Original Article

Watch out! How a fearful face adds credibility to warnings of danger

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ABSTRACT

People display facial expressions of fear to communicate danger to others and sometimes to exaggerate danger to manipulate an audience. Here we test whether fear expressions add credibility to a speaker's warnings of danger. Participants played an incentivized lie detection game in which they guess whether a confederate partner is lying or telling the truth. Participants viewed a video of their partner's message, after reading that there was a good chance (75%) their partner was instructed to lie. We manipulated across conditions whether the partner stated the message with a neutral or fearful expression. Experiment 1 finds that participants were more likely to believe the speaker's warning of danger when it was conveyed with a fear expression compared to a neutral expression. Experiment 2 finds that when a speaker instead claimed that a danger was absent, a fearful expression no longer added credibility to their message. These findings provide evidence that fear expressions add credibility to statements of danger, specifically, rather than any claim.

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1. Introduction

A fearful face is an arresting signal of danger (Ekman, 1992; Vuilleumier, 2002). People direct their fear expressions toward other people to alert them of threats. Politicians, for example, often warn citizens about grave dangers, whether genuinely or manipulatively (Lupia & Menning, 2009), and they use fear expressions to augment their message. Similarly, fear expressions are used by public health officials to warn against threats like spreading viruses, by religious leaders to exhort followers to avoid supernatural perils, and by law enforcement to stress the menace of rising crime.

However intuitive it might be that people use fear expressions to communicate danger, there is little evidence that it actually works. And there are even good reasons to think it might not, at least in some cases. Namely, a fearful speaker could be exaggerating the danger or outright lying to manipulate the audience. This problem of credibility is posed by the classic folk tale *The Boy Who Cried Wolf* in which a boy who feigned danger is no longer believed. The folk tale *Chicken Little* also underscores the unreliability of fear when a chick struck by an acorn panics and proclaims, "The sky is falling!" In politics, both commentators and researchers have argued that citizens should pay less heed to doomsday claims by politicians and the media (Furedi, 2005; Glassner, 1999). If fear is used to mislead and manipulate, then fearful expressions might also elicit skepticism in addition to concern.

Theories of communication in game theory and evolutionary biology elaborate further on this problem of credibility. When a signal could benefit the sender at the recipient's expense, the recipient should eventually come to ignore the signal, or at least to discount its veracity (Dezecache, Mercier, & Scott-Phillips, 2013; McCullough & Reed, 2016). From this perspective, a fearful expression is cheap talk, a signal that could be faked to trick the recipient. Hence, people might ignore mere facial expressions and instead focus their evaluations on other information that is more difficult to fake such as concrete evidence of danger.

At the same time, however, there are countervailing reasons why people might still be swayed by a fearful face. Some evolutionary researchers have argued that emotional expressions were sculpted by the evolutionary process specifically to overcome the problem of credibility (Frank, 1988; Reed, DeScioli, & Pinker, 2014). The argument is that some emotional expressions are actually designed to be involuntary and difficult to consciously fake so that they convey more credible signals.

This model does confront a difficult theoretical hurdle: It seems that evolution would favor a mutant design that could fake the same expressions. However, there are some possible resolutions. For instance, it might be that individuals who are too good at faking emotions are eventually revealed as cold and calculating liars after repeated interactions in tight-knit social groups (McCullough & Reed, 2016; Searcy & Nowicki, 2005). If so, they could eventually suffer extreme social costs like exclusion, punishment, and ostracism, which would preserve the advantages of genuine facial expressions.

A second possibility is that fearful expressions remain credible because they are downstream effects of an involuntary fear response. It is arguably adaptive for the emotion of fear to remain resistant to

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conscious control so that individuals cannot easily override their fear of grave dangers such as heights, crocodiles, or menacing strangers. Fearful expressions might be contained within the same cognitive architecture of fear which remains adaptively insulated from voluntary control. Although it is theoretically possible that natural selection could shape a counterfeit fear expression, this possibility could be blocked by developmental constraints. By analogy, it is theoretically possible to reroute the optic nerve to remove the blind spot in the vertebrate eye, but this has not occurred due to developmental constraints, despite its potential advantages (Williams, 1998). Similarly, there might be no simple way for natural selection to incrementally reroute fearful expressions to be under conscious control.

