When the selfish suffer: evidence for selective prosocial emotional and physiological responses to suffering egoists

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A B S T R A C T

Prosociality is fundamental to social relationships, but providing it indiscriminately risks exploitation by egoists. Past work demonstrates that individuals avoid these risks through a more selective form of prosociality, cooperating less and sharing fewer resources with egoists (e.g., Axelrod & Hamilton, 1981). The evolution of cooperation. Science, 211(4489), 1390–1396). We extend this work to explore whether individuals experience reduced prosocial affective and physiological responses to egoists in situations where they are suffering. In two studies, participants learned of a target’s egoistic or non-egoistic traits, and then encountered the target suffering. Suffering egoists evoked less compassion in others than non-egoists and elicited physiological responses that diverged from patterns associated with compassion and social engagement (reduced heart rate and greater respiratory sinus arrhythmia activity). Participants’ feelings of distrust toward egoists explained these attenuated emotional and physiological responses. These results build upon studies of prosocial behavior by suggesting that individuals experience reduced prosocial emotional and physiological responses toward suffering egoists.

1. Introduction

Individuals who are indiscriminately prosocial risk being exploited by egoists, who reliably focus on maximizing positive outcomes for themselves without regard to the needs of others (Van Lange, Otten, De Bruin, & Joireman, 1997). Given the costs and risks of exploitation, it has been argued that for prosocial tendencies to have evolved and persisted as a stable strategy, they need to be bounded by considerations of the person in need, and in particular that individual’s likelihood of future cooperation (e.g., Axelrod & Hamilton, 1981). Evidence in support of this claim finds that people can readily detect the egoistic tendencies of others and modify their behavior by cooperating less and sharing fewer resources with them (e.g., Brown, Palameta, & Moore, 2003). These findings complement emergent work on indirect reciprocity, which suggests that individuals use reputational information about how prosocial someone has been in past interactions with others when deciding whether or not to cooperate with that person (Nowak & Sigmund, 2005). Even prosocially minded individuals will defect in a social dilemma when paired with a person who has displayed egoistic tendencies toward others in the past. This more selective form of prosociality appears to be fundamental, emerging early in human development. Children as young as three months show a preference for prosocial over antisocial individuals (Hamlin, Wynn, & Bloom, 2010) and by three years of age children tend to refrain from helping those who had previously harmed another person (Vaish, Carpenter, & Tomasello, 2010).

Guided by a social functionalist approach to emotions, we extend the theoretical and empirical work on selective prosociality to the realm of affective experience and physiology. We hypothesize that individuals who learn a person has egoistic qualities will experience less compassion, and show attenuated physiological responses thought to be associated with compassion, when they witness that person suffer. We focus on contexts where another is suffering because such situations typically evoke strong affective responses in others and represent a critical opportunity for prosocial responding. We measure compassion using self-reports and two physiological measures, heart rate and respiratory sinus arrhythmia, which have been associated with the experience of compassion and social engagement.

1.1. Attenuated compassion for suffering egoists

Within the social-functionalist framework, it is posited that emotions evolved to serve particular functions that enhance the likelihood of reproduction and survival (Keltner & Haidt, 2001; Niedenthal & Brauer, 2012). To achieve this end, emotions coordinate independent systems, such as peripheral physiology, attention, and memory, to prioritize adaptive behaviors and strategic decision-
making (Cosmides & Tooby, 2000; Loewenstein & Lerner, 2003). Here we focus on compassion, which typically motivates prosocial behavior such as caretaking, support-giving, and helping (e.g. Eisenberg & Miller, 1987).

Compassion is defined as feeling sorrow or concern for someone who is suffering, coupled with the desire to alleviate that suffering (Eisenberg et al., 1994). Theorists contend that compassion originally evolved to encourage caretaking behaviors towards vulnerable offspring (Hrdy, 1999; Goetz, Keltner, & Simon-Thomas, 2010). Later, the propensity to experience compassion extended beyond the bounds of kinship, promoting altruistic behavior, which facilitated the formation of long-term, reciprocally beneficial relationships (Trivers, 1971). A meta-analysis supports this claim, revealing that compassion and compassion-related emotions reliably promote prosocial behavior towards those in need (Eisenberg & Miller, 1987). For instance, reports of sympathy after watching a video of a woman in a car accident predicted willingness to volunteer hours to help that woman (Eisenberg et al., 1989). Inducing compassion for others also increases levels of cooperation in economic games (Batson & Moran, 1999). Empathic concern, which is akin to compassion, features prominently in Batson’s empathy–altruism model (Batson, Duncan, Ackerman, Buckley, & Birch, 1981). In relevant research, participants who felt greater compassion were more willing to trade places with a confederate who was receiving painful shocks even when escape from the situation was relatively easy.1 Compassion predicts a more genuine form of altruism motivated by the desire to reduce another’s suffering, which cannot be explained by more egoistic motivations such as a desire to reduce one’s own distress (Batson, O’Quin, Fultz, Vanderplas, & ISEN, 1983), receive benefits, or avoid punishment for not helping (Batson et al., 1988). Overall, then, such work suggests that the experience of compassion increases the likelihood of prosocial behavior toward individuals in need.

