



The communication of anger and disappointment helps to establish cooperation through indirect reciprocity

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ABSTRACT

Indirect reciprocity is cooperation through reputation: third parties cooperate with those known to cooperate and defect against those known to defect. Defection, then, can have the unjust motive of greed or the just motive of retaliation. To establish cooperation, observers should distinguish both motives for defection and respond more cooperatively to the latter. We propose that the expression of emotions may facilitate this inferential process. Indeed, in two laboratory studies participants inferred that defection out of anger or disappointment was a just response to a defector and they responded more cooperatively than when no emotion was communicated. Moreover, participants inferred that defectors who evoked disappointment instead of anger had a relatively positive reputation. We conclude that emotions help establish cooperation through indirect reciprocity.

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1. Introduction

Cooperating with others is costly to oneself. That people nevertheless cooperate may have many proximal reasons, from following norms to maintaining one's self-concept or feeling concern for others (e.g., Penner, Dovidio, Piliavin, & Schroeder, 2005), but what likely underlies many of those reasons is reciprocity (Gouldner, 1960; Trivers, 1971). Put simply, people may cooperate because it pays off when reciprocated (Nowak, 2006). This is true when A's cooperation with B is reciprocated by B, but also when C reciprocates A's cooperation. This latter mechanism for cooperation is known as *indirect reciprocity* (Alexander, 1987; Nowak & Sigmund, 2005). But what do third parties have to gain by reciprocating? Presumably, becoming known as a 'cooperator' increases C's chances that B, or others, will in turn cooperate with C. Indirect reciprocity, then, is cooperation through reputation. In this view, a reputation is an aggregated judgment of character based on all available information of someone's cooperation and defection (i.e., non-cooperation) in the past. With every act of cooperation or defection one's reputation is updated, be it through direct observation or gossip. This allows persons with a positive reputation to identify each other and cooperate, even when the beneficiary is unable to reciprocate. Highly cooperative populations can thus emerge.

Crucial to indirect reciprocity is the assessment of a reputation as positive or negative. Such assessment can be as simple as evaluating every cooperation positively and every defection negatively. This so-called 'scoring' strategy does indeed foster cooperation (Nowak & Sigmund, 1998; Wedekind & Milinski, 2000), but not in a stable way (Leimar & Hammerstein, 2001;

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Panchanathan & Boyd, 2003; Sugden, 1986). The problem is that if defection damages one's reputation, one is better off maintaining a positive reputation by always cooperating, even with beneficiaries that have a negative reputation. This is eventually self-defeating. Truly establishing cooperation therefore seems to require a discriminating strategy, one that at the very least acknowledges that defection is more justified against a person with a negative than a positive reputation. Game-theoretically, this works (Ohtsuki & Iwasa, 2004, 2006), but little empirical evidence is found that people indeed discriminate justified from unjustified defection (Bolton, Katok, & Ockenfels, 2005; Milinski, Semmann, Bakker, & Krambeck, 2001).

In this paper we view this discrimination issue from a new angle. Instead of extensively notifying people of who cooperated with whom, we suspected that they might find *emotions* experienced by another when defecting informative to distinguish justified from unjustified defection, the reason being that emotions signal one's intentions and motivations (Keltner & Haidt, 1999). In two experiments we will show in a situation of indirect reciprocity that people signal by expressing anger and disappointment that their defection is justified because it is a response to unjustified defection. Third parties therefore respond more cooperatively than when these emotions are not communicated. Moreover, we will show that the difference between both emotions is that disappointment signals more than anger that a defector's initial reputation was positive (Experiment 2). Expressed emotions may thus present a reconciliation for the theoretically postulated but empirically unverified claim that justified defection is perceived and responded to differently than unjustified defection is.

1.1. The dynamics of indirect reciprocity

Why do third parties so often fail to evaluate defection against a person with a negative reputation as justified and act accordingly? One reason may be the practical complexity of the concept of justified defection (Nowak & Sigmund, 2005; Panchanathan & Boyd, 2003). First, it needs to be known whether the recipient of defection indeed had a negative reputation. This, however, requires knowing the reputations of the recipient's recipients, and the reputations of their recipients, and so on. That may be too much information to process. Indeed, Milinski and colleagues (2001) found that participants responded equally uncooperatively to defection against a person known to have defected every time as to defection against a person whose reputation was unknown. Participants did use more time when more information was provided, but it apparently did not substantially affect their behavior. Admittedly, instead of constructing reputations from scratch with extensive, descriptive information of who cooperated with whom it is cognitively less taxing to merely recollect a reputation from memory and update it with new information. But even then perception errors may occur and incomplete information may impede proper judgment (Milinski et al., 2001).

A second reason why empirical support for justified defection is scarce may be that not reputational information about the recipient of defection but the motive underlying defection is what people attend to when evaluating defection as justified. That the motives for one's actions matter in reciprocity has been proposed long ago (Gouldner, 1960; Nemeth, 1972), has been formalized in various models (Dufwenberg & Kirchsteiger, 2004; Falk & Fischbacher, 2006; Levine, 1998; Rabin, 1993) and has received good empirical support (Blount, 1995; Charness, 2004; Cox, 2004; Falk, Fehr, & Fischbacher, 2008; Offerman, 2002; Tazelaar, Van Lange, & Ouwerkerk, 2004; Van Dijk & Wilke, 1999, but see Bolton, Brandts, & Ockenfels, 1998). Perhaps, then, for defection to be perceived as justified, it needs to be clear that it was not just a greedy action that happened to be committed against someone with a negative reputation, but that it really had the just motive of withholding benefits from a person with a negative reputation. This may explain why Bolton and colleagues (2005) found that participants hardly responded more cooperatively when defection was a response to defection instead of to cooperation, especially because the little information that was provided makes overload unlikely. Knowing *that* defection is committed in response to defection, but not knowing *why* may therefore still lead to little leniency. Note however, that this problem, as well as that of informational overload, would be solved if those committing a justified defection could simply signal this in a reliable way to others.