Amid these theoretical debates, researchers have also used empirical studies to investigate whether people do in fact believe claims backed up by emotional expressions. The credibility hypothesis (Reed & DeScioli, 2015; Reed et al., 2014) states that facial expressions function, in part, to add credibility to accompanying messages. Previous research has tested this theory for several different emotions and types of messages. For instance, several studies have found that smiles increase the credibility of promises to cooperate (Brown & Moore, 2002; Brown, Palameta, & Moore, 2003; Reed, Zeglen, & Schmidt, 2012). Another study found that angry expressions increase the credibility of threats in ultimatum bargaining (Reed et al., 2014). And a third study found that sad expressions increase the credibility of statements of loss (Reed & DeScioli, 2015).

Fear expressions might also serve a credibility function. Specifically, we propose that fear expressions bolster claims of danger. The emotion of fear is elicited by threats to oneself and others (Ekman, 1992) and is composed of largely automatic, unconscious, and involuntary processes (Kandel, Schwartz, & Jessell, 1995; LeDoux, 1996; Ohman & Mineka, 2001; Witte, 1992). The basic evolved fear mechanisms function to prepare the individual to escape the threat (Epstein, 1972). To this end, fear activates a suite of physiological responses including those affecting adrenalin, heart rate, and musculature (Ekman, 1992; Marks, 1987; Tooby & Cosmides, 2016). Many of these basic processes are shared widely across other mammalian species (Waller & Michelatta, 2013).

In some animal species, fear also controls a species-typical facial expression. In humans, this is characterized by raised inner and outer eyebrows, widened eyes, an outward pull of the lip corners, and dropped jaw. Darwin proposed that the fear expression directly helps an individual evade a threat (Darwin, Ekman, & Prodger, 1998), which is supported by some modern research. Raising the eyebrows and eyelids increases the size of the visual field and increases saccadic velocity. The outward pull of the lip corners and dropped jaw increase inspiratory capacity (Susskind et al., 2008). Together, these physiological changes prepare the individual to respond adaptively to threats (Susskind & Anderson, 2008).

These physiological changes may also serve a communicative function: to alert others of an imminent danger. Compared to an alarm call or scream, fearful expressions can communicate dangers quietly, acting as a silent warning that safely communicates danger without putting the signaler at risk. A signaling function is consistent with research showing heightened amygdala activity in response to viewing fearful faces (Adolphs, Russell, & Tranel, 1999; Morris et al., 1996; Whalen et al., 2001), which suggests that receivers of fear expressions automatically activate their own fear response. It is also consistent with the finding that children and adults associate someone else's fear expression with dangers like consuming poisonous foods or cleaning products, and they expect a person who is presented with danger to show an expression of fear, more so than other emotions (Pooley, Hon, & Fiddick, 2010). There is also evidence that viewing fearful faces affects behavior in adaptive ways. In a classic study, Sorce, Emde, Campos, and Klinnert (1985) found that infants frequently referenced their mother's facial expression before crossing a visual cliff of uncertain height. They found that few infants crossed when mothers posed fearful facial expressions, suggesting that the infants used these expressions to help assess the danger ().

Previous research has not, to our knowledge, specifically tested whether a fear expression affects the credibility of a signaler's claim of danger. In situations where the signaler and receiver share interests, as in the visual cliff study, credibility is not a problem. Receivers have no reason to distrust the message because signalers have no reason to be dishonest (McCullough & Reed, 2016; Searcy & Nowicki, 2005). However, when signaler and receiver could have conflicting interests, credibility becomes a potential problem. If the signaler displays a fear expression, the receiver cannot be sure if the signaler is telling the truth or trying to deceive them. It is currently unknown whether fear lends credibility even when there could be conflicting interests. Yet, this exact situation frequently applies, such as when an auto mechanic, lawyer, doctor, or politician offers costly measures to protect against a danger they claim is imminent.

