RESEARCH ARTICLE

A Risk or an Opportunity? Facial Expressions of Fear in Bargaining

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Abstract
Successful bargaining often depends on our emotional expressions. We test whether a bargainer's facial expressions of fear make their partner more generous or opportunistic, and whether it depends on whose welfare the fear is about. In Experiments 1 and 2, participants played the role of the responder in an ultimatum game. Before choosing the lowest offer they would accept, they viewed a video of a typical proposer whose facial expression was either fearful or neutral, paired with a statement warning of the mutual harm if the deal fails. Participants were willing to accept lower offers after viewing the fearful face compared to the neutral face. In Experiment 3, participants played a dictator game and decided how much of the pot they would take. Before deciding, they viewed a video of a typical partner whose facial expression was either fearful or neutral, paired with a statement of the individual harm to the partner if the dictator is selfish. Participants who viewed the fearful expression took more money for themselves. These findings provide evidence that a fearful face can make a partner more generous when it warns of mutual harm, but not when it conveys a threat to only the signaler.

Keywords Facial expression · Fear · Game theory · Bargaining · Signaling

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When people bargain over resources like money, food, and labor, they struggle with one of the most common problems faced by our ancestors. In many cases, the stakes are high including the resources themselves, the benefits of ongoing cooperation with the partner, and the efficient division of labor enabled by the partnership. Furthermore, the bargainer's actions could hurt their reputation and draw punishment from others in the community (Fehr & Fischbacher, 2004). In these negotiations, people commonly express emotions such as anger, sadness, and gratitude to communicate their needs and try to reach a deal.

Here we ask how people use facial expressions of fear when bargaining with others. Generally, fear arises in response to threatening situations (Ekman, 1992; Öhman & Mineka, 2001) commonly faced by our ancestors (Marks, 1969; Seligman, 1971). The emotion of fear activates a suite of psychological programs, largely automatic and unconscious (LeDoux, 1996, 2003; Öhman & Mineka, 2001; (Vuilleumier, 2002, Witte, 1992), to prepare someone to avoid or escape the threatening situation (Davis & Whalen, 2001; Epstein, 1972; Gray, 1982). Many of these psychological programs are shared widely among mammals (Waller & Micheletta, 2013), including neurological, hormonal, physiological, and behavioral processes (Ekman, 1992; Marks, 1987; Sznycer et al., 2017). Other components of human fear may be more specialized such as varieties of fear that guard against threats to status, property, and relationships. One key component is the facial expression of fear, including the widened eyes, raised eyebrows and eyelids, outward pull of the lip corners, and dropped jaw (Ekman, 2012; Susskind et al., 2008).

How might facial expressions of fear influence bargaining? In some instances, a fearful expression might help a bargainer by conveying the mutual danger of a failed negotiation. For example, a politician who negotiates a bill for clean energy might benefit from displaying a fearful expression when speaking of the mutual dangers of climate change. However, a fearful expression might also hinder a negotiator if it conveys self-doubt, weakness, and vulnerability. The politician might fail to persuade their opponents if they appear to lack confidence and conviction.

In general, a number of researchers have argued that human emotions were modified by natural selection to help

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solve the problems posed by bargaining. First, people's emotions guide them to bargain and cooperate successfully. For example, Sell and colleagues propose that anger evolved to leverage the angry person's bargaining power in order to make someone put greater weight on their welfare (Sell & Sznycer, 2021). Similarly, Trivers (1971) argued that our feelings of liking and disliking others guide the strategy of reciprocal altruism. Finally, Hagen and colleagues' bargaining model of depression (Hagen, 2002) argues that depression and sadness, despite spreading gloom to others, functions to solicit help and resources from them.

Second, people's emotions activate expressions that function as signals. In evolutionary biology, a signal is a message that was designed by natural selection to affect the receiver of the message, and for which the receiver has evolved adaptations to receive the message (Dezecache et al., 2013; Fridlund, 1994; McCullough & Reed, 2016). Signals are distinct from cues, which refer to facts an observer learns about someone but were not designed to communicate that information. For instance, a lion's roar is a signal of their power, while a lion's limp is a cue of an injury, not a message designed to alert their rivals of their vulnerability. Applying this critical distinction, people's emotional expressions are not only cues of how they feel but also signals designed to convey specific messages to other people, who in turn have cognitive adaptations designed to receive those specific expressions.