1.2. Emotions and justified defection

Misinterpretation of justified defection not only damages the reputation of the person who committed it, but also takes away an opportunity for third parties to respond cooperatively. Both those who observe and commit justified defection therefore profit from a reliable way to communicate when defection is justified, so that it is not met with less cooperation. Emotions can fulfil exactly such a communicative function. A social-functional account of emotions (Keltner & Gross, 1999; Keltner & Haidt, 2001; Oatley & Jenkins, 1992) in fact suggests that emotions coordinate social interactions by signaling one's intentions and motivations to others in a way that, compared to language, is relatively involuntary, automatic and therefore fairly reliable (Boone & Buck, 2003; Frank, 1988, 2004; Keltner & Kring, 1998; Nesse, 1990). This does not mean that emotions always represent an entirely infallible way for cooperative people to coordinate their intentions and motivations. Emotions may occasionally be misinterpreted, and defectors with great acting talents may sometimes be mistaken for cooperators (Buller & Burgoon, 1998). However, a social-functional account of emotions does hold that, by and large, emotions have also evolved to help people overcome social challenges, many of which pertain to the problem of cooperation (Bowles & Gintis, 2003; Fessler & Haley, 2003; Keltner, Haidt, & Shiota, 2006). Indeed, that the communication of emotions affects other people's willingness to cooperate has been repeatedly validated, mostly in bargaining studies (for a comprehensive review, see Van Kleef, Van Dijk, Steinel, Harinck, & Van Beest, 2008; see also Pietroni, Van Kleef, De Dreu, & Pagliaro, 2008; Van Kleef & Van Lange, 2008; Van Kleef & De Dreu, 2010).

These studies have all focused on anger, an emotional response to a negative event for which another person is held responsible, such as defection (Smith & Ellsworth, 1985). More specifically, the social function of anger is to rectify injustice (Solomon, 1990), be it through threat, coercion, or retaliation (Canary, Spitzberg, & Semic, 1998). Indeed, a common finding in bargaining studies is that anger signals dissatisfaction with the demands of one's negotiation partner and a resulting unwillingness to make concessions before one's opponent does so. This may indeed induce cooperation, though escalation may also result (Van Kleef & Côté, 2007; Van Dijk, Van Kleef, Steinel, & Van Beest, 2008). The only other emotion that, when directed to another person, is as much as anger a response to a negative event for which another is responsible—even more so than is contempt or disgust (cf. Smith & Ellsworth, 1985)—is disappointment (Van Dijk & Zeelenberg, 2002). Disappointment is an emotional reaction to unfulfilled positive expectations (Van Dijk & Van Harreveld, 2008), such as the other person's decision to defect instead of cooperate. Though less studied in situations characterized by both conflict and mutual dependence (i.e., mixed-motive situations, Schelling, 1960), disappointment appears to address defection at least as effectively as anger does (Lelieveld, Van Dijk, Van Beest, Steinel, & Van Kleef, 2011; Van Kleef, De Dreu, & Manstead, 2006; Van Kleef & Van Lange, 2008; Wubben, De Cremer, & Van Dijk, 2009). Both anger and disappointment, then, signal that dissatisfaction with a recipient's defection is the antecedent of one's own defection, which third parties will therefore be likely to interpret as a justified response to which they will respond cooperatively.

The paper proceeds as follows. In Experiment 1, we will first test whether in a situation of indirect reciprocity the communication of anger and disappointment indeed affects whether defection is seen as justified or unjustified and is responded to accordingly. Assuming that both emotions fulfil this function, one may then wonder how anger and disappointment differ from each other. In Experiment 2, we will therefore not only aim to replicate the results of our first study, but also test when defection elicits anger, it is believed to be committed by someone with a less positive reputation than when defection elicits disappointment.

2. Experiment 1

Before examining in Experiment 1 whether anger and disappointment signal to others that an unjustified defection has been committed, we will first test whether unjustified defection actually elicits anger and disappointment, because otherwise these emotions would be an unlikely signal. Hence our hypothesis that unjustified defection elicits more anger and disappointment in third parties than does justified defection (Hypothesis 1). All our subsequent hypotheses, however, do address what exactly anger and disappointment signal and how they are responded to. More specifically, we predict third parties to infer—more so than in the no-emotion condition—that a person towards whom anger or disappointment is directed, has defected (Hypothesis 2a) and that this defection was unfair or disreputable (Hypothesis 2b). We further expect that an angry or disappointed person that responds to such defection by defecting should then be perceived as a more just and reputable person than when this person's defection would not be justified by any emotion expression (Hypothesis 3). Third parties should then respond more cooperatively to a defection out of anger or disappointment than to a defection without emotion expression (Hypothesis 4). Experiment 1 is thus designed to investigate if anger and disappointment help to distinguish justified from unjustified defection and act accordingly, which would in turn promote stable cooperation through indirect reciprocity.

2.1. Method

2.1.1. Participants and experimental design

Participants were 27 undergraduate students (12 men, 15 women; M age = 21.11) who participated voluntarily and received a show-up fee of €7. They were told in advance that this fee could decrease or increase to €5, €7, €9 or €11, depending on their own and other participants' decisions. In the first part of the experiment (see Fig. 1) we used a within-subject design to manipulate the decision of the person that participants could cooperate with by donating money (cooperated with

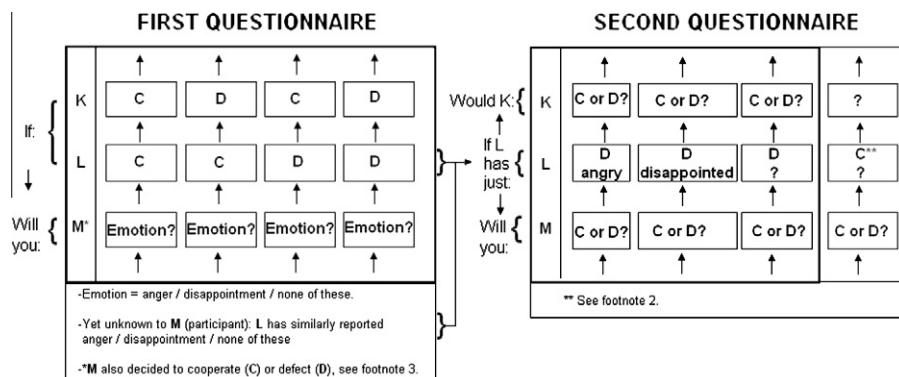


Fig. 1. Summary of the procedure used in Experiment 1. Note: Displays the information participants (M) based their emotional reactions (first questionnaire) and their and person K's (expected) choice behavior on (second questionnaire). Also displays how both questionnaires are yoked.

cooperator vs. cooperated with defector vs. defected against defector vs. defected against cooperator). We measured participants' emotions, as well as their choice behavior, which could afterwards determine their eventual payoff. In the second part of the experiment emotion (disappointment vs. anger vs. no emotion) was the within-subject variable and we measured emotion inferences and choice behavior, which could, again, determine participants' payoff.