The credible danger hypothesis predicts that fear expressions add credibility to messages even in situations with potentially conflicting interests. This does not of course mean that receivers will always believe fearful claims, but rather that, all else equal, a fearful claim is more believable than the same message conveyed without fear, even if both versions are viewed as relatively reasonable or dubious. The rationale for this idea is that fearful expressions evolved to be difficult to consciously fake, hence preserving their signal value. In response, receivers can use genuine fear expressions, among other cues, to assess the likelihood of danger and adjust their behavior accordingly. This hypothesis predicts that receivers will be more likely to believe claims of danger when they are paired with a fearful expression in comparison to a neutral expression. An alternative cheap talk hypothesis predicts that messages will be seen as equally credible whether paired with fearful or neutral expressions.

2. Experiment 1

2.1. Method

2.1.1. Participants

We recruited 218 participants (140 male, 78 female) using Amazon's MTurk, an online crowd-sourcing website where individuals sign up to complete tasks for payment. It has been used in previous research in psychology and experimental economics and has a large and diverse subject pool (Horton, Rand, & Zeckhauser, 2011; Buhrmeister, Kwant, & Gosling, 2011). Participants' mean age was 37.0 ($SD = 11.9$); their racial distribution was: 82.6% Caucasian, 8.7% African American, 6.9% Asian American and 2% other.

2.1.2. Lie detection task

We designed an incentivized lie detection task to observe participants' judgments about the credibility of a speaker's claim of danger. Participants viewed a pre-recorded video of a speaker stating a message about danger. Participants read that the speaker's message could be true or false and their task was to judge whether the speaker was telling the truth. If they guessed correctly, they would earn additional bonus money (50 cents). In reality, the message was recorded from a confederate actress and was neither true nor false, and participants were always paid the bonus.

We created a potential conflict of interest between the participant and the speaker by telling participants that there is a good chance the speaker is lying. Participants read that some speakers were instructed by the experimenter to lie, and specifically that there was a 75% chance that their partner was instructed to lie. We chose a 75% chance of conflicting interests so that participants would start with initial skepticism toward the speaker, allowing us to test whether a fear expression helps overcome this skepticism.

We described the task to participants using a fictional backstory to provide a concrete context for the speaker's message that included an element of danger and a possible motive for deception. Participants

were told that they would play the role of an explorer and another person would play the scout. Participants read the following backstory:

> In an ancient time, an explorer is traveling through a foreign land accompanied by a local scout. The explorer finds hidden gold in an abandoned temple. When this news gets out, a band of warriors sets out to search for the explorer to take the gold.

> The explorer can flee either east or west but does not know which direction the warriors are coming. The scout is small and agile enough to climb to the top of a tree to spot the warriors. But the explorer cannot be sure whether the scout is loyal or a traitor who will send them right into the warriors' hands.

Next, participants read the specific rules for their interaction with the (confederate) scout:

1. The scout learns if they are loyal or a traitor by drawing from a deck of cards that say "loyal" or "traitor." There is a 25% chance that the scout is loyal to the explorer and a 75% chance that the scout is a traitor who works for the warriors. The explorer won't know whether the scout is loyal or is a traitor.
2. The scout sees which direction the warriors are coming and makes a report to the explorer. If the scout is loyal, they truthfully report the direction. If the scout is a traitor, they falsely report the opposite direction.
3. The explorer receives the scout's report and decides whether the scout is telling the truth or lying.
4. If the explorer guesses correctly, then they escape the warriors. If they guess incorrectly, then they are captured.

Participants read that they earn 50 cents if they correctly guess whether the scout is telling the truth or lying, and they earn nothing for an incorrect guess. Participants further read that the participant playing the scout was seated in front of a video camera when they found out which direction the warriors were coming from, and the scout was instructed to report the true direction if they were assigned to be loyal and the false direction if they were assigned to be a traitor.

Participants then viewed a pre-recorded video of the (confederate) scout stating: "The warriors are coming from the east". After viewing the video, participants answered whether they thought the scout was telling the truth or lying. If they guessed correctly, they would escape the warriors, retain their gold, and earn 50 cents. If they guessed incorrectly, they would be captured, lose their gold, and earn 0 cents.

Across between-subject conditions, we manipulated the scout's emotional expression in the video: The scout showed either a neutral or fearful expression (see details below).