An affective approach to evolutionary game theory would suggest that egoists may be able to exploit others through several means, including eliciting compassion (Axelrod & Hamilton, 1981). The risks of exploitation would be reduced, however, if affective responses to suffering, such as compassion were contingent upon the prosocial tendencies of the person in need. Initial evidence supports this claim. Male participants who were personally exploited in an economic game showed reduced activation in empathy-related neural networks when they later saw the culprit in pain (Singer et al., 2006). In this way a bounded affective response to suffering could be an important component of a selectively prosocial strategy. Given this reasoning and select empirical evidence, we predict that individuals will experience reduced compassion towards a suffering egoist compared to a cooperater.

1. Differential physiological responding to egoists

In the present investigation, alongside self-report measures we also gather measures of two peripheral physiological responses, heart rate (HR) and respiratory sinus arrhythmia (RSA). Peripheral physiological changes covary with episodes of specific emotions (for recent review, see Keltner, Oatley, & Jenkins, 2013). They are less subject to conscious control than subjective experiences, and less vulnerable to self-report biases. Self-reports of compassion, in particular, are susceptible to social-desirability concerns and demand effects. In addition, researchers tend to measure self-reported emotions after the presentation of a stimulus, which makes such reports vulnerable to biases such as duration neglect and over-

1 We use the term compassion rather than empathy for a few reasons. Empathy is defined as the ability to see the perspective of others and share their emotions, whereas compassion is a complementary emotional response to another’s suffering. Compassion fits the criteria for a discrete emotion, unlike empathy (Ekman, 1992), and is elicited solely by suffering, whereas empathy can be felt in response to a variety of states that others experience (e.g. joy). We do believe compassion, sympathy, and empathic concern represent the same construct and use the terms interchangeably.

emphasis on the peak emotional moments as well as the end of the emotional experience (Fredrickson & Kahneman, 1993). In contrast, physiological responses are collected continuously during the experience of the emotion. Thus, including peripheral physiological responses helps avoid the potential biases of self-reports.

Within the study of prosocial behavior, there is increasing evidence suggesting that compassionate responses to suffering covary with a particular pattern of peripheral physiological activity. Specifically, studies find that the experience of compassion in response to witnessing another person suffer is reflected in slowing of HR, which also predicts downstream helping behavior (e.g. Eisenberg et al., 1989; Stellar, Manzo, Kraus, & Keltner, 2012). Recent research has established that HR deceleration differentiates between more or less compassionate responses to suffering, with greater self-reported compassion associated with greater slowing of HR (Stellar et al., 2012).

Additionally, emergent evidence suggests that the vagus nerve, a branch of the parasympathetic autonomic nervous system, may show greater activation during compassionate responses to others’ suffering (e.g. Fabes, Eisenberg, Karbon, Troyer, & Switzer, 1994). The vagus nerve is the 10th cranial nerve and projects to certain skeletal muscles, organs involved in digestion, and most importantly, to the heart where it helps determine heart rate (Bernston, Cacioppo, & Quigley, 1993). Increases in activation of the vagus nerve slow the heart and decreases in activation speed it up. Although not definitive, this relationship suggests that decreases in heart rate may indicate increased vagus nerve activity. Researchers use a non-invasive index, called RSA to assess vagal activity. RSA combines two principles: 1) inhalation temporarily suppresses vagal activity and exhalation allows for vagus nerve to regain control; 2) heart rate slows with greater vagal activation and speeds up with lower vagal activation. As a result greater RSA, or variability in heart rate due to respiration, is thought to index greater vagal activation, while lower RSA indexes reduced vagal activation.

Empirical work links greater vagus nerve activity to traits associated with compassion and social connection as well as the experience of prosocial states. Resting vagal tone is correlated with agreeableness, a facet of personality associated with a tendency to be compassionate and cooperative (Oveis et al., 2009), and a broader prosocial disposition in a sample of boys (Eisenberg et al., 1996). Vulnerabilities characterized by reduced social connection and empathy, such as autism, are associated with lower baseline RSA compared to normal populations (Ming, Julu, Brimacombe, Connor, & Daniels, 2005). In a recent study, adults with high baseline levels of RSA reported greater feelings of connection to others and increases in baseline RSA over time covaried with increases in reported social connection (Kok & Fredrickson, 2010).

Evidence that vagal activation relates specifically to the experience of compassion is mounting. For instance, children with high baseline RSA exposed to the crying of an infant were more likely to talk to that infant and offer help (Fabes et al., 1994). In a series of four studies, Stellar and Keltner (2013) show that the experience of compassion reliably elicits greater vagal activity compared to other positive emotions. In light of these empirical advances, we expect egoists to evoke reduced levels of compassion-related physiological responses (i.e. smaller decreases in HR and lower RSA activity for egoists) compared to cooperators.