2.1.2. Procedure

For this experiment we developed a new paradigm in which participants played for real money and in which full experimental control was maintained over the emotions that were communicated to participants. No deception was used, which renders alternative explanations based on any suspicion of participants unlikely (Hertwig & Ortmann, 2008a, 2008b; Kelman, 1967; MacCoun & Kerr, 1987; Taylor & Shepperd, 1996). Moreover, providing tangible financial incentives makes cooperation truly costly, so that participants make more realistic and less socially desirable choices (Camerer & Hogarth, 1999).

After participants had received their show-up fee and had been seated in separate cubicles, they proceeded with a first questionnaire. They read that they and all other participants would form one long chain, in which each participant could help the previous person and be helped by the next person in the chain¹. For convenience, participants were denoted with the letter M, the previous participant in the chain with L, the participant before that with K, etc. None of these participants were fictional. Help could be given by donating €2 of one's show-up fee to one's recipient. The experimenter would double this amount so that the recipient received €4. This situation allows for cooperation through indirect reciprocity because donating €2 is costly, but if a third party reciprocates this donation, the resulting benefit of €4 outweighs this cost.

To measure participants' emotional reactions to both justified and unjustified defection, we used a variant of the 'strategy method' (Selten, 1967). This method requires participants to specify in advance their response to every possible situation in a game, not just to the specific situation that actually occurs. Complete information about participants' responses can thus be obtained and compared without sacrificing experimental control. Moreover, participants' responses do have real consequences, because their decision for the situation that eventually arises in the game is used to determine their payment. Compared with a method where participants make decisions only for the situation at hand, the strategy method has produced reliable results in the prisoner's dilemma, which is a close derivative of the present paradigm (Brandts & Charness, 2000). Accordingly, participants had to indicate how angry and disappointed they would feel (1 = not at all, 7 = very much) over person L's decision for each of the four possible situations that could emerge: (a) person L helped, but person K had not, (b) person L did not help, but person K had helped (c) both helped and (d) neither helped. Furthermore, for each of these situations they had to select which emotion they would experience most: "disappointment", "anger", or "none of these". For experimental design purposes (see below) we also asked for each situation whether participants would donate €2 of their show-up fee to person L or not. After the experiment, when person L and K's actual decisions were known, participants could be paid accordingly.

Subsequently, the experimenter brought in a second questionnaire. Recall that in the first questionnaire all participants had just indicated which emotion they experienced in each possible scenario right before deciding whether to donate €2 or not. We therefore again applied the strategy method to let all participants decide a second time whether they wanted to help person L, but now based on which emotion person L had indicated to experience. More specifically, participants could choose to donate €2 to person L for all of the following three possible situations: In the first questionnaire person L had chosen not to help person K and felt (a) angry, (b) disappointed or (c) no emotion information was available². These situations were offered in random order. This constituted our emotion manipulation. We also asked how many cents participants would have donated if they could transfer any amount of money from 0 to 200 cents. Because when filling out the first questionnaire, participants did not know that their answer would be communicated to other participants, strategic motives for communicating a specific emotion were out of question. Participants also had to indicate for each of these three possible situations whether they thought person K had helped or not (−7 = definitely not, 0 = no idea, 7 = definitely so) and if person L and K were considered just and fair (1 = totally disagree, 7 = totally agree; for both persons in all three situations each $r > .41$, each $p < .03$).

After having finished both questionnaires, participants were debriefed and paid separately to guarantee their anonymity. The experimenter randomly selected either their monetary decision in the first or second questionnaire to determine the payment. If the first questionnaire was selected, the experimenter looked up if the previous two players in the chain had cooperated or not and checked if the participant had decided to cooperate in that case. If the second questionnaire was selected, the experimenter looked up the communicated emotion and decision of the previous participant in the chain and paid

¹ We initiated the indirect reciprocity chain by having a participant that took part in an unrelated experiment agree to be provided an underpayment of €2 in exchange for the chance that the second person in the chain used the opportunity to help her. This second person took part in the same unrelated experiment, but could donate €2 of his reward to the first person, so that she would get €4. The procedure for the third person was the same as for the second person. The fourth person in the chain was the first participant in our experiment. The last participant in the chain received an overpayment of €3 in an unrelated experiment and was told that this was because he would get the opportunity to help the second last person in the chain by donating €2, which would be doubled to €4. All participants whose data are reported in Experiment 1 were told that they would be inserted in the middle of the chain, so that their help always benefited another participant and another participant always received the opportunity to help them. Participants were encouraged to ask for additional information about the first or last persons in the chain if they deemed this necessary for their decisions, but none did so.

² We also asked whether participants wanted to help if person L had helped and no emotion information was available. Because the hypothetical situation that person L had cooperated instead of defected was irrelevant to our research question about justified and unjustified defection, we included this question only to determine participants' payoffs if the previous participant in the chain had actually cooperated.

Table 1

Means (and standard deviations) of participants' reported emotions by choice behavior of previous participant (L) and the participant before that (K) in the chain (Experiment 1).

Decision K	Decision L	Emotion participant (M)	
		Disappointment	Anger
Cooperate	Cooperate	1.37 _a (0.63)	1.37 _a (0.69)
Defect	Cooperate	2.22 _d (1.67)	1.52 _a (0.98)
Cooperate	Defect	4.44 _c (1.85)	3.07 _d (1.73)
Defect	Defect	3.07 _d (2.13)	2.41 _b (1.61)

Note: Higher scores indicate higher intensities of the reported emotions. Means in the same row or column without identical subscripts differ at $p < .05$.

participants according to their decision. Participants that had cooperated returned €2 from their show-up fee of €7 to the experimenter, who deposited €4 on their recipient's bank account. Finally, participants provided their own bank account number and were thanked for participating.