After making their decision, participants rated based on the video how happy, sad, angry, fearful, and disgusted the scout felt on 7-point scales (1 = "Not at all" and 7 = "Extremely"); participants could replay the video during their ratings. Finally, participants reported their demographic information and received a debriefing statement.

2.1.3. Facial expression stimuli

To create the video of the scout's message, a female actress (23 years old, Caucasian) was instructed to state, "The warriors are coming from the east," while making either a neutral expression or a fearful expression. The actress was instructed to use the same tone of voice while showing a fearful or neutral expression. For the fearful expression, we instructed the actress to use the facial actions described for fear in the Facial Action Coding System (Cohn & Ekman, 2005). FACS is a comprehensive, anatomic system for describing and measuring facial movement. FACS allows for the creation and coding of facial muscle configurations as combinations of individual *action units* (AUs) (Ekman &

Friesen, 1978; Ekman, Friesen, & Hager, 2002), providing an objective and reliable description of facial behavior. The fearful expression consisted of the following AUs: AU1; inner eyebrow raiser, AU2; outer eyebrow raiser, AU5; eyelid raiser, AU25; lips part, and AU26; jaw drop.

Both clips were recorded at 30 frames per second in full color at a resolution of 1260 × 1080 pixels. Clips were 6 s in duration. This is similar in length to the average 4 to 6 s reported for spontaneous expressions (Frank, Ekman, & Friesen, 1993; Schmidt, Ambadar, Cohn, & Reed, 2006). We used video clips rather than static images because they provide more information to perceivers (Ambadar, Schooler, & Cohn, 2005) and would seem more authentic to participants.

2.1.4. Results and discussion

As a manipulation check, we first examined participants' ratings of emotions in the neutral and fearful clips of the scout (Table 1). As expected, participants rated the scout as more fearful in the fearful clip ($M = 4.34$, $SD = 1.84$) than the neutral clip ($M = 2.41$, $SD = 1.56$), $t(216) = 8.30$, $p < 0.001$. Further, fear was the dominant expression in the fear condition, significantly greater than the next highest rated emotion, anger, $t(112) = 10.81$, $p < 0.001$; in contrast, fear was not the dominant emotion conveyed in the neutral condition (see Table 1).

We next check whether participants were generally skeptical of the scout's message in the neutral condition. Recall that we told participants that there was a 75% chance the scout was instructed to lie. Consistent with initial skepticism, a binomial test indicated that participants in the neutral condition were less likely to believe the scout than would be expected by chance (50%), $p < 0.001$.

The main results are shown in Fig. 1. Participants were more likely to believe the scout who displayed a fearful expression (38.9%) than the scout who displayed a neutral expression (24.8%), $X^2(1, N = 218) = 5.02$, $p = 0.018$, Cramer's $V = 0.15$.

This finding supports the hypothesis that a fear expression adds credibility to a claim of danger. Participants were more likely to believe the scout when they displayed a fearful face, and this occurred despite the fact that the participant and the speaker had potentially conflicting interests (75% chance). This finding shows that people do interpret a fearful face as more than pure cheap talk even when the signaler could have an incentive to lie.

We note that the majority of participants still continued to disbelieve the scout even with a fearful expression. This shows, as expected, that people are not fully credulous toward fearful claims. Instead, these observations fit a nuanced account in which fearful expressions provide one cue among other cues that ultimately shape someone's decision to believe a speaker. In this case, participants knew there was a 75% chance the speaker was lying and their decisions had to reconcile this information with any additional credibility conveyed by the speaker.

3. Experiment 2

Experiment 1 found that a fearful face added credibility to a claim of danger. However, it is possible that fear increases credibility in general, rather than for claims of danger specifically. To examine this issue, we look at a case in which the speaker claims the opposite—the absence

Table 1
Participants' emotion ratings of neutral and fearful expressions, Experiment 1.