Since emotional expressions often function as signals, they are social adaptations (Keltner & Haidt, 1999; M. W. Morris & Keltner, 2000; Pietroni et al., 2008). For instance, scholars have argued that emotional expressions motivate recipients to adapt their responses accordingly (Van Kleef, 2009; van Kleef et al., 2004; Van Kleef et al., 2010). Regarding anger, Sell and colleagues (2021) posit that people use angry facial expressions to signal their formidability to others (Sell et al., 2014). Another idea is the credibility hypothesis which holds that facial expressions add credibility to cheap talk (Reed et al., 2014, 2018). This hypothesis notes that speech alone is often cheap talk that may be ignored by receivers without consequence (Reed et al., 2018). However, facial expressions can add credibility to questionable messages because they are automatically tied to emotions and they are difficult to fake through deliberate effort (McCullough & Reed, 2016). Thus, when the emotional expression matches the content of the speech, such as a fearful face paired with a verbal warning of danger, the expression can add some credibility to the message.

To study emotional signals in bargaining, we can use a standard method: the ultimatum game (Guth et al., 1982). A proposer offers a division of a pot of money to a responder. If the responder accepts the offer, both parties receive the amounts proposed. If the responder rejects the offer, the pot is destroyed and both parties get nothing. Rationally, the proposer would offer the lowest amount to the responder and keep the maximum for themselves, since the responder should accept the lowest amount as better than nothing (Rubinstein, 1982; Stahl, 1972; Thaler, 1988). In reality, however, responders frequently reject offers that are less than about a third of the pot, and proposers typically offer more than a third and often an even split (Camerer, 2003). For example, List and Cherry (2000) reported that responders rejected approximately 20% of offers between 40% and 49%, 30% of offers between 30% and 39%, and 70% of offers less than 25%. A common interpretation is that responders feel angry and reject unfair offers to spite their partner (Sanfey et al., 2003; Straub & Murnighan, 1995).

If responders reject offers out of anger, then proposers might interpret angry expressions as a signal to bargain more generously. Reed and colleagues (2014) examined how a proposer reacts to a confederate responder's angry face or neutral face paired with a fair demand that seems credible ("I will reject your offer if you offer me less than 50% of the pot.") or an unfair demand that seems exaggerated ("I will reject your offer if you offer me less than 70% of the pot."). The proposers made higher offers to the angry responder than the neutral responder, but only when paired with the unfair demand that seems unlikely. This suggests that an angry face can serve as an emotional guarantor that increases the credibility of an otherwise doubtful threat. Similarly, research has found that people make concessions in response to a partner's anger expressed in a written message (van Dijk et al., 2008) and in negotiations similar to ultimatum bargaining (Sinaceur & Tiedens, 2006).

Fear also appears to play a key role in bargaining. Recall that proposers typically offer nearly half of the pot, which is commonly interpreted as motivated by their fear of rejection (Camerer & Thaler, 1995; Pillutla & Murnighan, 1996; van Dijk & Vermunt, 2000; Weg & Zwick, 1994). Corroborating this interpretation, when the possibility of rejection is removed in the dictator game, participants share less money with their partner (typically 20% of the pot compared to 40% in the ultimatum game) (Hoffman et al., 2000). In experiments looking at fear specifically, proposers make more generous offers when they feel more afraid of rejection, both when the fear is measured observationally and when it is induced by an experimenter (Nelissen et al., 2011).

Given that proposers' offers are shaped by their fear of rejection, responders might adjust their demands when they see an expression of fear. However, it remains to be seen how responders might react. One hypothesis from previous research is that fear expressions signal danger. In the context of bargaining, specifically, fear may warn a partner of the mutual harm of a failed negotiation. Generally, a fearful face is characterized by widened eyes, raised eyebrows and eyelids, an outward pull of the lip corners, and a dropped jaw (Ekman, 2012; Susskind &

Anderson, 2008). The fear expression originally served a simpler physiological function of configuring the face to enhance vision, attention, and respiration during a dangerous encounter (Darwin, 1872; Shariff & Tracy, 2011) (Susskind & Anderson, 2008). From this origin, the fear expression was modified for the social purpose of signaling danger to others, which coevolved with the receiver's ability to recognize and respond adaptively to fearful expressions (Vuilleumier, 2002). As such, fearful expressions signal danger to other people (Adolphs et al., 1999; Breiter et al., 1996; Davis & Whalen, 2001; J. S. Morris et al., 1996, 1999; Reed & DeScioli, 2017b; Whalen et al., 2001). If someone sees a fearful face, there could be a threat that endangers them too.