2.2. Results

2.2.1. Reported emotion³

To analyze if people's reported emotions in the first questionnaire about person L's decision to cooperate or not depended on person K's decision, we conducted a four (recipient's choice behavior) \times two (emotion) repeated-measures ANOVA, with both factors as within-subject variables. As in all similar analyses reported below, we employed a Huynh and Feldt (1976) adjustment to the degrees of freedom to correct for violations of sphericity. This yielded main effects of choice behavior, $F(2.50, 64.93) = 21.18, p < .001, \eta_p^2 = .45$, and emotion, $F(1, 26) = 38.32, p < .001, \eta_p^2 = .60$, which were qualified by a significant choice behavior \times emotion interaction, $F(2.15, 55.79) = 4.93, p < .001, \eta_p^2 = .16$. In line with Hypothesis 1, planned comparisons showed that defection against a cooperator (i.e., unjustified defection) indeed elicited more anger and disappointment than did defection against a defector (i.e., justified defection; $p_{\text{anger}} = .02, p_{\text{disappointment}} = .002$; see Table 1 for all means and standard deviations). Interestingly, the reported intensity of disappointment was even higher than that of anger ($p < .001$). Unjustified defection also elicited more disappointment and anger than did cooperation with a cooperator or cooperation with a defector (all $ps < .001$).

2.2.2. Inferences about person K

Evidently, participants themselves reported feeling angry and disappointed in response to unjustified defection. But, conversely, when another person expresses anger or disappointment, would participants then also infer that an unjustified defection has been committed? A repeated-measures ANOVA with emotion as the within-subject variable indeed showed a main effect on the item measuring person K's inferred choice behavior, $F(1.67, 43.50) = 37.65, p < .001, \eta_p^2 = .59$ (see Table 2). Separate t tests revealed that when person L expressed anger or disappointment over person K's decision, participants were more likely to infer that person K had defected than when no emotion was expressed, $t_{\text{anger}}(26) = -7.23, p < .001$; $t_{\text{disappointment}}(26) = -6.30, p < .001$; see Hypothesis 2a. Another repeated-measures ANOVA on justice judgments showed that participants in the disappointment and anger conditions did not find this supposed defection by person K fair, $F(1.75, 45.38) = 12.37, p < .001, \eta_p^2 = .32$. As separate t tests showed, participants judged person K as less just when anger or disappointment, as opposed to no emotion, was communicated over person K's choice behavior $t_{\text{anger}}(26) = -4.29, p < .001$; $t_{\text{disappointment}}(26) = -2.51, p = .02$; see Hypothesis 2b.

2.2.3. Inferences about person L

Participants in the anger and disappointment conditions thus inferred that person K had committed an unjustified defection. But would they then judge person L's defection against person K as fair? Another repeated-measures ANOVA indicated that participants indeed did so, $F(1.53, 39.71) = 10.34, p < .001, \eta_p^2 = .28$ (see Table 2). In line with Hypothesis 3, person L was seen as more just when expressing anger or disappointment than when expressing no emotion, $t_{\text{anger}}(26) = 3.26, p = .003$; $t_{\text{disappointment}}(26) = 3.65, p = .001$. Additional evidence that emotions justify defection is that person L was seen as quite fair, because one sample t tests showed person L's justice ratings to be above the midpoint of the 7-point scale ($p_{\text{anger}} = .006, p_{\text{disappointment}} = .001$).

³ Monetary decisions in the first part of the experiment were irrelevant to our hypotheses and measured only so that participants could reciprocate real instead of imaginary decisions in the second part of the experiment. Still, readers may be interested to know that our data strongly resembled those of Bolton and colleagues (2005): Cooperation with cooperators was more frequent than with defectors (55.56% vs. 11.11%) and these frequencies were not strongly affected by whether one's recipient cooperated with a cooperator or with a defector (17 out of 27 vs. 13 out of 27 cooperated, $p = .12$, two-tailed) or whether one's recipient defected against a cooperator or defector (1 out of 27 vs. 5 out of 27 cooperated, $p = .12$, two-tailed).

Table 2

Means (and standard deviations) of participants' own cooperation and inferences about persons K and L (Experiment 1).

Dependent variable	Communicated emotion L		
	Disappointment	Anger	No emotion
Inferred cooperation Decision K	−4.66 _a (1.90)	−4.79 _a (1.72)	−1.31 _c (2.13)
Justice perceptions K	3.44 _a (0.86)	2.93 _b (1.24)	3.76 _c (0.91)
Justice perceptions L	4.56 _a (0.80)	4.50 _a (0.87)	3.74 _b (1.04)
Number of €2 donations to L	9/27 _a	8/27 _a	3/27 _b
Donated money to L	67.22 _a (65.26)	68.89 _a (68.00)	36.11 _b (57.38)

Note: Higher scores indicate higher cooperation or inferred cooperation and higher justice ratings. Means in the same row without identical subscripts differ at $p < .05$.

2.2.4. Choice behavior participants

These data support our view that anger and disappointment signal unjustified defection, making that responding with defection is perceived as justified and does not lead to a negative reputation. But do participants actually meet such justified defection with cooperation? Due to the binary, non-independent nature of the cooperation measure, we used General Estimating Equations to obtain an omnibus test of this hypothesis (Diggle, Heagerty, Liang, & Zeger, 2002; Hardin & Hilbe, 2003), which indeed showed a main effect of emotion⁴, $\chi^2(4) = 8.44$, $p = .02$ (see Table 2). Separate one-tailed McNemar tests showed that cooperation was higher in the anger and disappointment conditions than in the no-emotion condition ($p_{\text{disappointment}} = .02$, $p_{\text{anger}} = .03$; see Hypothesis 4). Furthermore, repeated-measures ANOVA showed that emotion also affected cooperation if participants could have donated any amount of money from 0 to 200 cents, $F(2.62, 68.21) = 7.89$, $p < .001$, $\eta_p^2 = .23$. Again, communicated anger and disappointment induced more cooperation than no emotion did ($p_{\text{anger}} = .02$, $p_{\text{disappointment}} = .006$).

2.3. Discussion

Defection can have the unjust motive of selfishly maximizing personal gains or the just motive of withholding benefits from defectors. Distinguishing both motives is necessary to establish cooperation through indirect reciprocity. Experiment 1 showed that anger and disappointment help in making this distinction. These emotions are not only elicited by—but also signal—a previously committed unjustified defection. They communicate that defecting against this unjustified defection has a just motive. Defection out of anger or disappointment is therefore met with more cooperation than when no emotional information is present. Emotions thus seem lubricants of indirect reciprocity. Yet an interesting, unanticipated finding remains. Cooperation with a defector, or 'unjustified cooperation', also elicited disappointment, albeit not as much as unjustified defection did. This suggests that cooperation can occasionally even damage one's reputation. In the general discussion we return to this issue.

