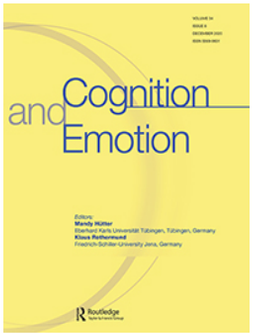

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Empathic emotion regulation in prosocial behaviour and altruism

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ABSTRACT

Emotions evoked in response to others' distress are important for motivating concerned prosocial responses. But how emotion regulation shapes prosocial responding is not yet well understood. We tested the role of empathic emotion regulation in promoting prosocial motivation and costly donations across two studies, first in a community sample and then in a sample of altruistic kidney donors and a matched comparison sample. Participants engaged in hopeful and distancing reappraisals while viewing images of others in distress, then decided whether to help by donating to charity. Whereas hope was expected to evoke approach-based motivation indexed by increased donations, distance was expected to evoke avoidance-based motivation indexed by decreased donations, via varying effects of the two reappraisals on positive and negative affect. Across both studies, both reappraisals decreased negative affect and hopeful reappraisal increased positive affect. In the community sample, hope resulted in higher donations than distancing. Altruists were more prosocial overall, but the associations between affect and donation behaviour in this group mirrored the hopeful reappraisal in the community sample, suggesting that altruists might adopt this strategy by default. These findings clarify the role of empathic emotion regulation in prosocial behaviour and also independent effects of positive and negative affect.

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Empathy; altruism; emotion regulation

The sight, sound, or even knowledge that another person is distressed and vulnerable commonly results in "multidetermined concern" (Vaish, 2016). Concerned responses reflect bottom-up emotional processes that can be automatically evoked by cues that signal distress and vulnerability (Brethel-Haurwitz et al., 2017; Brethel-Haurwitz et al., 2018; Marsh et al., 2014; O'Connell et al., 2019) as well as by top-down cognitive processes that modulate their behavioural effects. Cognitive regulation of emotion affects empathic concern in a variety of ways. In some cases, regulating emotions evoked in response to distress may bias responding toward concern and compassion rather than personal distress (Batson et al., 1987; Batson et al., 1983; Eisenberg et al., 1989; Klimecki et al., 2014). But in other cases, down-regulation of empathic affect can impede active helping (Cameron & Payne, 2011). Given these conflicting results, under what circumstances does emotion regulation support versus inhibit other-regard and prosociality? The current studies sought to examine the role of regulatory appraisals of emotion in promoting prosocial helping behaviour. First, effects of two potentially opposing reappraisals were examined in a novel empathic emotion regulation task. Then, the role of emotion regulatory appraisals in prosocial helping was examined in a sample of extraordinarily altruistic adults – altruistic kidney donors.

Emotion regulation refers to processes that change the occurrence, strength, and duration of negative or positive emotional reactions (Gross, 2015). Regulation is typically enacted to modulate an emotion when that emotion is inconsistent with a desired state. Although much research has focussed on regulatory processes applied to *intra*personal emotions such as fear, regulation can also be applied to *inter*personal emotions

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experienced in response to the emotional circumstances of others (Williams et al., 2018; Zaki & Williams, 2013). Just as effective emotion regulation helps to shape intrapersonal emotional experiences, it may help shape empathic emotion in ways that facilitate prosocial helping (Cameron, 2018; Zaki, 2014).

Empathic emotional arousal to others' distress can yield a variety of responses with variable effects on helping. Such empathic simulation, in which one's emotional experience approximates that of another person, can promote other-focussed empathic concern (Batson et al., 1987; Eisenberg, 2000) or, alternatively, can trigger aversive levels of self-focussed personal distress via, for example, negative emotional contagion. Whereas both empathic accuracy, or the success with which one perceives and understand the emotions of others, and concern predict helping behaviour, personal distress typically predicts negative arousal and avoidance of helping (Batson et al., 1987; Carrera et al., 2013; Eisenberg, 2000; Eisenberg et al., 1994; Eisenberg & Miller, 1987; FeldmanHall et al., 2014; Lopez-Perez et al., 2014). Emotion regulation may be a core component of empathic processing that can help shift empathic responses toward concern and prosocial helping (Decety, 2010; Eisenberg, 2000; Eisenberg et al., 1994; Eisenberg et al., 1996; Eisenberg & Okun, 1996; Eisenberg et al., 1998; Fabes et al., 1994). Consistent with this, Eisenberg and colleagues have found that both empathic concern and personal distress are predicted by emotional *reactivity* in response to others' distress, whereas emotion *regulation* positively predicts empathic concern and negatively predicts personal distress (Eisenberg et al., 1994). For example, adults with dispositional high reactivity and low regulation experience more personal distress, but those with moderate reactivity and regulation experience more empathic concern (Eisenberg et al., 1994). This suggests that when people experience negative affect in response to others' distress, they can activate a goal to regulate this negative affect to within an optimal range that biases them toward helping rather than avoiding the needy other.

