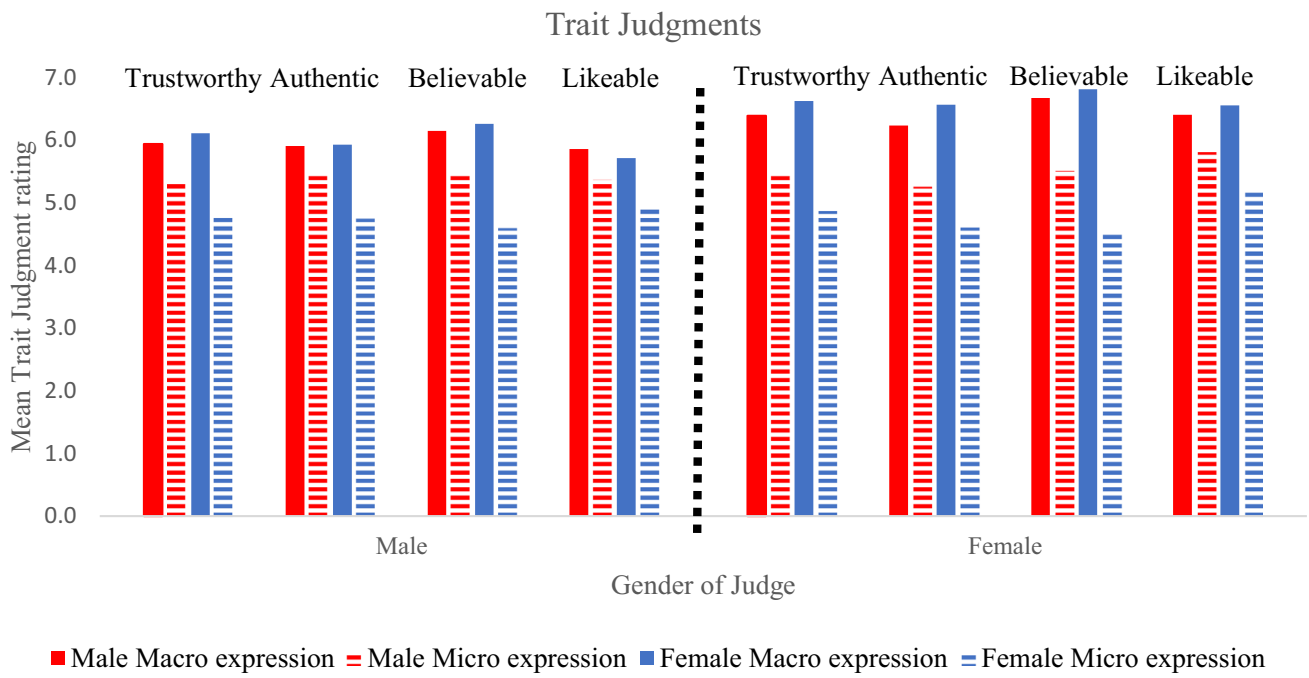

Fig. 1 Mean trait ratings by male and female judges of male and female participants displaying micro and macro expressions of disgust

SD= 1.37). A marginal main effect for *gender of expressor* occurred (*F* (1, 133) =3.54, *p* =. 062, η2 =0.03) such that the male expressers (*M*= 5.79, *SD*= 1.24) were rated slightly more trustworthy overall than the female expressers (*M*= 5.60, *SD*= 1.35). We also found an interaction between *gender of expresser* and *expression (F* (1,133) =19.87, *p* <. 001, η2 =0.131). Breaking down this interaction, it appears that females showing micro expressions of disgust (*M*= 4.83, *SD*= 1.83) were judged less trustworthy than males showing micro expressions of disgust (*M*= 5.41, *SD*= 1.38; *t* (133) = −3.91, *p*<.001, *d*= 1.72). Interestingly, females showing macro expressions of disgust (*M*= 6.37, *SD*= 1.53) were rated slightly more trustworthy than males showing macro expressions of disgust (*M*= 6.17, *SD*= 1.50), but this difference was marginal (*t* (133) = −1.804, *p*=.074).