Supporting this idea, seeing a fearful face stimulates subcortical neural processing that redirects attention and enhances perception (Vuilleumier, 2002). Also, studies show that people use others' fearful expressions as a reference to guide their decisions. In fact, experiments on rhesus monkeys reared in the lab found that they developed a fear of snakes after seeing other monkeys react to the snakes with fearful faces (Öhman & Mineka, 2001). In a study of human infants, researchers found that the infants frequently referenced their mother's facial expression before crossing a visual cliff of uncertain height (Sorce et al., 1985). Few infants crossed when their mothers posed a fearful face, suggesting that mothers use a fearful face to communicate danger while infants recognize the message to assess danger.

Altogether, this previous research suggests that a bargainer could use a fearful expression to signal to their partner the mutual danger of failing to reach a deal. Even if the partner knows the deal could fail, a bargainer's expression of fear could draw further attention to the risk, encouraging their partner to fully weigh the risk amid the commotion of negotiation. If so, emphasizing the danger of rejection should make the partner bargain more generously to prevent rejection and make them more likely to reach a deal.

However, another hypothesis suggests that a fearful face could make your partner bargain more selfishly. Another social function of fear expressions is to signal subordination and appeasement in order to reduce aggression from the receiver (Blair, 1995; Schenkel, 1967). Related, fear expressions might be interpreted as a cue rather than a signal, particularly as a cue of weakness inadvertently shown by the fearful bargainer. In this case, a fearful face serves as a cue of weakness, arising as a byproduct of the automatic tie between a fearful expression and the perception of danger. In either case, whether fear is a signal of subordination or a cue of weakness, it could make an opportunistic partner bargain selfishly since their partner appears prepared to concede. This prediction also follows research finding that people bargain more aggressively with partners who are less physically formidable (Sell et al., 2009).

Moreover, these contrasting hypotheses are not mutually exclusive. Fearful expressions could have both effects: calling attention to a mutual danger and showing the signaler's weakness. In this case, the stronger influence would determine the net effect.

In the present experiments, we test how a bargainer's expression of fear affects their partner's generosity. In the first two experiments, participants play the role of responder in an ultimatum game and view a video of a typical partner with a fearful or neutral expression paired with a statement about the mutual danger of rejection. The mutual danger hypothesis predicts that the responders will bargain more generously to prevent rejection, accepting lower offers, when their partner has a fearful face. Alternatively, the weakness hypothesis predicts that responders will bargain more selfishly after seeing fear and vulnerability in their partner. In the third experiment, we remove the danger to the proposer by using a variant of the dictator game, so that the fear expression refers only to the danger to the partner rather than both players. Having removed the mutual danger, the weakness hypothesis predicts that the dictator will be more selfish after seeing their partner's fear, especially without the countervailing consideration of a mutual danger. We report all studies, measures, manipulations, and data/participant exclusions (though there were none) in each experiment.

Experiment 1

Method

Participants We recruited 115 participants (61 male, 53 female, 1 other) using Amazon's MTurk (Buhrmester et al., 2018; Horton et al., 2011). We planned in advance to collect a sample size of approximately 60 per condition, and we did not analyze the date until all of the responses were collected. This sample size provides 80% power to detect an effect size of $d = .53$ in a two-tailed t test with a 5% false-positive rate (calculated with G*power). Participants' ages were: 4% 18-24, 52% 25-34, 23% 35-44, 12% 45-54, 8% 55-64, and 1% 65-74 years. Participants were 79% White, 12% Black or African American, 3% Asian, 1% American Indian or Alaskan Native, and 5% other. In a between-subjects design, participants were randomly assigned to view a neutral ($n = 57$) or fearful ($n = 58$) facial expression of a typical partner (see below).