Important strengths of the strategy method employed in Experiment 1 are that we used no deception while maintaining full experimental control, even though participants engaged in a social interaction where they could really influence their own and others' monetary outcomes. A possible weakness of this strategy method, however, is that participants made decisions based on how the recipient *might* feel and only later found out how the recipient *really* felt. Although previous research has suggested this is of little concern for the type of paradigm we used (see Brandts and Charness (2000) on the use of the strategy method in prisoner's dilemma settings), we still found it desirable to run a second experiment in a 'hot' situation, where only one emotion was communicated and only one decision had to be made. This has the additional advantage of ruling out any explanations based on comparisons that participants might have made between the different situations that were presented to them in Experiment 1. It also no longer requires participants to report their own emotions before interpreting those of others, thereby ruling out any demand effects.

3. Experiment 2

Besides aiming to replicate the effects of expressed emotion obtained in Experiment 1, we also posed a new question. So far, both anger and disappointment appear to help in distinguishing justified from unjustified defection. How, then, do both emotions differ from each other in indirect reciprocity?

⁴ To test for order-effects of emotion we compared the fit of a model featuring only emotion with three models that also featured the interaction of emotion with the order in which one of three types of emotion feedback was provided. All these models provided a worse fit (all QICCs > 618.29) than the model with only emotion as a predictor (QICC = 532.29). We therefore collapsed choice behavior across order of emotion.

In Experiment 1, participants could choose to cooperate with a recipient that had cooperated or defected only once. In that case, only the perceived justice of this one decision determines the recipient's reputation. But with more information available, reputations can also be based on multiple decisions. Disappointment and anger can then still be reactions to unjustified defection, but perhaps that people with a positive reputation who commit an incidental unjustified defection elicit disappointment in third parties, whereas people with a negative reputation who commit yet another unjustified defection elicit anger.

There is some indirect theoretical support for the idea that anger and disappointment communicate how positive someone's initial reputation was before defecting in a situation of indirect reciprocity. Recall that disappointment is the emotion that occurs if an outcome does not fulfil one's positive expectations (Van Dijk & Van Harreveld, 2008). Consequently, feeling disappointed in someone else should communicate that this person has not lived up to your high expectations or, put differently, to his or her positive reputation (cf. Lelieveld et al., 2011; Timmers, Fischer, & Manstead, 1998; Van Kleef & Van Lange, 2008; Van Kleef et al., 2006; Wubben et al., 2009). Disappointment should therefore also signal to others that a person with a positive initial reputation has committed a transgression such as unjustified defection.

Anger, on the other hand, may be particularly effective in addressing defection from people with a less positive or even a negative reputation. Anger is evoked by a "demeaning offense against me and mine", whereby arbitrary, malevolent and inconsiderate offenses are particularly demeaning (Lazarus, 1991, p. 222). Rectifying such instances of injustice is the function of anger (Solomon, 1990) and this is achieved through threats, coercion and retaliation (Canary et al., 1998; Lerner & Tiedens, 2006). Anger is therefore a strongly interpersonal emotion (Averill, 1983) and its communication can indeed induce cooperation in others, (e.g., Sinaceur & Tiedens, 2006; Van Kleef, De Dreu, & Manstead, 2004), but may backfire as well (Van Dijk et al., 2008; Van Kleef & Côté, 2007). This suggests that communicating anger is quite a risky and drastic strategy that is best reserved for 'serious cases'. Such a case may occur when a person with a negative reputation, in spite of earlier warnings from others, defects yet another time. Anger is therefore an apt response when someone with a negative reputation commits an unjustified defection.

We thus expect that people infer that the initial reputation of a person stooping to unjustified defection was more positive when their interaction partner expresses disappointment relative to anger towards them. We will test this by having the person who expresses anger or disappointment fulfil a different role than in Experiment 1. This person will be an observer who has acquired unique information about the initial reputation of the person that committed an unjustified defection. We will then examine whether participants use the observer's expressed emotion (i.e., anger or disappointment) to infer the defector's initial reputation.

Our remaining hypotheses are similar to those of Experiment 1. Again we predict that emotions signal that one's defection is a justified response to unjustified defection and will therefore be met with more cooperation than when no emotion is communicated. However, in Experiment 2 we aim to replicate this mechanism while placing participants in a different role than in Experiment 1 (see Fig. 2). Although they are again in a position in which we expect them to infer unjustified defection from anger or disappointment that is now expressed by an observer, this time we will test whether they themselves respond to it with justified defection. Moreover, we will examine if the communication of anger and disappointment by this observer leads participants to expect that a third party would respond more favorably to their justified defection than to their cooperation. Again finding evidence for this mechanism but then with participants in a different role and in a 'hotter' situation would attest to the robustness of how emotions help to deal with unjustified defection in indirect reciprocity.

3.1. Method

3.1.1. Participants and experimental design

Participants were 79 undergraduate students (26 men, 53 women; $M_{\text{age}} = 19.86$) who participated voluntarily in exchange for course credits. Participants were randomly assigned to the disappointment, anger, or no-emotion conditions.

3.1.2. Procedure

Participants entering the laboratory were welcomed and seated behind a computer in separate cubicles. We told them they would have to make financial decisions that would affect how many lottery tickets they would receive in a raffle with

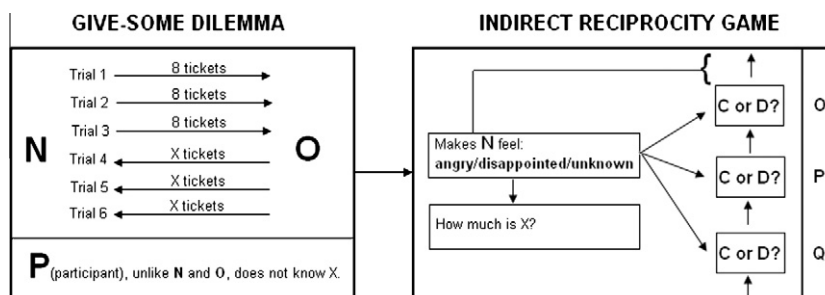


Fig. 2. Summary of the procedure used in Experiment 2. Note: Displays participants' (P) role as observer in the sequential give-some dilemma and their subsequent role and the information they received in the indirect reciprocity game. C stands for Cooperate, D for Defect.

several €10 prizes. Participants could donate up to ten lottery tickets in each trial to other participants, who would then receive twice the number of donated tickets. More tickets meant more chances to win a prize, but we told participants that if other participants earned many tickets too, this would not decrease their own chance to win a prize, but instead increase the number of €10 prizes that would be awarded. As in Experiment 1, this makes cooperation through indirect reciprocity possible, because donating tickets reduces one's chances of winning a prize, but pays off when reciprocated by a third party.