Cognitive reappraisal is an emotion regulatory strategy that involves changing one's interpretation of an emotional situation in order to change the reaction to it, and is thought to be one of the most effective approaches to modifying an emotional response (Gross, 1998). Cognitive reappraisal of others' distress can increase empathic concern (Lopez-Perez & Ambrona, 2014) and decrease personal distress, as well as activity in brain structures like the amygdala and insula, while observing someone else's pain (Lamm et al., 2007). One of the few existing studies to directly link emotion regulation and empathy to situational prosocial outcomes found that the tendency to engage in cognitive reappraisal predicted empathic concern and helping behaviour toward an individual in distress, while expressive suppression (a form of emotion regulation characterised by the inhibition of outward displays of emotion) was associated with reduced prosociality (Lebowitz & Dovidio, 2015). Thus, different forms of emotion regulation yield divergent prosocial outcomes. Cognitive reappraisal may be particularly effective in promoting prosociality when it reduces overwhelming aversive affect in response to another's distress, just as cognitive reappraisal can be used to reduce non-empathic feelings of fear or anxiety.

Emotion regulation does not necessarily promote prosociality, however. Emotion regulation can also inhibit empathy and prosociality, as seen in studies on the "collapse of compassion" in which both higher trait emotion regulation skill and instructed emotion regulation result in decreased concern for multiple victims (Cameron & Payne, 2011). Other studies have found that trait empathy only predicts prosocial tendencies for those with low to moderate trait reappraisal tendency (Lockwood et al., 2014). Such studies highlight that the goals and context of emotion regulation may be critical in shaping interpersonal outcomes. Whether the goals of empathic emotion regulation are other-regarding or self-focused may be a key consideration. A common strategy in many studies examining the regulation of intrapersonal emotion via cognitive reappraisal is to decrease negative affect using a distancing strategy (i.e. imagining the situation as fake or otherwise distant from the immediate reality of the observer). But such a strategy may be more likely to lead to compassion collapse than prosocial motivation, depending on the initial level of empathic negative affect (in which moderate amounts of empathic affect may be ideal for motivating helping behaviour). Due to suggestions of a quadratic association between empathic affect and prosociality (Eisenberg et al., 1994; Kogan et al., 2014), we examined both linear and quadratic associations between affect and donation behaviour in the current studies.

The present research explored how affect and reappraisal interact to influence prosociality toward others' distress. Two reappraisal strategies selected as

opposite ends of an approach-avoidance appraisal continuum and predicted to yield opposite effects on prosocial behaviour were tested during a donation task in each of two studies. In one strategy, participants were instructed to employ a hopeful reappraisal in which they viewed images of people in distress while attempting to decrease their own negative empathic affect and reframe the situation in an optimistic way. Given the approach-oriented nature of this reappraisal and its similarity to a compassionate orientation (Goetz et al., 2010), it was predicted that this reappraisal would both decrease negative affect and increase positive affect. In the second strategy, participants were instructed to employ an avoidant and hopeless distancing reappraisal which was only predicted to reduce negative affect. During the task, participants also decided whether or not they would make costly donations to charity. We hypothesised that although both reappraisal strategies would decrease negative affect in response to the images, hopeful reappraisals would promote more costly helping behaviour toward strangers, potentially via concurrent increases in positive affect, given their closer association with approach motivation and empathic concern rather than avoidance of distress. Additionally, we examined the relationship between individual differences in reappraisal tendencies and the effect of instructed reappraisal on prosocial behaviour.

Our initial study testing these predictions was conducted in a community sample. Our second study aimed to test the relationship between reappraisal processes and costly real-world altruism. We therefore replicated the study in a rare population of altruistic kidney donors, who had volunteered to undergo a major medical procedure to donate one of their own internal organs to a stranger. Altruistic kidney donation is a voluntary and extremely costly form of altruism that benefits a stranger, thereby meeting the most stringent definitions of human altruism (Batson, 2010; Clavien & Chapuisat, 2013; de Waal, 2008). Studying this special population provides insights into costly altruism that are not otherwise possible given ethical prohibitions on inducing risky or high-cost helping behaviour in the laboratory and the fact that the low-cost altruism assessed in the laboratory is often affected by social desirability and norm adherence biases (Eisenberg & Fabes, 1990). This population of altruists is known to experience heightened empathic arousal in response to others' fear and pain (Brethel-Haurwitz et al., 2017; Brethel-Haurwitz et al., 2018; Marsh et al., 2014; O'Connell et al., 2019) but nothing is yet known about their emotion regulation strategies in response to others' distress. It was hypothesised that altruists would be more effective in implementing reappraisal to regulate empathic negative affect and that this distinction would be particularly pronounced for a hopeful reappraisal congruent with empathic concern.