Procedure Participants gave consent and read a description of the game. Participants read that they would play a game with another MTurk worker they would be paired with after each worker completed their part. Participants earned $1 for completing the task, and read they could earn an additional

bonus depending on the decisions made by them and the other worker. In reality, participants were paid the full bonus regardless of their decisions.[1]

Modified Ultimatum Game Participants played the role of the responder in an ultimatum game in which their partner was the proposer. In the instructions, participants read:

> You start with 0 cents and the other player starts with 100 cents.
>
> The other play can choose to offer you any amount (between 0 and 100 cents) and keep the rest.
>
> If you accept the offer, you will be paid whatever the offer is and the other player will keep the rest.
>
> If you reject the offer, the pot will be destroyed, and you and your partner will be paid nothing.

To make their decision, participants indicated what offers they would accept or reject from the proposer by choosing the lowest offer they would accept, commonly called the minimum acceptable offer (MAO). Participants chose "the lowest amount that [you] will accept from the other player without destroying the pot." To clarify the consequences, they also read:

If the other player offers you more than your minimum acceptable offer, you will keep what the other player offers you and they will keep the rest (100 cents minus their offer to you).

If the other player offers you less than your minimum acceptable offer, you and your partner will each receive nothing.

Participants chose two minimum offers. The first amount would be communicated to the proposer before their decision, but this amount was cheap talk and did not determine whether an offer was accepted. The second amount was kept private and was the actual minimum that would determine whether a deal is made. Participants were reminded that the communicated minimum could differ from their actual minimum. The actual minimum is our main interest. But we additionally wanted to see whether the fearful face would similarly affect how much the responder told the proposer they would accept.

After reading the instructions, participants answered 3 comprehension questions (e.g., "If your actual minimum acceptable offer is 50 cents and your partner offers you 40 cents, how much will you and the other player earn in MTurk bonus payments?"). If they answered incorrectly, they could try again. Participants had to answer correctly in order to proceed.

Before choosing their minimum offer, participants viewed a video of a proposer paired with a written message about

the mutual danger of rejection. The proposer's face showed either a fearful or neutral expression (see below for details). Participants then made their decisions.

After the game, participants viewed the video again and rated the partner's emotion as a manipulation check. Participants rated how fearful the proposer looked on a 7-point scale from 1 for *Not at all* to 7 for *Extremely*. Participants could replay the video while making these ratings. Then participants reported their sex, age group, and race. Participants were debriefed that they were not really matched with another player and would receive the full bonus payment. They could also choose to remove their data from the study (no one did). Participants completed a single trial in approximately 5 – 10 min.

Facial Expression Stimuli As explained above, before making their decisions participants viewed a video of a person playing a proposer in the ultimatum game, described as "a typical person playing the other role in this game." Paired with each video was a message that warned of mutual danger: "If you reject my offer, we'll both end up with nothing." Using standard videos and messages reduced the noise inherent in real-time interactions (e.g., grooming behaviors such as skin picking and scratching and irrelevant dialogue) increasing experimental control. By holding the video and message constant across participants, we aimed to increase experimental control and avoid noise from variation in expression that would occur with different videos or real-time interactions. Though not those of their actual partner, we anticipated that participants would take the actresses expression as representative of an actual partner, both because people's processing of facial expressions is relatively automatic and because the actress was participants' only example of a proposer to guide their decisions. This methodological choice follows previous research that used a "typical" partner to study the effects of emotional expressions (Reed et al., 2018; Reed & Castro, 2022).

The stimuli for the facial expressions were brief and silent videos of an actress (25 years old, Caucasian) instructed to display facial actions for emotional expressions described in the Facial Action Coding System (Cohn & Ekman, 2005). The FACS is a comprehensive, anatomical system for describing and measuring facial movements. It allows researchers to create and code configurations of facial muscles as combinations of action units, providing an objective and reliable measure of facial behavior. After recording the videos, two coders certified in FACS independently coded the action units displayed by the actress in the two videos. We quantified the coders' agreement using κ and found it was almost perfect ($\kappa = .97$), confirming that the faces in the videos showed a fearful expression and a neutral expression (Landis & Koch, 1977).