The procedure is summarized in Fig. 2. Participants would again form a chain, but this time anger or disappointment was expressed about the decision of person O, with whom participants could choose to cooperate in an indirect reciprocity paradigm. Moreover, participants were led to believe that the person who expressed this emotion, Person N, had unique information about whether or not person O had cooperated in previous trials.

To make participants believe that person N indeed had unique reputation information about person O, participants were first allegedly at random appointed to the role of observer in a sequential give-some dilemma between person N and O. In this game, Person N would get three opportunities to donate up to ten lottery tickets to person O. Person O would subsequently get three opportunities to donate tickets back to person N. All donated tickets would be doubled. Participants then observed that in each of the first three trials person N donated eight out of ten tickets to person O. How many tickets in each of the following three trials person O subsequently donated back to person N allegedly became known to person N but not to participants. Unlike participants, Person N thus had information about how many lottery tickets person O had donated when given three opportunities to do so previous to person O's decision in the indirect reciprocity chain. We will use this measure of how cooperative person O has been in the past as a measure of reputation (see Alexander, 1987, p. 94).

Thereafter, participants played an indirect reciprocity game. We told them that person O was given another opportunity to donate lottery tickets, this time to another unknown participant from a previous research session. Person O could decide to either donate 0 or 10 tickets and this amount would be doubled. Person N was said to have observed person O's decision. Participants would then get the opportunity to help person O by donating any number of tickets between 0 and 10. Participant Q from a future session would get the opportunity to help the participant.

Subsequently, the emotion manipulation commenced. Person N, who had witnessed all of person O's decisions, would communicate to the participant how he or she felt about person O's decision in the indirect reciprocity game. After a short wait, participants in the anger and disappointment condition were informed that person N felt angry/disappointed about person O's decision. In the no-emotion condition no such information was provided. Next, the dependent variables were measured and finally the participants were debriefed, thanked and paid. One week later the winners of the lottery were announced.

3.1.3. Dependent measures

After the emotion manipulation we asked whether participants thought that person O had decided to cooperate with the previous participant in the chain ($-7 =$ definitely not, $0 =$ no idea, $7 =$ definitely so) and if person O was perceived as just and fair ($1 =$ totally disagree, $7 =$ totally agree; $r = .69$, $p < .001$). Subsequently, we asked participants how many tickets they would want to donate to person O. We also measured if participants believed that person Q would help them in case they would have donated 0 tickets and in case they would have donated 10 tickets ($1 =$ totally disagree, $7 =$ totally agree). For both questions participants had to assume that person Q had the same information about person N and O as they had themselves. Thus we could measure expectations of future cooperation while controlling for participants' actual donations. Next, we measured how positive, according to participants, the reputation was that person O had obtained in the first part of the experiment, as measured by how cooperative person O had been when repeatedly having the opportunity to donate lottery tickets. We therefore asked how many lottery tickets participants thought that person O had donated back to person N in trials four, five and six during the first task ($\alpha = .93$). Finally, we administered two manipulation checks by asking to what extent person N felt disappointed and angry about person O's decision towards the participant from the previous session.

3.2. Results

3.2.1. Manipulation checks

If our emotion manipulation was successful we should find an interaction between the emotion that was communicated and participants' perceptions of the emotion that was communicated. That is, participants should fill out higher scores for the emotion that person N did—versus did not—communicate (a within-participants check) and reported disappointment should be highest in the disappointment condition whereas reported anger should be highest in the anger condition (a between-participants check). A three (emotion: disappointment vs. anger vs. no emotion) \times two (item: disappointment vs. anger) indeed yielded this interaction, $F(2, 73) = 23.36$, $p < .001$, $\eta_p^2 = .39$. Planned comparisons showed that participants in the anger condition rated person N as angrier ($M = 5.58$) than did participants in the disappointment ($M = 3.54$, $p < .001$) or no-emotion condition ($M = 3.41$, $p < .001$). Also, participants in the disappointment condition rated person N as more disappointed ($M = 5.50$) than did participants in the no-emotion condition ($M = 3.85$, $p < .001$). The difference between the disappointment rating in the disappointment and anger conditions was marginally significant ($M_{\text{disappointment}} = 5.52$, $M_{\text{anger}} = 5.03$, $p = .089$). Furthermore, paired-sample t tests revealed that participants in the disappointment condition rated person N as significantly more disappointed than angry ($p < .001$) and that participants in the anger condition rated person N as significantly more angry than disappointed ($p = .02$).

Table 3

Means (and standard deviations) of inferences about person O, participants' own cooperation and expected cooperation from the next person in the chain (Experiment 2).

Dependent variable	Expressed emotion		
	Disappointment	Anger	No emotion
Inferred cooperation person O	−3.44 _a (2.40)	−3.33 _a (2.75)	3.41 _c (2.62)
Justice perceptions of person O	3.12 _a (0.85)	3.22 _a (0.81)	4.10 _b (0.45)
Donated lottery tickets by participant	5.72 _a (2.35)	5.75 _a (2.66)	7.19 _b (2.09)
Expected cooperation when donating 10 tickets	5.20 _a (1.12)	4.83 _a (1.43)	5.90 _b (0.60)
Expected cooperation when donating 0 tickets	2.84 _a (1.43)	3.33 _a (1.69)	2.63 _a (1.86)
Reputation person O	18.21 _a (5.59)	14.83 _b (7.87)	22.85 _c (3.50)

Note: Higher scores indicate higher cooperation, reputation and justice ratings. Means in the same row without identical subscripts differ at $p < .05$.

3.2.2. Cooperation and emotion inferences

Did anger and disappointment signal unjustified defection? A one-way ANOVA showed that they did, $F(2, 73) = 59.88$, $p < .001$, $\eta^2 = .62$ (for all means and standard deviations of Experiment 2, see Table 3). According to post hoc tests, participants estimated it less likely that person O had cooperated when disappointment or anger rather than no emotion was communicated (both $ps < .001$). That scores in the anger and disappointment conditions deviated from the midpoint of the scale ($t_{\text{anger}[24]} = -7.17$, $t_{\text{disappointment}[23]} = -5.95$, both $ps < .001$) is additional evidence that participants inferred defection. Moreover, a one-way ANOVA on justice judgments showed the same pattern, $F(2, 73) = 14.46$, $p < .001$, $\eta^2 = .28$. Person O was perceived as less fair when anger or disappointment were communicated ($M_{\text{disappointment}} = 3.12$, $M_{\text{anger}} = 3.22$) as opposed to no emotion ($M = 4.10$, both $ps < .001$), thereby indicating that person O's defection was unjustified.