1.3. Mediating role of distrust and anger

In the present investigation, we seek to explain why egoists evoke reduced compassion and prosocial physiological responses in others. To do so, we focus on distrust and anger, two states associated with less cooperative, more antagonistic behavior (e.g. Fehr & Gächter, 2002; Feinberg, Willer, & Keltner, 2012). We expect that distrust and anger will explain why individuals demonstrate decreased compassionate responding for suffering egoists. Our reasoning is based on two lines of evidence.
First, it has been argued that trust felt between individuals increases the likelihood of prosocial behavior (Zak, Stanton, & Ahmadi, 2007). Distrust, within this conceptual analysis, reduces the willingness for individuals to behave prosocially towards others. For example, in a trust game, participants were willing to invest significantly less when they perceived an individual to be less trustworthy and prosocial (Feinberg et al., 2012). Still other studies find that once an egoist’s reputation is established, participants are less inclined to trust him or her, even when the egoist’s behavior in a repeated economic game suggests no selfish tendencies (Delgado, Frank, & Phelps, 2005). In contrast, when individuals recognize others as trustworthy they are more likely to initiate cooperative relationships with them and select them as partners in social dilemma situations (Barclay & Willer, 2007; Kogan et al., 2011) Along those lines, participants who perceived a partner to be prosocial after a short conversation were more likely to cooperate with that person in a one-shot prisoner’s dilemma game (Frank, Gilovich, & Regan, 1993).

Egoists also evoke anger and hostility in others. Steinel and Dreu (2004) found that when participants were paired with an egoist, they were more likely to withhold accurate information and provided inaccurate information to their partner that could be damaging to their partner’s outcomes. Individuals also financially and socially punish egoistic others, even if the egoist’s behavior did not directly impact them (e.g. Fehr & Gächter, 2002). When an egoist is seen suffering it may even induce pleasure in others, a response known as schadenfreude. Male participants who were cheated by their partner in an economic game showed increased activation in reward regions of the brain (nucleus accumbens) when their partner was later seen in pain (Singer et al., 2006). Given these findings, we test the prediction that distrust and anger felt towards egoists will mediate the relationship between exposure to egoists and reduced compassion to their suffering.

1.4. Present research

In the present investigation we hypothesized that compared to cooperators, egoists who suffer would evoke reduced feelings of compassion and attenuated prosocial physiological responses, and that these responses would be mediated by greater feelings of distrust and anger toward egoists. Two studies tested these hypotheses. Participants interacted with either an egoistic, cooperative, or control target who disclosed a time of suffering, the death of a grandparent (Study 1) or the death of a family pet (Study 2). In Study 1 we measured HR and RSA, and in Study 2 we measured HR. Additionally, in Study 2 after participants learned of their partner’s egoistic or cooperative qualities, but before they viewed that person suffer, we collected measures of distrust and anger to test if these measures might mediate participant’s emotional and physiological responses.

2. Experiments 1–2

2.1. Experiment 1

2.1.1. Method

Ninety participants (41 male, 47 female, 2 declined to answer) from a west coast university took part in this study. Participants were given credit for a psychology class for their participation.

Participants were brought into the experiment room with one chair in front of a computer. They were connected to the MP 150 data acquisition and analysis systems (Biopac systems, Inc.). Electrocardiogram recordings were sampled with leads placed on the abdomen on the right and left side in a modified Lead II configuration with a 35 Hz filter. Expansion of the thoracic region during inhalation and exhalation was measured by placing a respiratory effort transducer on participant’s abdomen (TSD201, by Biopac Systems, Inc.), which enabled us to calculate RSA.

After completing demographics surveys participants took part in a 1.5 min paced breathing task to obtain a physiological baseline. This period is greater than the minimum duration required to assess RSA and is short enough that it allows us to assess rapid responses that define emotional experience (Ekman, 1992; Berntson et al., 1997). Participants closed their eyes and followed the rising and falling of a tone with their breathing, which standardized breathing (Grossman, Stemmler, & Meinhardt, 1990). Participants were then told that they would receive a response written by a previous participant about one of three possible topics: dating and romantic partners, relationships with family, or working with strangers. In reality, participants were always given the response about working with strangers, which was prewritten to include either egoistic or cooperative qualities. After reading the response, participants were told they would watch a video of that same individual talk about a life event. Participants were shown a three minute scripted story where a confederate discussed the death of his or her grandparent. Participants then reported how much they felt a variety of emotions. After a suspicion check participants were debriefed and released.

2.1.2. Materials

The prewritten responses of the individuals in the videos were approximately one paragraph and exhibited egoistic or cooperative qualities. They were handwritten and scanned into the computer. Excerpts include:

Egoist: “There was this one time in a group when I was presenting and the teacher loved our idea. After class I told her it was my idea. I mean it was the whole group’s, but I knew no one would find out. I ended up getting a better grade than any of them on the project. You have to look out for yourself not others.”