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[1] Although this was a courtesy, it would have been preferable to follow the standards of experimental economics and pay participants based on their actual decisions.
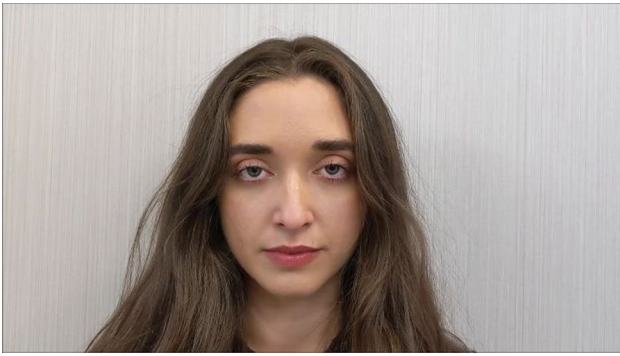
Fig. 1 Still image taken from neutral clip

We created the videos using methods from previous studies (Reed et al., 2018, 2019; Reed & DeScioli, 2017b). Briefly, we used a metronome (unrecorded) to create 6 s clips of the actress's facial expression. For the neutral face (see Fig. 1 for still image), the actress displayed a neutral expression (activated no action units). For the fearful face (see Fig. 2 for still image of apex fearful expression), the actress began with a neutral expression and then at 1 s the actress simultaneously displayed the action units characteristic of fear (Ekman, 1992). These included the inner eyebrow raiser (AU1), the outer eyebrow raiser (AU2), the eyelid raiser (AU5), the lips part (AU25), and the jaw drop (AU26). As in previous work (Reed & Castro, 2022), we encouraged the actress to use imagination and memories to enhance the genuineness of her fear expression. Both clips were recorded at 30 frames per second in color at a resolution of 1,920 x 1,080 pixels. The clips are close to the average duration of 4-6 s for spontaneous expressions (M. Frank et al., 1993; Schmidt et al., 2006). We used video clips rather than static images to convey fuller expressions that appear more authentic (Ambadar et al., 2005).

We also confirmed the facial expressions with participants' ratings of fear as a manipulation check. Participants
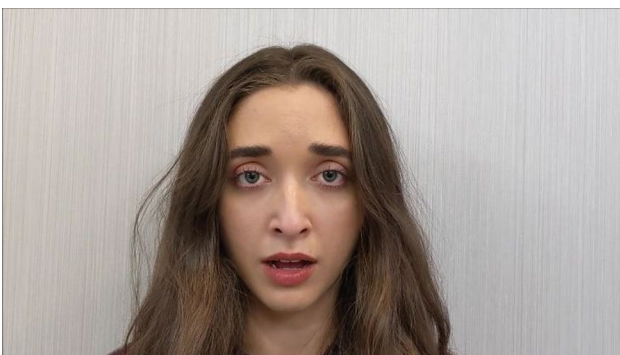

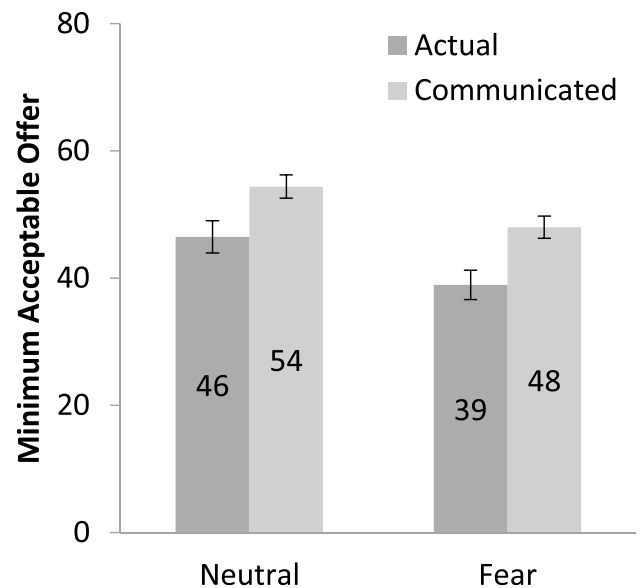**Fig. 2** Still image taken from fearful clip

Fig. 3 Responders' choices of the lowest offer they would accept. The choices are shown by whether they viewed a proposer with a fearful or neutral face, and whether the choice was the actual minimum or the minimum communicated to the proposer. Error bars are standard errors

rated the proposer's expression as more fearful in the fearful clip ($M = 3.80$, $SD = 1.72$) than the neutral clip ($M = 2.37$, $SD = 1.60$), $t(113) = -4.637$, $p < .001$, $d = -.865$.