We also did not find any significant main effects, interaction effects, or three-way interactions effects for the *gender of the judge* with *gender of expressor*, (*F* (1,132) =0.00, p =. 968, η2 =0.00, *expression*, (*F* (1,132) =2.26, p =. 135, η2 =0.02, or with *expression* and *gender of expressor*, (*F* (1,132) =0.18, p =. 675, η2 =0.00. These results support the signaling theory explanation that those individuals showing macro expressions will be rated as more trustworthy.

Authenticity

We found a significant main effect for *expression*, (*F* (1, 132) =73.52, *p* <. 001, η2 =0.36). That is, individuals who displayed macro expressions were rated as significantly more authentic (*M*= 6.16, *SD*= 1.43) than those displaying micro expressions (*M*= 5.01, *SD*= 1.47). A significant main effect for *gender of expresser* also occurred, (*F* (1, 132) =5.83, *p* =. 017, η2 =0.04) such that males (*M*= 5.71, *SD*= 1.30) were rated more authentic than females (*M*= 5.46, *SD*= 1.40). Moreover, an interaction effect between *gender of expresser* and *expression* on perceived authenticity ratings was noted (*F* (1,133) =17.94, *p* <. 001, η2 =0.12). A t-test comparing the means showed that females who displayed a micro expression (*M*= 4.68, *SD*= 1.87) were perceived as less authentic compared with males who displayed a micro expression (*M*= 5.35, *SD*= 1.51; *t* (133) = −4.57, *p*<.001, *d*= 1.70). However, there were no statistically significant differences between males and females who displayed macro expressions of disgust (*M*= 6.08 and *M*= 6.25, respectively; *t* (133) =1.308, *p*=.193, two-tailed). Thus, females were perceived just as authentic when displaying macro expressions, yet significantly less authentic when displaying micro expressions, compared to males.

There was no interaction effect between *gender of expressor* and *gender of judge*, *(F* (1,132) =0.74, *p* =. 392, η2 =0.01). Yet, there was a significant interaction effect between *gender of judge* and *expression (F* (1,132) =5.66, *p* =. 019, η2 =0.04) such that female judges rated those showing macro expressions (*M*= 6.40, *SD*= 1.44) as more authentic than male judges (*M*= 5.92, *SD*= 1.37). However, female judges rated those showing micro expressions (*M*= 4.93, *SD*= 1.51) as less authentic than males judging micro expressions (*M*= 5.09, *SD*= 1.44). Thus, it seems that

female judges were more extreme in their ratings of macro expressions compared to micro expressions. There was no three-way interaction effect for *gender of judge*, *gender of expressor*, and *expression*, *(F* (1,132) =0.43, *p* =. 511, η2 =0.00).

Believability

We found a main effect for *expression*, (*F* (1, 133) =113.49, *p*<.001; η2 =0.46) such that those expressing macro expressions (*M*= 6.48, *SD*= 1.41) were rated as significantly more believable than those expressing micro expressions (*M*= 5.01, *SD*= 1.47). A significant main effect for *gender of expresser* also occurred, (*F* (1, 132) =14.78, *p* <. 001, η2 =0.10) such that female expressers (*M*= 5.55, *SD*= 1.37) were rated as less believable than male expressers (*M*= 5.95, *SD*= 1.31).

Further, an interaction effect occurred between *gender of expresser* and *expression*, (*F* (1,132) =29.29, *p* <. 001; η2 =0.18. Females displaying micro expressions (*M*= 4.55, *SD*= 1.90) were rated as less believable that males displaying micro expressions (*M*= 5.48, *SD*= 1.57; *t* (133) = −5.76, *p*<.001, d= 1.87), although there were no differences between males and females when they displayed macro expressions of disgust (*M*= 6.54, *SD*= 1.65, vs. *M*= 6.41, *SD*= 1.49, *t* (133) =1.06, *p*=.291). Thus, males and females were equally believable when expressing macro expressions, but females were significantly less believable than males when displaying micro expressions. We also found a significant interaction effect between *gender of judge* and *expression* (*F* (1,132) =4.09, *p*=.045: η2 =0.03), such that female judges rated those showing macro expressions (*M*= 6.75, *SD*= 1.47) as more believable than male judges rating the same macro expressions (*M*= 6.21, *SD*= 1.29). There was no difference between female (*M*= 5.00, *SD*= 1.43) and male judges (*M*= 5.02, *SD*= 1.53) rating micro expressions. There was no significant interaction effect between *gender of judge* and *gender of expressor*, (*F* (1,132) =0.08, *p*=.780: η2 =0.00). there was also no three-way interaction, (*F* (1,132) =0.18, *p*=.675: η2 =0.00).