Cooperator: “Once I was in a group and I thought I had this great idea and when we decided to pick out what we were going to do the group didn’t choose my idea…Other people bring different points of view. You just have to recognize that you are stronger as a group than you are by yourself.”

Confederates in the video were undergraduate research assistants. They memorized scripts that included cues meant to elicit compassion such as their feelings of loss and regret associated with grieving over their grandfather’s death.

2.1.3. Measures

Participants rated the emotions they felt towards the sufferer after watching the video. Compassion was embedded among twelve other emotions in order to make our target emotion less salient. Participants reported their enthusiasm/excitement, afraid/scared, frustrated, surprised/shocked, trust, contempt/disdain, angry, interested/curious, annoyed, disgusted/revolted, distressed, inspired/impressed on a 10-point Likert scale from 1 (I do not feel this at all) to 10 (I feel this as much as I’ve ever felt).

Continuous physiological measures were averaged to create scores for the 1.5 min of the baseline and the three minutes of the compassion induction. Direct second-by-second ECG readings were transformed into a continuous measure of HR through the analysis system of the Biopac program. In addition, HR data for the first thirty seconds of the time spent reading the egoist or cooperative teamwork response were calculated. Artifacts in the HR, errors that occurred in the data for reasons unrelated to the experiment such as coughing or sneezing, were corrected or interpolated by taking the average time (in milliseconds) between the previous and subsequent heart beat and inserting an artificial R-spike in the ECG channel. This procedure was used in less than five percent of files.

Respiration data were filtered directly as it was being recorded with a low pass filter of .05 Hz and high pass filter of 1 Hz. A continuous
measure of respiration rate was then obtained by transforming the data through the Biopac data acquisition program. The respiration rate was then averaged over the 1.5 min of baseline and the 3-min compassion induction to produce a single score. We used CMet Software to calculate RSA, which takes a series of inter-beat intervals and filters it in the high frequency band (0.12–0.40 Hz; Allen, Chambers, & Towers, 2007). We chose this program because it is a validated analysis of RSA, which correlates highly to other established programs such as Mxedit, and reduces the effects of potential human error (Allen, 2002). Intervals met the standards for duration required to measure high frequency heart rate variability captured by RSA (Cacioppo, Tassinary, & Berntson, 2000) and are similar to previous baseline and emotion induction intervals (e.g., Demaree, Pu, Robinson, Schmeichel, & Everhart, 2006).

2.1.4. Results

In keeping with our central hypothesis, an independent samples t-test revealed that perceivers felt significantly less compassion for the egoist (Mean ± SD = 6.80 ± 2.04) than the cooperator (Mean ± SD = 7.69 ± 1.95), t\textsubscript{68} = 2.11, P = 0.04. Gender did not interact with condition to predict self-reports of compassion, \( F_{1, 64} = 0.06, \) ns. We conducted additional analyses to examine whether the other twelve emotions differed significantly by condition. In addition to compassion, only inspiration showed significant differences by condition correcting for multiple tests using the Bonferroni method with a \( P \) value threshold of 0.004 (see Table 1). Inspiration was also significantly lower for participants paired with the egoist (Mean ± SD = 2.36 ± 1.79) compared to the cooperator (Mean ± SD = 4.00 ± 2.54), \( t_{68} = 2.11, \) \( P = 0.001. \)

Three participants were removed from physiological analyses because we could not obtain clear HR readings during their sessions and twelve participants’ physiology data files were lost because of a technical problem where they were saved over by the subsequent technical problem where they were saved over by the subsequent

We explored the alternative hypothesis that the perceivers may have started with a higher HR during the compassion induction due to potential increases in HR from reading the negative teamwork response of the egoist, which took place immediately before the compassion induction. Two other participants had artifacts while reading the confederate’s response and were not included in analyses pertaining to this measure. No significant differences in HR were found by condition during this interval when controlling for resting HR, \( F_{1, 70} = 1.49, \) ns. This finding rules out the possibility that differences in HR during the compassion induction were a result of perceivers in the egoist condition starting out with significantly higher HR after reading the egoist paragraph.

Seventy-one participants had both valid HR and respiration data, which were necessary for calculation of RSA. An independent samples t-test revealed no differences between participants paired with the egoist or cooperator in baseline RSA, \( t_{70} = 1.27, \) ns. There were significant differences in RSA activity for participants watching an egoist versus cooperator suffer, controlling for baseline RSA and changes in respiration from baseline to manipulation, \( F_{1, 68} = 7.00, \) \( P = 0.01. \) Perceivers paired with the suffering egoist (Mean ± SD = 5.96 ± 0.86) had significantly lower RSA activity than perceivers paired with the cooperator (Mean ± SD = 6.56 ± 0.83). Again, gender did not interact with condition to predict RSA, \( F_{1, 65} = 2.09, \) ns. We chose to control for baseline in favor of calculating a change score because our baseline participants artificially slowed their breathing inflating RSA during that period. We found no significant correlations between self-reports of compassion and HR, \( r(72) = -.03, \) ns, or RSA, \( r(68) = -.17, \) \( P = .15, \) during the compassion induction.