Data and Analysis This study is registered on the Open Science Framework. Video clips and de-identified data are available on OSF (https://osf.io/r4hdv/?view_only= 558c58ca8d004508823b36f4de617999). We analyzed the data with SPSS software.

Results and Discussion

Figure 3 shows the results. Regarding their actual minimums, participants were willing to accept lower offers after viewing the fearful face ($M = 39.53$, $SD = 17.57$) compared to the neutral face ($M = 46.47$, $SD = 19.08$), $t(113) = 2.029$, $p = .022$, $d = .378$. Regarding their communicated minimums, participants communicated that they would accept lower offers after viewing the fearful face ($M = 48.00$, $SD = 13.35$) compared to the neutral face ($M = 54.37$, $SD = 13.78$), $t(113) = 2.519$, $p = .007$, $d = .470$.

These results support the mutual danger hypothesis. Participants bargained more generously by accepting lower offers when the warning of mutual harm was paired with the fearful face compared to the neutral face. Moreover, participants also communicated lower minimum offers when the message was paired with a fearful face compared to the neutral face. These findings support the hypothesis that fearful expressions signal mutual danger in bargaining, eliciting generosity that

benefits both the signaler and receiver. In contrast, the results oppose the weakness hypothesis which holds that a fearful face can make a bargainer look vulnerable and embolden their opponent to bargain more aggressively. Although a fearful face might show weakness, we found that on average a fearful proposer drew more generosity than selfishness from their partner, consistent with signaling mutual danger.

Experiment 2

Next, we repeat the same experiment except participants choose only their actual minimum and not a separate minimum to communicate to the proposer. In the previous experiment, participants did both which may have influenced their actual offers.

Method

We recruited 98 participants (65 male, 33 female) using MTurk. We planned in advance to collect a sample size of approximately 50 per condition, and we did not analyze the date until all of the responses were collected. This sample size provides 80% power to detect an effect size of $d = .57$ in a two-tailed t test with a 5% false-positive rate. Participants' ages were: 6% 18-24, 44% 25-34, 30% 35-44, 14% 45-54, and 6% 55-64 years. Participants were 86% White, 8% Black or African American, 3% Asian, and 3% other. In a between-subjects design, participants were randomly assigned to view either the neutral ($n = 49$) or fearful ($n = 49$) facial expression.

The procedure was identical to Experiment 1 with one exception: participants chose only their actual minimum for an acceptable offer, and not a communicated minimum as before. The instructions about the communicated minimum were removed. As before, the manipulation check confirmed that participants rated the proposer's expression as more fearful in the fearful clip ($M = 3.35$, $SD = 2.01$) than the neutral clip ($M = 2.46$, $SD = 1.76$), $t(96) = -2.311$, $p = .011$, $d = -.467$.

Results and Discussion

Figure 4 shows the results. Participants were willing to accept lower offers after viewing the fearful face ($M = 37.78$, $SD = 17.16$) compared to the neutral face ($M = 46.35$, $SD = 20.85$), $t(96) = 2.222$, $p = .014$, $d = .449$. These results lend further support the mutual danger hypothesis. As in Experiment 1, responders bargained more generously after viewing a proposer warning of mutual harm with a fearful face compared to a neutral face.
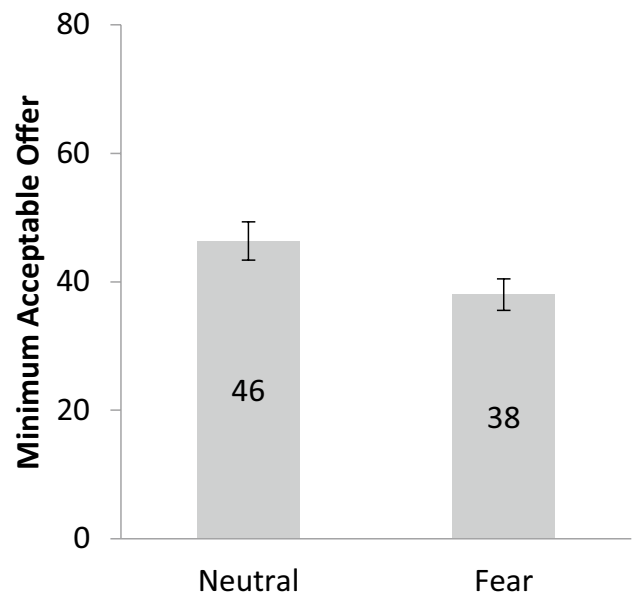