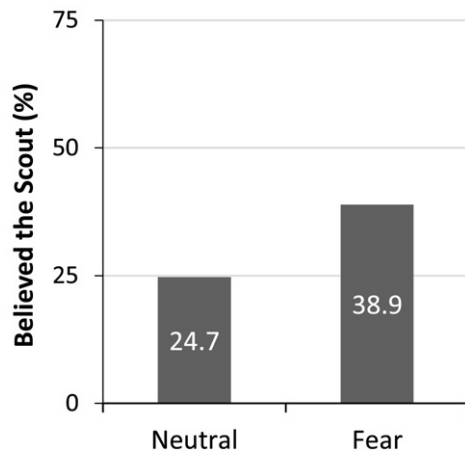|	Neutral		Fearful	
	M	*SD*	*M*	*SD*
Happy	1.94	1.18	2.03	1.28
Sad	2.38	1.37	1.86	1.22
Angry	2.95	1.62	2.03	1.37
Fearful	2.41	1.56	4.33	1.84
Disgusted	2.52	1.51	1.90	1.34

Fig. 1. Percentage of participants who believed the scout when they displayed a neutral or fear expression, Experiment 1.

of a danger. If a speaker's fear boosts the credibility of any claim, then it will similarly bolster a claim that a danger is absent. Alternatively, if fear expressions specifically bolster claims of danger, then it will have no effect or even backfire when the speaker claims a danger is absent.

A fearful expression could backfire for a claim that a danger is absent if it betrays the speaker's actual beliefs, despite their attempt to conceal them. For example, a murder suspect who is questioned by police might try to suppress their fear expressions so the police do not know how afraid they are of getting caught. But since fear expressions are partially involuntary, the suspect might inadvertently give away their heightened fear, betraying their guilt. In this case, fear expressions would undermine the speaker's claim that a danger (getting caught) is absent, and this effect would be a deleterious byproduct of a fear expression that is designed to be involuntary. This involuntary structure could boost credibility for claims of danger, but at the cost of making it more difficult to conceal danger.

In Experiment 2, we test whether fear expressions boost or undermine credibility for a claim that danger is absent.

3.1. Method

3.1.1. Participants

We recruited 209 participants (125 male, 84 female) on MTurk. Their mean age was 36.0 (SD = 10.1); their racial distribution was as follows: 84.2% Caucasian, 6.7% African American, 6.2% Asian American, and 3% other.

3.1.2. Lie detection task

As in Experiment 1, we used an incentivized lie detection task, except this time the speaker claimed an absence of danger. Specifically, the speaker is a merchant who claims they do not have stolen gold to a sheriff who would jail the merchant if they are guilty.

Participants read that they would play the role of a sheriff and another participant would play the merchant. Participants read the backstory:

In medieval times, a sheriff watches over the city and hunts down outlaws. One day a thief takes a bag of gold from the King's treasury. The sheriff receives a tip that the thief hid the gold in one of the two merchant's carts traveling out of the city, either the cart going east or the cart going west. The sheriff sets out to find the gold and throw whoever has it in jail.

The sheriff asks the merchant going east whether they have any gold in their cart. If the merchant denies it, then the sheriff has to decide whether to inspect the cart or let the merchant pass.

Importantly, if the sheriff stops to inspect the cart, they will not have time to catch up to the cart going west. So if they inspect the eastbound merchant and find no gold, then the gold will be lost on the cart going west.

Next, participants read the specific rules of the interaction:

1. The eastbound merchant learns if they have gold or not by drawing from a deck of cards that say "gold" or "goods". There is a 75% chance the merchant receives gold and a 25% chance they do not. The sheriff won't know whether the merchant has the gold.
2. The sheriff questions the merchant about the gold. If the merchant does not have the gold, they truthfully report this. If the merchant does have gold, they falsely report that they do not have gold.
3. The sheriff decides whether the merchant is telling the truth or lying.
4. If the sheriff guesses correctly, then they successfully recover the gold (either from the eastbound merchant or the westbound merchant). If the sheriff guesses incorrectly, then they lose the gold (either by missing it on the eastbound cart or failing to reach the westbound cart in time).

As in Experiment 1, participants read that they earned 50 cents for guessing correctly and nothing otherwise, and also, that the merchant was recorded on video at the moment they learned whether they did in fact possess the gold.