2.1.5. Discussion

Participants reported less compassion to suffering egoists compared to cooperators. Converging with these self-report findings, participants watching an egoist suffer exhibited smaller decreases in heart rate from baseline than participants paired with a cooperator. Interestingly, participants paired with the egoist exhibited slight increases in heart rate, on average, though this effect did not reach significance. RSA activity was also lower for participants watching an egoist suffer compared to those watching a cooperator. Taken together, these patterns of results suggest that perceivers felt less compassion for the suffering of egoists, as measured through self-reports and physiological responses.

2.2. Experiment 2

In Study 2 we aimed to replicate the findings from Study 1 in a naturalistic setting with a face-to-face interaction. One of the core appraisals associated with compassion is perceived similarity

<table>
<thead>
<tr>
<th>Emotion</th>
<th>Study 1 Egoist Mean ± SD</th>
<th>Study 1 Cooperator Mean ± SD</th>
<th>Significance (P)</th>
<th>Study 2 Egoist Mean ± SD</th>
<th>Study 2 Cooperator Mean ± SD</th>
<th>Significance (P)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enthusiasm/excitement</td>
<td>1.60 ± 1.54</td>
<td>1.78 ± 1.33</td>
<td>ns</td>
<td>3.00 ± 2.18</td>
<td>3.91 ± 2.00</td>
<td>.04</td>
</tr>
<tr>
<td>Afraid/scared</td>
<td>2.16 ± 1.89</td>
<td>1.58 ± 1.23</td>
<td>.09</td>
<td>2.41 ± 1.33</td>
<td>1.73 ± 1.32</td>
<td>ns</td>
</tr>
<tr>
<td>Frustrated</td>
<td>2.29 ± 2.07</td>
<td>1.68 ± 1.52</td>
<td>ns</td>
<td>1.69 ± 1.73</td>
<td>1.34 ± 1.01</td>
<td>ns</td>
</tr>
<tr>
<td>Surprised/shocked</td>
<td>2.80 ± 2.28</td>
<td>2.93 ± 2.22</td>
<td>ns</td>
<td>4.43 ± 2.86</td>
<td>5.43 ± 2.56</td>
<td>.09</td>
</tr>
<tr>
<td>Trust</td>
<td>3.95 ± 2.30</td>
<td>4.64 ± 2.36</td>
<td>ns</td>
<td>3.63 ± 2.27</td>
<td>5.25 ± 2.06</td>
<td>.001</td>
</tr>
<tr>
<td>Contempt/disdain</td>
<td>1.84 ± 1.51</td>
<td>1.38 ± 1.07</td>
<td>ns</td>
<td>1.35 ± 0.95</td>
<td>1.91 ± 1.75</td>
<td>.06</td>
</tr>
<tr>
<td>Angry</td>
<td>1.80 ± 1.53</td>
<td>1.24 ± 0.91</td>
<td>.04</td>
<td>1.04 ± 0.29</td>
<td>1.16 ± 0.64</td>
<td>ns</td>
</tr>
<tr>
<td>Interested/curious</td>
<td>3.69 ± 2.56</td>
<td>4.60 ± 2.30</td>
<td>.08</td>
<td>4.91 ± 2.42</td>
<td>5.39 ± 1.98</td>
<td>ns</td>
</tr>
<tr>
<td>Annoyed</td>
<td>1.84 ± 1.58</td>
<td>1.20 ± 0.73</td>
<td>.02</td>
<td>1.13 ± 0.40</td>
<td>1.25 ± 0.65</td>
<td>ns</td>
</tr>
<tr>
<td>Disgusted/revolting</td>
<td>1.16 ± 0.90</td>
<td>1.04 ± 0.21</td>
<td>ns</td>
<td>1.11 ± 0.38</td>
<td>1.14 ± 0.46</td>
<td>ns</td>
</tr>
<tr>
<td>Distressed</td>
<td>2.11 ± 1.75</td>
<td>2.53 ± 1.74</td>
<td>ns</td>
<td>1.91 ± 1.55</td>
<td>2.50 ± 0.42</td>
<td>ns</td>
</tr>
<tr>
<td>Inspired/impressed</td>
<td>2.36 ± 1.79</td>
<td>4.00 ± 2.54</td>
<td>.001</td>
<td>2.96 ± 2.26</td>
<td>4.05 ± 2.32</td>
<td>.03</td>
</tr>
</tbody>
</table>

Note. Only bolded variables represent significant effects (p < .004) with a Bonferroni correction for conducting multiple tests.
(Valdesolo & DeSteno, 2011), which enhances the motivation and ability to perspective take (Burnstein, Crandall, & Kitayama, 1994) and may have been a signal of genetic relatedness (Cialdini, Brown, Lewis, Luce, & Neuberg, 1997). Therefore, we included a more stringent control condition, where an individual was presented who exhibited negative traits, but these traits were self-focused rather than other-focused (i.e. low self-esteem and high neuroticism). This condition allowed us to ensure that the effects in Study 1 could not be explained by the mere presentation of negative information about the target or perceptions of dissimilarity, but instead were specifically derived from the partner’s egoistic qualities. In addition, we examined whether our effects may be mediated by distrust and anger upon learning of an individual’s selfish qualities.