Fig. 4 Responders' choices of the lowest offer they would accept. The choices are shown by whether they viewed a proposer with a fearful or neutral face. Error bars are standard errors

Experiment 3

We have seen that a fearful face can signal mutual danger in bargaining. However, another interpretation of the previous results is that the partner's fear made the responder feel sympathy and altruism for their partner. Hence, it is unclear whether responders were primarily motivated by altruism for the proposer or prudence for themselves.

To test this possibility, we remove the danger to the participant by allowing them to decide unilaterally how much money to take from their partner with no risk of rejection. Participants play the dictator in a taking version of the dictator game (Kahneman et al., 1986). Participants view a video of a partner's face paired with written message, but now the message warns of a danger to only the partner, rather than a mutual danger. Specifically, the message is: "One of us could end up with nothing." This message indicates a danger to the partner since the dictator alone decides how much to give the partner. As before, the message is paired with either a fearful or neutral face.

If participants' generosity toward a fearful partner is motivated primarily by altruism, then the dictator will be more generous toward a partner with a fearful face compared to a neutral face. But this generosity will not occur if fear expressions work mainly by signaling mutual danger, since there is no danger to the dictator. Further, with the mutual danger removed, a fearful face could show the partner's weakness and so tempt the dictator to take more for themselves.

Method

We recruited 97 participants (57 male, 40 female) using MTurk. We planned in advance to collect a sample size of approximately 50 per condition, and we did not analyze the date until all of the responses were collected. This sample size provided 80% power to detect an effect size of $d = .58$ in a two-tailed t test with a 5% false-positive rate. Participants' ages were: 9% 18-24, 47% 25-34, 17% 35-44, 16% 45-54, 9% 55-64, and 2% 65-74 years. Participants were 80% White, 10% Black or African American, 5% Asian, 3% American Indian or Alaskan Native, and 1% other. In a between-subjects design, participants were randomly assigned to view either the neutral ($n = 47$) or fearful ($n = 50$) facial expression.

Participants played the dictator in a dictator game where they decided how much to take from a partner. They read:

You start with 0 cents and the other player starts with 100 cents.

You can choose to take any amount of that 100 cents from your partner. Any amount that you don't take will be left over for them.

Before making their decision, participants viewed the same videos of fearful and neutral faces, except they were paired with a message about a danger to the partner (not a mutual danger). The message was "One of us could end up with nothing." Aside from the different game and message, the rest of the procedure was the same as in the previous experiments. And as before, the manipulation check confirmed that participants rated the partner's expression as more fearful in the fearful clip ($M = 4.09$, $SD = 1.94$) than the neutral clip ($M = 2.05$, $SD = 1.40$), $t(95) = -5.907$, $p < .001$, $d = -1.20$.