Participants then viewed a pre-recorded video depicting either a neutral or fearful clip of the merchant stating: "There is no gold in this cart". The video stimuli were created with the same model and in the same way as Experiment 1 for the neutral and fearful conditions, except with the different message. After viewing the video, participants answered whether they thought the merchant was telling the truth or lying. If the participant guessed correctly, they recover the gold and earn 50 cents; if the participant guessed incorrectly, they miss the gold and earn nothing.

After making their decision, participants rated how happy, sad, angry, fearful, and disgusted the merchant felt on 7-point scales (1 = "Not at all" and 7 = "Extremely"). Finally, participants reported their demographic information and received a debriefing statement.

3.1.3. Results and discussion

As a manipulation check, we first examined participants' ratings of emotions for the neutral and fearful clips (Table 2). As expected, participants rated the merchant as more fearful in the fearful clip (M = 3.86, SD = 1.84) than the neutral clip (M = 2.41, SD = 1.48), $t(207)$ = 6.29, p < 0.001. Further, fear was the dominant emotion in the fear condition, significantly greater than the next-highest rated emotion, anger, $t(103)$ = 7.38, p < 0.001; in contrast, fear was not the dominant emotion in the neutral condition.

We next checked whether participants were generally skeptical of the merchant's message in the neutral condition. Recall that we told participants that there was a 75% chance the merchant was instructed

Table 2
Participants' emotion ratings of neutral and fearful expressions, Experiment 2.

	Neutral		Fearful	
	M	SD	M	SD
Happy	1.94	1.15	2.09	1.31
Sad	1.90	1.21	1.55	0.82
Angry	2.87	1.76	1.49	0.79
Fearful	2.41	1.48	3.86	1.84
Disgusted	2.21	1.49	1.37	0.67

to lie. Consistent with initial skepticism, a binomial test indicated that participants in the neutral condition were less likely to believe the merchant than would be expected by chance (50%), $p < 0.001$.

The main results are shown in Fig. 2. We found no significant difference between the percentage of participants who believed the merchant with a fearful expression (22.1%) compared to the merchant with a neutral expression (26.7%), $X^2 = (1, N = 209) = 0.059, p = 0.273$, Cramer's $V = 0.05$. Hence, we did not find evidence that a fearful expression boosts the credibility of a claim that danger is absent.

Next, we examined whether the difference between fear and neutral conditions itself differed between Experiment 1, when the speaker claimed the presence of a danger (the direction of the warriors), and Experiment 2, when the speaker claimed an absence of a danger (illegal cargo). To test for a difference in differences, we combined the data from both experiments and conducted a logistic regression of whether they believed the speaker (yes or no) with predictors for the speaker's expression (neutral and fearful), the different messages in the two experiments (present danger and absent danger), and an expression by message interaction (Table 3). We found a significant main effect for emotion, no main effect for the message, and importantly, a significant emotion by message interaction. The interaction effect shows that the effect of the fearful expression on credibility was indeed greater when the speaker claimed that a danger is present (Experiment 1) than when the speaker claimed a danger was absent (Experiment 2).

4. General discussion

In two experiments, we tested the hypothesis that fear expressions enhance the credibility of claims of danger. In Experiment 1, participants guessed whether a confederate speaker was telling the truth about a danger, while knowing the speaker could have been instructed to lie (75% chance). We found that participants were more likely to believe the speaker's claim when they displayed a fear expression compared to a neutral expression. This finding shows that participants did not view fear expressions as merely cheap talk, even when the speaker could have an incentive to lie.