Likability

A significant main effect occurred for *expression*, (*F* (1, 132) =55.51, *p* <. 001; η2 =0.296) such that those showing macro expressions were rated as significantly more likable (*M*= 6.14, *SD*= 1.40) than those showing micro expressions (*M*= 5.33, *SD*= 1.30). A significant main effect also occurred for *gender of expresser (F* (1, 132) =8.82, *p* =. 004; η2 =0.06) such that males (*M*= 5.86, *SD*= 1.31) were rated as significantly more likable than females (*M*= 5.61, *SD*= 1.28). An interaction effect occurred between *gender of expresser* and *expression* on perceived likability, (*F* (1,132) =9.79, *p* =. 002; η2 =0.07). This was broken down with such that females who displayed micro expressions (*M*= 5.08, *SD*= 1.64) were perceived as less likeable compared with males displaying micro expressions (*M*= 5.59, *SD*= 1.42); *t* (133) = −3.66, *p*<.001, *d*= 1.61). As with previous analyses, we did not find any differences in the *gender of the expressor* for those showing macro expressions (*t* (133) =−0.110, *p*=.912). We also did not find any significant interaction effects, or three-way interaction effects for the *gender of the judge* with *expression*, (*F* (1,132) =2.46, *p* =. 120, η2 =0.02, *expressor*, (*F* (1,132) =0.13, *p* =. 724, η2 =0.00), or *expression* and *expressor*, (*F* (1,132) =1.967, *p* =. 163, η2 =0.02 on likeability. However, we found a main effect for *gender of judge* on likeability as females (M =6.00) ratings of likeability were significantly higher than males (M =5.47).

Post hoc analysis We used three distinct stimulus subjects of each gender, for each condition. These stimulus individuals were those whose neutral baseline expression face was rated average on trustworthiness to enhance generalizability of results. To further alleviate concerns over any given individual neutral face interacting with the muscle movements in the disgust expression (e.g., Wiggers, 1982), we subtracted the 1–10 trustworthiness ratings of each of the 12-stimulus subject's neutral faces from their 1–10 trustworthiness ratings for their macro or micro expression to examine the changes in trustworthiness from their neutral expression baseline. The results showed macro expressions were rated more trustworthy (*M* difference =0.90) than the neutral face rating, whereas micro expressions were rated less trustworthy (*M* difference = −0.67) than the neutral face rating. A t-test between the macro vs. micro difference scores was significant (*t* (10) =5.24, *p*<.001, *Hedges' g*= 0.56). We further note in this small sample that in *every* instance, the trustworthiness ratings of each stimulus subject who showed a macro expression was rated higher than their neutral baseline trustworthiness, and in *every* instance, the trustworthiness ratings of each stimulus subject who showed a micro expression was rated lower than their neutral baseline trustworthiness.

Discussion

This study found that males and females who showed macro expressions of disgust were seen as more trustworthy, authentic, believable, and likable than males and females who showed micro expressions of disgust. This change from their neutral 'baseline' trustworthiness rating was, without exception, more trustworthy when the stimulus subjects

showed a macro expression, and less trustworthy when they showed a micro expression. This pattern applied to both male and female expressers, and male and female judges.

We further note that these impressions seem to be more extreme when judging females who expressed disgust, such that females were seen as less trustworthy, authentic, believable, likable when they showed micro expressions compared to the males when the males showed micro expressions, even though females and males were not seen differently on these traits when expressing macro expressions. The effect of the length of expression was a consistent, strong effect (all effect sizes $\eta 2 > 0.296$) that was almost twice the magnitude for the interaction of type of expression and gender of expresser or any other variables (all $\eta 2 < 0.184$).