Results and Discussion

Figure 5 shows the results. Participants took more money for themselves after viewing the fearful face ($M = 78.70$, $SD = 22.74$) compared to the neutral face ($M = 68.28$, $SD = 25.96$), $t(95) = -2.107$, $p = .019$, $d = -.428$. This finding contradicts the hypothesis that people are generally more altruistic toward a fearful partner when dividing resources. Instead, participants were more selfish after viewing a receiver with a fearful face compared to a neutral face. And this finding indicates that the signal of mutual danger in the previous experiments worked mainly by appealing to the person's prudence for themselves rather than altruism for their partner. Also, participants' selfishness lends some support to the hypothesis that a fearful expression can show a partner's weakness and thus tempt their opponent to be more selfish. This detrimental effect of looking afraid appears to
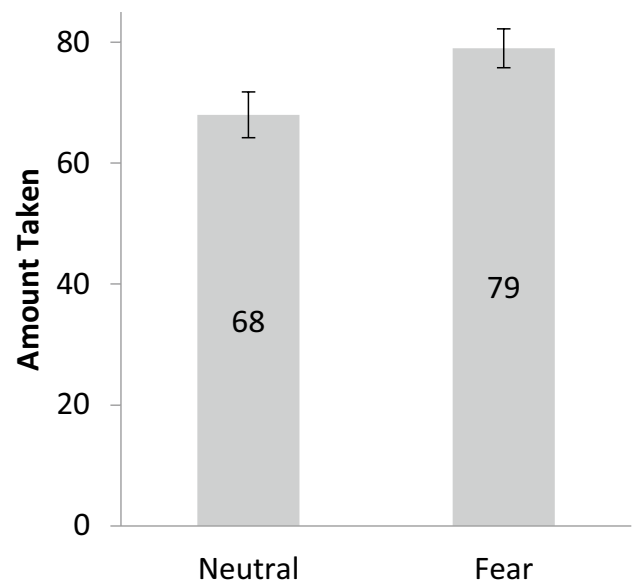

Fig. 5 The amount that the dictator took from their partner. The choices are shown by whether they viewed a partner with a fearful or neutral face. Error bars are standard errors

be more likely when the partners do not have a mutual danger to fear together.

General Discussion

These experiments support the hypothesis that bargainers use fearful expressions to signal mutual danger in order to elicit generosity from their partner. In Experiments 1 and 2, participants were willing to accept lower offers after viewing a partner with a fearful face compared to a neutral face. In Experiment 3, we removed the danger to the participant by allowing them to take money unilaterally from their partner. Now the fearful face made participants more selfish. They chose to take more money from their partner after viewing a fearful face compared to a neutral face. Thus, without a mutual danger, a fearful expression appears more likely to show weakness and elicit selfishness. Taken together, these findings suggest that fearful expressions induce generosity in the face of a mutual danger, which is motivated mainly by prudence rather than altruism.

Generally, these conclusions fit with previous research arguing that emotional expressions function as signals (Dezecache et al., 2013; Fridlund, 1994; McCullough & Reed, 2016). For instance, emotional expressions can credibly signal subjective commitments (R. Frank, 1988; Hirshleifer, 1987; Nesse, 2001). And people can use emotional expressions to add credibility and emphasis to their claims and statements, including expressions of happiness (Brown et al., 2003; Brown & Moore, 2002; Reed

et al., 2012, 2018), sadness (Reed & DeScioli, 2017a), anger (Reed et al., 2014), and fear (Reed & DeScioli, 2017b).

These experiments also add to previous research on facial expressions in bargaining. For instance, a recent study found that responders were less likely to accept offers from a proposer with an angry or disgusted face compared to a neutral expression, while happiness did not differ from neutral (Ferracci et al., 2021). However, another study found that responders were more likely to accept offers from proposers who smiled, suggesting that happy expressions may increase generosity (Mussel et al., 2013). The first study also found that proposers made lower offers when the responder expressed anger or disgust and higher offers when the responder expressed happiness in comparison to a neutral expression (Ferracci et al., 2021). However, another experiment found that proposers give higher offers to an angry responder when the responder makes a doubtful threat that they would reject a generous offer, since the angry face can bolster the threat in this case (Reed et al., 2014).

The present experiments have several limitations that can be addressed in future research. First, we used videos of a single, female actress representing typical partners, which merits cautious generalization until expanded to other people and demographic groups. The use of a female actress may have affected male and female participants differently which can be examined in future research with sufficient sample sizes of each sex. Second, participants viewed a video said to be typical of a participant playing their partner. Future research could examine face-to-face conversations that would allow more nuanced expressions of emotion, as in a few previous studies (Reed et al., 2007, 2012).

In sum, bargainers can use a fearful face to signal mutual danger and thereby make their partner bargain more generously. There may be several practical implications. For example, a fearful face could help a negotiator find common ground in avoiding a harmful impasse. On the other hand, a negotiator who sees a fearful opponent might think twice about conceding too easily, checking first whether the partner is exaggerating the danger. Future research on emotions in bargaining can further examine how useful these suggestions might be.

Declarations

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