2.2.1. Method

One hundred and thirty-five undergraduates (63 male, 70 female, 2 declined to answer) from a west coast university participated in this study for credit towards a psychology class. Two participants were dropped from data analysis because they failed the suspicion check, suspecting that their partner was a confederate, leaving a total of 133 participants.

Participants waited for the experimenter along with three female undergraduate research assistants ages 20–22, posing as participants. The participant was taken down the hall to the experiment room, and connected to the physiology device. The confederates were informed that they would be brought to another room. Participants completed an emotion-rating form to indicate the emotions and states they felt toward their partner. Participants were then probed for suspicion and released.

After completing demographic surveys participants closed their eyes and breathed slowly with a tone for one and half minutes. Upon completing this baseline task participants were given three minutes to write a response to a prompt about their views on teamwork. The prompt asked whether they liked working with others and to provide a relevant example of an instance when they worked with others in the past. Although participants were not informed their responses would be made public, the responses were collected and combined with three prewritten responses into a packet. Participants were told that the packet contained a response from each of their three potential future interaction partners and that everyone had received this packet. After participants read the responses the experimenter randomly assigned them a partner and asked participants to re-familiarize themselves with that partner’s response before the two would interact. Participants indicated how much they felt a selection of emotions before meeting their partner.

The experimenter then brought the confederate, who was blind to condition, into the room and connected her to the physiology device. Before starting the teamwork activity participants took part in a Day Reconstruction Task, which ostensibly allowed them a chance to get to know one another. In reality, this activity provided the context for the compassion induction. The topic of discussion was the speaker’s activities from the day before. The experimenter always told the participant to talk first and stated that the listener (confederate) should not comment or respond as the other person talked.

When it was the confederate’s turn, she described a scripted story of how the previous day had been unusual because her family dog had passed away. We chose this particular event because we believed it was relatable for most undergraduates, moderately upsetting, and would not arouse suspicion when it was spontaneously disclosed. During this scripted interaction confederates described learning that the dog they had grown up with had passed away, driving home to help their mother bury the dog in the backyard, and grieving over his passing. Confederates were asked to express the story in a sad tone of voice, hunch over to make themselves smaller (in accordance with Duclos et al., 1989), and to make direct eye contact for the majority of the time they discussed the story to engage the participant. In an effort to standardize the presentation of the story, confederates were trained together and practiced with three pilot subjects, in between which the experimenter provided feedback and advice.

After 1.5 min the experimenter reentered the room, disconnected the confederate from the physiology device, and escorted her to another room. Participants completed an emotion-rating form to indicate the emotions and states they felt toward their partner. Participants were then probed for suspicion and released.

2.2.2. Materials

Participants saw the same responses for the egoist and cooperator as Study 1. The negative-control condition centered upon a self-focused trait of low self-esteem and high neuroticism that engendered a negative attitude toward working with others. Below is an excerpt from the response. All responses were handwritten.

“I don’t really like working in groups with others. I get really anxious when I work with other people...People tell me not to let what others think get to me, but I get really worked up.”

The egoist and negative control paragraphs were provided to 24 pilot participants (7 male, 16 female, 1 declined to state) in a between-subjects design. Pilot participants read the paragraph and were asked how much they liked the person who wrote it from 1 (dislike very much) to 5 (like very much) and how similar they felt to
that person from 1 (very dissimilar) to 5 (very similar). Pilot testing of the negative control response, confirmed that although participants liked the egoist (Mean ± SD = 1.93 ± .62, N = 12) less than the negative control (Mean ± SD = 3.00 ± .67, N = 12), t_{22} = 4.06, P < .001, they perceived themselves to be equally dissimilar to both the egoist (Mean ± SD = 1.70 ± .91) and negative control (Mean ± SD = 2.4 ± 1.35), t_{22} = 1.39, ns. These results suggest that the negative control was relatively effective at removing the possibility that our effects would be accounted for by the presence of negative information or perceptions of dissimilarity.

2.2.3. Measures

Participants reported a smaller subset of the original emotions from Study 1 after reading the paragraph about their partner, but before they interacted with her. Our two measures of interest, distrust (trust reverse scored) and anger, were embedded amongst three other emotions/states (enthusiasm/excitement, surprised/shocked, interested/curious) to reduce the salience of our hypotheses. Participants reported their responses on a 10-point Likert scale in Study 1. After interacting with their partner, participants marked the extent to which they felt the full set of emotions from Study 1.