This pattern of results is consistent with what signaling theory would predict - that those stimulus subjects who present the clearest, most unmistakable signals will be trusted and liked more than those who are not as clear, despite them showing a negative emotion such as disgust. They are also seen as more believable and authentic – in other words, more honest signalers. This is in contrast to the emotion overgeneralization hypothesis, which would argue that clearer signals of disgust should engender more negative feelings toward the expresser, which would then be reflected in ratings of lower trustworthiness. However, micro expressions are often perceived at a gut level (Svetieva & Frank, 2016) and that gut might have created the negative impression, which in turn may cause the perceiver to overgeneralize that negative feeling to then downgrade the trustworthiness of the expresser. We only speculate that it was being detected at a gut level, based upon results of studies using similar duration of micro expressions. However, we did not explicitly ask whether they detected the disgust expression because we felt labeling the emotion explicitly may have created a demand that may have driven the results, rather than the impression of the signal itself.

As far as perceiving these macro and micro expressions, it seemed gender of judge did matter, but only for believability and authenticity, where female judges were more extreme in their judging such that their ratings were more positive for those showing the macro expressions but more negative when rating those showing micro expressions. However, this pattern did not hold when rating trustworthiness or likability. It is unclear why this might be. It might be due to those trait concepts of trustworthy and likeability being more dispositional judgments versus more situational ones like authenticity and believability, or it might be a fluke, or due to measurement error normally found in judgment studies, or lack of power, as all means were in the same direction. Future studies may help elucidate this. We note that these effects are slightly different for females, where the cost of being a less clear signaler seemed much higher for them. Females who displayed micro expressions were rated significantly more negatively on their trustworthiness, authenticity, believability, and likability than males who displayed micro expressions. Interestingly, in this instance the predictions of evolutionary psychologists would agree with the predictions of social constructionists as to the pattern of that finding but would disagree as to the explanatory mechanisms. The evolutionary psychologists would argue that being more discerning is something females would need to be given the physical costs of childbearing, whereas the social constructionists would argue that given biases against women in society, and how the patriarchy puts women in weaker power positions, they must be more discerning to navigate the culture infested with these power disparities and biases (see LaFrance & Vial, 2016).

Our findings have implications for understanding the differences in impressions created by emotions expressed by male, compared to female faces. Our findings are consistent with studies that showed women were perceived harshly for showing both too much, or not enough, restraint behavior (reactive behavior) when shown emotional stimuli (Hess et al., 2016). In this study, the stimuli to produce the expressions consisted of eight photos from the International Affective Picture System (IAPS; Bradley & Lang, 2007), which produced expressions captured on video that lasted for 4 s before disappearing, and they depicted expressions of sadness and anger for four different men and women taken from the Amsterdam Dynamic Facial Expression Set (ADFES; Van Der Schalk et al., 2011). That study found that when women don't conform to stereotypes of emotional reactivity by showing restraint, their behavior was seen as calculated or strategic, and subsequently judged more harshly. Consistent with this analysis, our results suggest that showing a clearer macro expression of a negative emotion such as disgust does not create any negativity in the perception of females, whereas being more furtive via showing a micro expression does seem to come with a social cost of being seen as less trustworthy, authentic, believable, and likable. Unfortunately, these perceptions, or misperceptions, do have a social cost to women, thus we welcome further research into this specific area.

In a similar vein, racial dynamics may also affect these judgments. Implicit biases and cultural contexts are known to shape emotional judgments (e.g., Li et al., 2016; Trawiński et al., 2021). However, we used expressers from a single ethnicity, and did so as means to reduce variance and examine a proof of principle. Research should investigate how racial dynamics influence signal clarity and social judgments, and whether signal clarity can override these biases - which in turn would provide a further test of signaling theory.