Did participants respond to this unjustified defection by defecting themselves? A one-way ANOVA indeed showed a main effect of emotion, $F(2, 73) = 3.26$, $p = .04$, $\eta^2 = .08$. Post-hoc tests revealed that communicated disappointment and anger over person O's decision led participants to cooperate less with this person than when no emotion was communicated (both $ps = .03$). Hence, participants responded to communicated anger and disappointment with defection.

Finally, when comparing the anger and disappointment conditions to the no-emotion condition, participants should expect a response from their future donor that should make defection compared to cooperation more attractive. A three (emotion) \times two (participants' decision: cooperation vs. defection) mixed-model ANOVA indeed yielded this interaction, $F(2, 73) = 4.05$, $p = .01$, $\eta_p^2 = .12$. Interestingly, simple-effect analyses showed that participants' justified defection seemed not so much encouraged by their expectation of a cooperative response ($F[2, 73] = 1.16$, $p = .32$) but rather by their expectation of a relatively uncooperative response if they would have cooperated, $F(2, 73) = 6.40$, $p = .003$, $\eta^2 = .15$. Accordingly, post hoc tests showed that when anger or disappointment was communicated, participants expected their cooperation to be met with less cooperation than when no emotion was communicated ($p_{\text{anger}} = .001$, $p_{\text{disappointment}} = .02$). Thus, when deciding how to respond to unjustified defection, communicated anger and disappointment make the option of cooperation less attractive and as such encourage justified defection.

Experiment 2 has thus far provided additional evidence for every hypothesis tested in Experiment 1. To examine the additional hypothesis that disappointment communicates a more positive initial reputation than anger does, we conducted a one-way ANOVA on the number of lottery tickets that participants believed person O had donated in the first part of the experiment. This yielded a main effect of emotion, $F(2, 73) = 12.13$, $p < .001$, $\eta^2 = .25$. Post-hoc tests revealed that participants inferred more lottery tickets were donated and thus person O's initial reputation was more positive when disappointment ($M = 18.21$) versus anger ($M = 14.83$) was communicated, $p = .047$. Furthermore, when no emotion was communicated such that participants had no reason to assume defection in the first place, person O's inferred initial reputation was higher ($M = 22.85$) than when anger or disappointment was communicated ($p_{\text{anger}} < .001$, $p_{\text{disappointment}} = .003$).

4. General discussion

Our studies support the central hypothesis that the display of emotions allows people to distinguish when defection is justified and unjustified in indirect reciprocity and act accordingly. When anger or disappointment was communicated, people tended to (a) infer that an unjustified defection had been committed, (b) retaliate against this defector by defecting, and (c) respond cooperatively to such justified defection. Moreover, compared to when anger was communicated, people inferred from disappointment that defection has been committed by someone with a positive reputation. Our results thus

show that emotions function as lubricants of indirect reciprocity, allowing people to assess, communicate and act upon the reputations of others. Below, we will further outline and elaborate on our findings and subsequently discuss contributions and implications of our research, as well as possible limitations and avenues for future research.

Examining whether anger and disappointment signal to other third parties that a defection is unjustified only makes sense if third parties themselves actually experience anger and disappointment when witnessing unjustified defection. This is indeed what Experiment 1 showed: Although justified defection did elicit some anger and disappointment, unjustified defection elicited significantly more intense anger and disappointment. Both emotions thus help substantially, albeit not perfectly, in identifying whether defection is justified or not. Do they then also signal this to other people?

Experiments 1 and 2 showed that anger and disappointment indeed also fulfil an important communicative and regulatory function in indirect reciprocity. First, people inferred from communicated anger and disappointment that a defection had been committed and that this was unjustified. Second, people tended to retaliate against such unjustified defection by defecting themselves (Experiment 2) and evaluated it as justified when another person retaliated by defecting (Experiment 1). Finally, people tended to respond to such retaliatory, justified defection with an equally just response: cooperation (Experiment 1). Anger and disappointment, then, signal who defected and why, so that unjust motives can be met with defection and just motives with cooperation. Observers of these emotions may do this themselves, as our experiments showed, but another possibility is that emotions affect the subsequent gossip that observers disseminate (e.g., Sommerfeld, Krambeck, & Milinski, 2008). Such gossip may consist of informing others that an observed defection was motivated by anger or disappointment. These others may then decide for themselves whether such defection was justified or not and respond accordingly. But even when emotions are not mentioned so explicitly in subsequent gossip, they still affect observers' judgments and therefore probably also the contents of their gossip about whether or not defection was justified. Emotions of defectors may even affect the emotions that observers themselves express when gossiping (Baumeister, Zhang, & Vohs, 2004). Thus, emotions help observers to distinguish justified and unjustified defection, so they can respond accordingly themselves, or perhaps even encourage others to do so by spreading gossip.

Why at least two separate emotions deal with defection in indirect reciprocity was shown in Experiment 2. We proposed that when people with a negative reputation defect yet again, a forceful, antagonistic response like anger may be required, whereas people with a positive reputation may only need to hear that they did not live up to their precious reputation, as signaled by disappointment. Accordingly, people inferred that a defector had a more positive initial reputation when disappointment as opposed to anger was communicated. The previous findings that people who express disappointment instead of anger are perceived to be more prosocially motivated and forgiving rather than retaliatory (Wubben et al., 2009) also follow from the idea that disappointed people still envision their interaction partner as relatively valuable, reputable and worthy of future cooperation.

We also obtained an interesting finding that we did not specifically predict: People cared about unjustified cooperation, too. In Experiment 1, cooperation with a defector elicited mild disappointment and in Experiment 2 people feared they would be defected against if they would cooperate with a defector. These findings are not unprecedented in indirect reciprocity theory, though, which has even identified conditions under which defection in response to unjustified cooperation can be an established norm that promotes cooperation (Nowak & Sigmund, 2005; Ohtsuki & Iwasa, 2004, 2006). Overall, though, participants seemed more preoccupied with whether defection, rather than cooperation, was justified. In Experiment 1, unjustified defection elicited more anger and disappointment than unjustified cooperation did. In Experiment 2 participants explicitly identified anger and disappointment as signs of unjustified defection and not of unjustified cooperation.

Defection against unjustified cooperation might thus be justifiable, but such a norm does not prove as widespread as refusal to cooperate with defectors.