Experiment 2 further tested whether fearful expressions also increase credibility for a claim that danger is absent, or if instead fear specifically bolsters claims of danger. In contrast to Experiment 1, we did not find an effect of fear expressions for a claim that danger is absent. Participants were not more likely to believe a claim that a danger was absent (no illegal goods in the cart) when it was paired with a fear expression compared to a neutral expression. Together with Experiment 1, these findings support the hypothesis that fear boosts the credibility of claims of danger, specifically, rather than any type of claim.
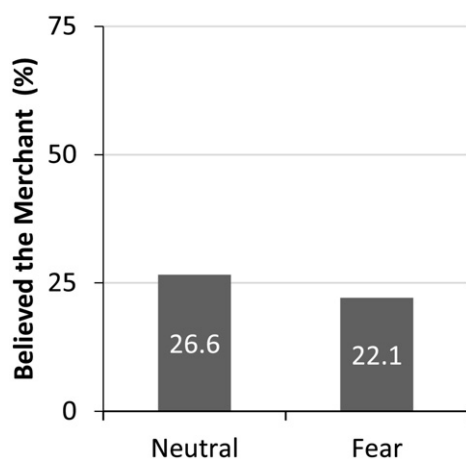
Table 3
Logistic regression of participants' judgments that the speaker is telling the truth.

	B	SE	Exp (B)	p
Constant	1.111	0.226	3.038	<0.001
Emotion	−0.661	0.297	0.516	0.026
Message	−0.063	0.318	0.939	0.842
Emotion * message	0.872	0.441	2.393	0.048

Note. Emotion coded as 0 = "neutral" or 1 = "fear". Message coded as 0 = "danger present" (Experiment 1) or 1 = "danger absent" (Experiment 2).

In fact, the credible danger hypothesis suggests that fear might, as a byproduct, actually hinder an individual's ability to conceal danger. For example, when someone falsely claims to a police officer that they do not possess illegal drugs, their involuntary fear expression could inadvertently give away the ruse. The credible danger hypothesis holds that fear expressions are designed to involuntarily signal the presence of danger, which boosts the signal's credibility. As a byproduct, the same involuntary signal can undermine credibility when a speaker claims a danger is absent. Of course, this implies a corollary that the evolutionary benefits of credibly signaling danger outweighed the costs of undermining one's ability to conceal danger.

As discussed above, we think that fear expressions are one source of cues among others that people use to judge a speaker's honesty. Another important factor is the relative risks at stake if the danger is real or fabricated. If the potential danger is severe, ignoring a warning could be catastrophic, leading to serious injury or death. However, if the danger is mild, ignoring a warning may only result in smaller costs, such as lost energy or time. As such, a receiver's response to a fearful warning will depend on the costs and benefits of false positives and false negatives, following the logic of signal detection theory (Haselton & Buss, 2000; Johnson, Blumstein, Fowler, & Haselton, 2013; Swets, Tanner, & Birdsall, 1961). Future research adjusting these relative costs could shed light on this.

Supporting evidence is also likely to affect people's judgments of honesty. For example, a scientist's claim of global warming can be bolstered by videos of melting glaciers or data on rising sea levels, in addition to the fear displayed on their face. Finally, receivers are also expected to be sensitive to previous experiences with a particular speaker. A speaker who previously lied might be disbelieved even if they display a convincing fearful expression.

In addition to these other cues, the emotion of fear itself might provide multiple cues about danger. Here we focused on facial expressions but it seems likely that people use additional channels to communicate fear including body language and tone of voice, which could be studied with methods similar to the present research. For example, future research could manipulate whether a speaker has a trembling, fearful voice when delivering a questionable message, and whether this vocal cue adds or interacts with fearful facial expressions.

More generally, the present results further supports the broader theory that multiple emotional expressions function to boost credibility. They are consistent with previous research finding that facial expressions enhance the credibility of promises (Reed et al., 2012), threats (Reed et al., 2014), and claims of loss (Reed & DeScioli, 2015).

In short, we find evidence for the credible danger hypothesis for fear expressions. This theory has a number of implications for many domains of social life. For instance, politicians who display fearful expressions while warning of international conflict, spreading viruses, or illegal immigrants might gain an advantage in persuading citizens. In economic exchange, fearful expressions might influence consumers when they choose vehicle repairs, medical procedures, insurance policies, and other products with danger at stake. Importantly, although fearful expressions might typically be fairly reliable signals of danger, this might not always be the case for professionals such as politicians, salespeople, or actors who might have considerable practice faking these expressions to persuade others. Further study of fear expressions can help understand both how fear supports honest signaling as well as how it is used by speakers to manipulate a credulous audience.

Fig. 2. Percentage of participants who believed the merchant when they displayed a neutral or fear expression, Experiment 2.

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