Another issue with the results pertains to the nature of the emotion of disgust. Disgust is one of the essential emotions in the dehumanization process (along with anger and contempt) that has in the past led to genocide (Matsumoto et al., 2015). It is reasonable to presume its influence on social behavior should be of rejection, and avoidance of others - especially those who are different – and hence a significant driver of ingroup/outgroup biases (Terrizzi et al., 2023). It can also affect perceptions of ourselves, that is, we can experience self-disgust, which presents serious life outcomes such as depression and anxiety (Terrizzi et al., 2023). Depression and anxiety are biproducts of self-shame, which shares similar behavioral features with disgust as they both encourage avoidance and social withdrawal; hence loneliness, rejection, and social disconnection are likely to follow (Terrizzi et al., 2023). Thus, identification of disgust is important to navigate negative affect in one's life.

Disgust also has implications in interpersonal interactions that can also extend and impact morality and decision-making judgments. For example, disgust has also been found to influence the social perception of one's moral character and trustworthiness. Those who express disgust either verbally or nonverbally (facial expressions, tone of voice) are often viewed as less moral, less competent, and less likeable than people who do not express disgust (Inbar et al., 2012). Our findings suggest a caveat – if there is a trace of that disgust expression – versus a more blatant, clear expression – then the judgment costs might be even more extreme.

We note that scientists have distinguished disgust as a moral value from disgust as a physical reaction known as "pathogen disgust" (Tyber et al., 2009). This may account for why signaling theory was supported instead of the overgeneralization hypothesis. In the current study, the stimulus subjects had taken a drink and then expressed a macro or micro disgust while verbally expressing 'this drink tastes bad'. That context was more akin to a 'pathogen' context, and hence the desirability of a clear, trustworthy signaler would seem to be vital. In contrast, had the context been more akin to a moral context (e.g., someone commenting on hated outgroups), the interpretations of that individual showing macro disgust may have been more likely to make that individual seem less attractive, become overgeneralized and hence seen as less trustworthy. These stimulus subjects were showing the facial expressions defined by the Facial Action Coding System (FACS), specifically Action Units 9 and 10, as well as speaking, and it would be interesting to further investigate the combined verbal and facial display of disgust and how that might affect positivity. This too is a future empirical question.

Finally, although this paper focused on the spontaneous display of one negative emotion, future work should explore if these findings extend to additional negative emotions such as anger, fear, or sadness. It would also warrant further exploration to replicate this study using positive emotions such as happiness to see if the clarity of the signal enhances perceptions of trustworthiness. In general happiness has already been associated with high trustworthiness along with other positive traits (Oosterhof & Todorov, 2009; Van der Biest et al., 2023). What we don't know is what are the effects if that expression of happiness is more unclear, more micro, in its display, and whether that has deleterious effects on trustworthiness and likability, and how the context matters, and whether it has even stronger effects for females who display such an emotion.

What we can suggest is that perceived trustworthiness, authenticity, believability, and likability, could also have benefits that extend to many domains in life and in various social contexts. Understanding these dynamics can provide deeper insights into the underlying social perception and improve our ability to foster genuine interpersonal connections (Zloteanu & Krumhuber, 2021; Hess et al., 2022). For example, in a courtroom setting, type of facial display (macro vs. micro) could alter impression judgments from a jury such that the more 'genuine' individual (showing macro expressions) may be more likely to gain the benefit of the doubt from that jury. Prior research has shown indirect support for this idea through studies that examined gender differences in laughter and smiling which suggest the judgments of authenticity of the laughter and smiling does affect perceptions and judgments (McKeown et al., 2015). These findings further support the overall notion that facial expressions send social signals that affect not just judgments as to one's emotional state, but perceptions of one's trustworthiness in general (Schmidt & Cohn, 2001).

Conclusion

Human facial expressions not only regulate social interactions, as Darwin (1872/1998) proposed, but also shape perceptions of individuals, including trustworthiness, authenticity, and likability. This study applies signaling theory to demonstrate how spontaneous emotional reactions to social stimuli create varying impressions based on signal clarity, the expresser's gender, and, to a lesser extent, the judge's gender. It highlights that clarity is a necessary, though not sufficient, element of honest signaling. Honest signalers are perceived more positively, even when expressing negative emotions like disgust, due to the transparency of their emotional communication.

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Data availability The data supporting the findings of this study are available upon request. Please contact the authors for access to the data.

Declarations

Conflict of interest We have no known conflicts of interest to disclose.

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