4.1. Implications and contributions

Economists, evolutionary biologists and game theorists have yielded convincing theoretical evidence that stable cooperation through indirect reciprocity requires people to distinguish justified from unjustified defection (Leimar & Hammerstein, 2001; Ohtsuki & Iwasa, 2004, 2006). Yet people fail to do so when provided with descriptive information of who has previously defected against whom (Bolton et al., 2005; Milinski et al., 2001). We proposed that from behavioral information alone it cannot be definitively concluded whether a defection is motivated by greed or retaliation and showed that emotions may provide the motivational information necessary to infer whether or not defection was justified. This importance of perceived underlying motives invites further psychological study, which may elucidate which specific input people need in which situations and how they process it. The resulting focus on, among other things, lie-detection, perspective-taking, gossip and morality may help solve the interdisciplinary puzzle of cooperation through indirect reciprocity.

Morality is especially interesting when studying emotions in indirect reciprocity. In our experiments, both anger and disappointment (a) were elicited by defection that harmed only the interests of *other* people and (b) seemed to motivate prosocial action to address such defection. These characteristics are respectively called disinterested elicitors and prosocial action tendencies and are the two defining features of moral emotions (Haidt, 2003). In our experiments, anger and disappointment thus qualify as moral emotions. That is not to say they do not also surface readily in nonmoral situations (e.g., losing a match), but it does seem accurate to say that in indirect reciprocity moral emotions, rather than emotions per se, are important lubricants.

Anger belongs to the subcategory of *other-condemning* moral emotions which governs those moral emotions that uphold the moral order against transgressions from others (Haidt, 2003). Disappointment, however, has to our knowledge never been studied from a moral perspective. Yet our findings show that disappointment is just as much an other-condemning moral emotion as anger is—its communication motivated justified defection and in response to unjustified defection disappointment was even reported at higher intensities than anger. The question then is how disappointment fits in with the other three emotions that belong to the category of other-condemning moral emotions: contempt, anger and disgust (Haidt, 2003). Rozin, Lowery, Imada, and Haidt (1999) have presented evidence that these three emotions map cleanly onto three different moral domains: Community, Autonomy and Divinity. Consequently, violations of communal codes elicit contempt, violations of individual rights elicit anger and violations of purity or sanctity elicit disgust. Should this so-called *CAD-hypothesis* be extended with a fourth domain to accommodate disappointment? We believe not. Disappointment is an emotional reaction to any type of unfulfilled positive expectations (Van Dijk & Van Harreveld, 2008) and therefore not specific to any moral domain. A minor moral violation by someone with a positive reputation in one of the three domains may then be satisfactorily addressed with disappointment. Community, autonomy or divinity violations by frequent defectors can then, as the CAD-hypothesis states, be met with, respectively, the more drastic moral emotions of contempt, anger, or disgust.

Justified defection bears some similarity to altruistic punishment, which occurs when actors penalize (uncooperative) behavior of others at a cost to themselves (Fehr & Fischbacher, 2003; Fehr & Gächter, 2002). Both encourage cooperation, but differ in that justified defection is not costly and merely withholds benefits from others instead of actively imposing costs. Still, it is suggested that altruistic punishment, like justified defection, is often motivated by negative emotions such as anger (Bosman & Van Winden, 2002; de Quervain et al., 2004; Sanfey, Rilling, Aronson, Nystrom, & Cohen, 2003). Yet whether disappointment, too, may motivate altruistic punishment has to our knowledge never been tested. Admittedly, disappointment lacks the clear, retributive action tendencies that anger does have (Frijda, 1986) and may therefore be more successful in motivating justified defection than altruistic punishment. But it should still be considered as a mechanism for the punishment of a regular cooperator that has committed an incidental defection.

4.2. Possible limitations and future research

Before closing with some avenues for future research, we wish to discuss the fact that we decided not to use face-to-face interaction. We decided against such a procedure to maintain full experimental control, thus increasing our confidence in a causal link between the communication of emotions and cooperation in indirect reciprocity. However, due to the absence of face-to-face interaction caution is advised when generalizing these results. This is less of a concern for indirect reciprocity in situations such as internet business or shift work (Dellarocas, 2003), where emotions and other information is typically not expressed face-to-face, but through similar media as used in our experiments, such as e-mail, short message services (SMS), web logs and letters (Ling, 2008; McGrath & Hollingshead, 1994; Solove, 2007). However, for situations of indirect reciprocity with face-to-face interaction only indirect evidence is available that our experimental procedure produces comparable findings to experimental procedures where emotions are communicated non-verbally (Pietroni et al., 2008, see also Van Kleef et al., 2009) or in face-to-face settings (Sinaceur & Tiedens, 2006). Future research in a more natural setting is therefore required to warrant the external validity of our findings.

Avenues for follow-up research also readily present themselves. Emotions communicate whose reputations are positive and negative and how the latest events changed them. A reasonable hypothesis would then be that emotion intensity signals the magnitude of this change and that a change in an intermediate reputation elicits a mixed emotion of anger and disappointment. Emotional information may even lead to a reinterpretation of someone's motives for previous defections. Furthermore, given that the other-condemning moral emotions anger and disappointment affect reputations negatively, it would be interesting to investigate whether other-praising moral emotions such as gratitude, admiration and elevation then affect reputations positively (cf. Algoe & Haidt, 2009; Haidt, 2003). Similarly, contempt—and not anger or disappointment—may signal the presence of people that keep defecting, regardless of retaliation, and that are therefore best excluded before they further undermine the community (cf. Fischer & Roseman, 2007; Rozin et al., 1999). Also worthy of investigation is how reliably anger and disappointment help distinguish between justified and unjustified defection when, unlike in our experiments, emotion communication can potentially be strategic instead of only truthful. Answers to these questions may shed further light on perhaps the most important mechanism for cooperation: indirect reciprocity.

5. Conclusion

Indirect reciprocity can establish cooperation. Evolutionary game theory proves this and everyday observation verifies it. Now it is up to the social sciences to solve the puzzles that separate both extremes. We embarked on this undertaking by showing how people manage to defect against defectors without unleashing a chain reaction of defection. For this it has to be clear not only *that* one has defected, but also *why*. Emotions neatly signal such intentions. As a result, justified and unjustified defections can be distinguished, reputations reassessed and decisions to cooperate reconsidered. Thus, emotions appear important lubricants of indirect reciprocity: they allow just motives to be reciprocated with cooperation and unjust motives with defection.

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