ECG was analyzed during two time points: the baseline task and the compassion induction. Second-by-second ECG readings were transformed into beats per minute (HR) and averaged over the baseline period and the compassion induction. Artifacts were removed in the same fashion as Study 1.

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2.2.4. Results

The script described elicits high levels of compassion in perceivers (Mean ± SD = 7.37 ± 2.10). A one-way ANOVA revealed that the confederate, one of five female research assistants, did not elicit different levels of compassion, F_{4, 127} = 0.36, ns. Consistent with our hypothesis, there were significant differences in reported compassion between conditions, F_{2, 130} = 3.68, P = 0.03. Planned comparisons revealed that egotists (Mean ± SD = 6.72 ± 2.61) evoked significantly lower self-reports of compassion than cooperator (Mean ± SD = 7.82 ± 1.79), t_{130} = 2.53, P = 0.01, and negative controls (Mean ± SD = 7.63 ± 1.59), t_{130} = 2.08, P = 0.04. There were no significant differences between reported compassion for the cooperator compared to the negative control, F_{2, 130} = 0.17, ns. In this instance, gender did interact with condition to predict self-reports of compassion, F_{2, 125} = 4.27, P = .02, such that men were affected more by the manipulation of egoism than women.3

We tested whether any of the twelve other emotions showed significant differences by condition, using a Bonferroni correction for multiple tests (see Table 1). Trust, which showed no significant differences in Study 1, was significantly different by condition in Study 2, F_{2, 131} = 6.46, P = .002, such that participants reported feeling less trust toward the suffering egoist (Mean ± SD = 3.63 ± 2.27) than cooperator (Mean ± SD = 5.25 ± 2.05), t_{130} = 3.43, P = 0.001, even with the family-wise correction. No other emotions were significant.

Two participants were removed from physiological analyses because we could not obtain clear HR readings and nine subjects’ data files were lost because of a technical problem in which files were saved over by the subsequent session’s data, leaving a total sample size of 124 participants. One participant, who exhibited a change in heart rate that was more than three standard deviations from the mean, was removed from the heart rate analyses. A one-way ANOVA comparing baseline HR showed no differences by condition, F_{2, 123} = .94, ns, although baseline heart rate in the negative control condition was, on average, three beats higher than the baseline for participants in the egoist or cooperator condition. To test our hypotheses concerning different patterns of HR in reaction to egotists, we conducted an ANCOVA predicting the effect of condition on changes in HR from baseline to the compassion induction, controlling for baseline HR. As expected, there was a significant effect of condition, F_{2, 118} = 4.91, P = 0.009, such that participants paired with the egoist showed significantly smaller decreases in HR than those paired with the cooperator, F_{2, 118} = 7.98, P = 0.002, and marginally smaller decreases in HR than those paired with the negative control, F_{2, 118} = 2.76, P = 0.099 (see Fig. 1). Gender did not interact with condition to predict changes in HR, F_{2, 112} = 1.79, P = 0.17. In a simple effects test of changes in HR from baseline to the compassion induction within each condition, participants showed significant HR deceleration in response to the suffering of the cooperator (Mean ± SD = −2.19 ± 5.32), F_{2, 118} = 6.97, P = 0.009, but not in response to the negative control (Mean ± SD = −0.96 ± 4.22), F_{2, 118} = 1.15, ns, or egoist, F_{2, 118} = 0.72, ns, where heart rate went up slightly (M ± SD = 1.20 ± 5.30). Overall, participants showed smaller decreases in HR for suffering egotists compared to co-operators. In addition, those who watched a cooperator suffer showed HR deceleration, which is typical of compassion (Eisenberg et al., 1989), whereas those paired with an egoist did not. We found no correlation between changes in HR, controlling for resting HR and self-reports of compassion, r(118) = −0.01, ns.

We investigated whether distrust and anger mediated the relationship between egoism of the target and subsequent levels of self-reported compassion and HR responses. We tested distrust and anger separately as mediators in our analysis. We compared the egoist condition (coded as “1”) to the cooperator and negative control conditions, which were combined (coded as “0”) given that the hypothesis was that egotists would elicit different responses from other types of individuals. We used bootstrap analysis, which is a more sensitive method for testing mediation because it increases power, and helps control for the Type I errors (Preacher & Hayes, 2008). We conducted bootstrapping analyses with 1000 re-samples with 95% confidence intervals for the indirect effects. The null hypothesis of no mediation means that the estimate for the indirect effect is zero so if the confidence interval does not include zero then we can reject the null hypothesis. Distrust was a significant mediator of the effect of egoism on self-reported compassion (95% CI: 0.67, 0.05; see Panel A of Fig. 2), whereas anger was not (95% CI: −0.20, 0.58). We examined whether distrust or anger mediated the effects of egoism on changes in HR, in the same manner. Again, in two separate mediation analyses, distrust was a significant mediator of the effects of egoism on HR (95% CI: 0.06, 1.81), whereas anger was not (CI 95%: −0.18, 0.76).

2.2.5. Discussion

The findings from Study 2 are in keeping with our hypothesis that individuals experience attenuated prosocial emotional and physiological responses to suffering egotists compared to cooperators, replicating the findings of Study 1. Participants reported less compassion in response to the suffering of an egoist compared to a cooperator or negative-control partner. They responded with typical heart rate deceleration (Eisenberg et al., 1989) to the suffering of the cooperator, but not the egoist. Again, participants paired with the egoist showed slight increases in HR, though this effect did not reach conventional levels of statistical significance. The negative control elicited similar levels of self-reported compassion as the cooperator, but physiological responses to their suffering fell in between those elicited by the egoist and cooperator. These results suggest that attenuated prosocial responses to the egoist are not based merely on the presence of negative information or perceived dissimilarity. Distrust explained the emotional and physiological response to suffering egotists, whereas anger did not.

3 Gender moderated self-reports and physiological measures in only one instance out of five. Therefore, we are not confident that this finding is part of a meaningful effect of gender more broadly and do not address it further.
3. General discussion

The stability of altruism hinges upon modifying one's prosocial inclinations in response to the egoistic tendencies of the individual in need. Although research has demonstrated that individuals exhibit selective prosocial behavior (Axelrod & Hamilton, 1981), we explored the extent to which individuals also experience selectively prosocial affective, and accompanying physiological, responses to egoists' suffering. When individuals are confronted with the decision to provide help or support, these choices often occur in emotionally-charged situations where another person expresses vulnerability or distress. In these contexts the importance of affective responding may be especially significant in guiding strategic behaviors (e.g., Tooby & Cosmides, 2008). Participants were exposed to the suffering of an individual who incidentally revealed him or herself to be egoistic. Participants reported reduced compassion and differed in their autonomic physiological responses to suffering egoists compared to suffering cooperators. We used decreases in HR and greater RSA activity as physiological markers of compassion and social connection (Stellar et al., 2012; Stellar & Keltner, 2013). Participants paired with egoists showed smaller decreases in HR from baseline, and lower RSA activity (in Study 1), than those paired with cooperators, suggesting they were experiencing less compassion.

Lack of trust mediated our results in Study 2, suggesting that distrust fosters disengagement and disassociation from egoists who may take advantage of others' compassion. Specifically, distrust, but not anger, attenuated perceivers' compassion and physiological responses to the egoists' need. The power of distrust to mediate our effects dovetails with recent claims made in the literature on indirect reciprocity that egoists' need. The power of distrust to mediate our effects dovetails with attenuated perceivers' compassion and physiological responses to the suffering target, those paired with egoists would have played less prosocially, and the changes we observed in emotional and physiological responding would have mediated this effect. Future studies should examine this link between reduced compassionate responding for egoists and reduced prosocial behavior.

Our results raise intriguing methodological questions about multi-method approaches to prosocial response that rely on self-report and physiological measures of emotion. We did not find correlations between self-reports of compassion and physiological responses, although we did find that the conditions in which participants reported greater compassion were accompanied by patterns of physiological responding that are consistent with prosocial tendencies. This kind of coherence between self-reports of distinct emotions and autonomic physiology are most typically the exception rather than the rule at the individual level of analysis (Mauss, Levenson, McCarter, Wilhelm, & Gross, 2005). Self-reports of emotion and physiological responses are currently thought of as different aspects of the affective experience, and may have different relationships with behavior. These issues, as they play out in understanding selective prosociality, warrant future research.

As this research progresses it will be important to bear in mind the strengths and weaknesses of each modality of measurement. Self-reports of emotion are subject to biases and self-presentation concerns. Measures of autonomic response often index systems that have many different functions. For example, changes in RSA may be linked to attention (Suess, Porges, & Plude, 1994) or emotion regulation (Butler, Wilhelm, & Gross, 2006). In the present studies, we note that participants viewed the same target persons; the only variation was whether they were framed as an egoist or cooperator. Given this, we feel confident that the observed decreases in heart rate in response to the cooperator compared to the egoist reflect greater compassion rather than different attentional deployment or adaptation to the experiment stimulus. However, future research should further test these constructs of attention, regulation, and compassion, to understand more precisely the contribution of HR and RSA reactions to prosocial responses.

3.1. Conclusion

Human social life requires a balance of self-focused and other-oriented behavior. On one hand, our studies are part of a broader literature that points to the costs of unbridled egoism, which can reduce prosocial responses in others even in times of great need. On the other hand, it also cautions of the costs of indiscriminant prosociality. We find that selective prosociality occurs at the level of affect and physiology, suggesting a more bounded form of compassion that depends on the nature of the individual in need.

References