Study 1

Methods

Participants

Fifty-one healthy adults (34 female) took part in the study for payment ($10) or course credit. Following consenting, one participant was excluded due to lack of fluency in English that impeded understanding the task instructions. This resulted in a final sample of 50 participants (34 female) between 18 and 58 years old ($M = 21.62$, $SD = 6.01$). This sample size was consistent with other recent studies of the effect of emotion regulatory instructions on helping behaviour (Lebowitz & Dovidio, 2015). Of these 50 participants, 67% were Caucasian, 18% were Asian, 6% were Black or African-American, and 10% were mixed race or did not otherwise specify a race. Most participants were currently enrolled undergraduates, while 18% had completed college and 10% had a graduate degree. All study procedures were approved by the Institutional Review Board at Georgetown University and all participants provided written informed consent before testing.

Validation of stimuli

Neutral photos for the regulation task were selected from the validated Nencki Affective Picture System (NAPS; Marchewka et al., 2013) photo database. Negative photos were selected from NAPS and publicly available web sources, including major news organisations and charities. The negative photos selected all depicted a single individual in a context indicating suffering (e.g. natural disaster, homelessness), many of whom were visibly expressing distress (e.g. crying). Negative and neutral photos were validated in a separate participant sample via Amazon's Mechanical Turk (mTurk; see Supplementary Methods for details).

Empathic emotion regulation task

Across four blocks of the empathic emotion regulation task, participants viewed sets of neutral or negative photos, each paired with instructions to view the

photos or reappraise. Following each block of negative photos, participants completed a donation task. The task structure is illustrated in Figure 1 and described in detail below.

Prior to beginning the laboratory task, participants were given a $10 endowment of ten $1 bills that they were instructed to put in their pocket, wallet, etc., so that it was within their possession and thus was their money to spend on the task. Across the four blocks of the task, they then viewed and responded to a series of 46 images (10 neutral and 30 negative test images, plus 6 negative practice images) following instructions to view or reappraise each image.

At the outset of the task, participants received instructions regarding the strategies they would be asked to follow: viewing the photos or reappraising them using two directly opposing strategies. Participants were told that during the *view* blocks, they should "view the photos as you naturally would." For the *hope* block: "You may decrease negative feelings in a hopeful way by thinking things like, 'It's not a hopeless situation for this person,' 'Something could be done to make the situation better,' or 'I could help this person.'" For the *distance* block, participants were instructed, "You may decrease negative feelings in a distancing way by thinking things like, 'It is a hopeless situation for this person,' 'Nothing could be done to make the situation better,' or 'There's nothing I can do.'" Thus, distancing was not a neutrally objective reappraisal in which participants simply viewed themselves as more distant from the subject of the photo, but rather was actively avoidant to ensure direct motivational contrast with the *hope* strategy; the distance condition could thus also be conceptualised as a "hopeless" condition. These reappraisals thus interrogated the effects of approach- versus avoidance-oriented regulatory states, respectively.

Participants completed a practice block in which they practiced following both reappraisal instructions (3 photos per instruction, for a total of 6 practice photos), responding to the affect scales, and responding to the donation requests. An experimenter confirmed comprehension before proceeding with the task.

Participants next completed the four test blocks (Figures 1 and 2). The first block contained only neutral images (10 unique photos) and participants were cued with an initial instruction slide (*view*) to view the images. In each of the next three blocks they viewed 10 unique negative photos, which were matched across blocks for both positive and negative valence based on independent ratings from our validation sample (see Supplemental Material). Presentation of unique photos across blocks was selected as preferable to presenting the same 10 negative photos three times across the negative blocks, which would risk repetition effects. (Which instructions accompanied each block of 10 photos was counterbalanced across participants.) During the first negative block, participants were instructed to view the images. For the final two negative blocks, participants received either *hope* or *distance* reappraisal instructions (the order of these blocks was counterbalanced across participants). Within each block, photos were presented in random order. A 30 s fixation separated each block.

After the instruction slide in each block, participants saw a sequence of 10 images in random order (Figure 2A). Each photo appeared for 8 s and was followed by two affect rating scales. The rating scales queried participants to rate their own experiences of positive and negative affect on unipolar scales (Kron et al., 2013) that ranged from 0 (no pleasant/unpleasant feelings) to 8 (strong pleasant/unpleasant feelings). Two unipolar scales were used to enable participants to express mixed affective responses (i.e. concurrent positive and negative feelings, which would result in a rating of 0 on a bipolar scale), and to provide a measure of affective arousal as indexed by the sum of positive and negative affect (Kron et al., 2013). In keeping with Kron and colleagues, participants were instructed that a maximal rating on the pleasant scale represents feeling completely pleased, happy, satisfied, content, or hopeful; a minimal rating on the pleasant scale represents a neutral state of no pleasant feelings; a maximal rating on the unpleasant scale represents feeling completely unpleasant, unhappy, annoyed, unsatisfied, melancholic, or despaired; and a minimal rating on the unpleasant scale represents a neutral state of no unpleasant feelings. Each rating scale appeared for 4 s and participants responded via keyboard press. Affect rating scales were always presented in the same order for each participant, but their order was counterbalanced across participants. While there is a risk that repeated affect ratings after each photo could have resulted in less accurate ratings (i.e. if participants were satisficing with their responses) or that such ratings could have affected emotional responses, given the known effects of affect labeling on behavioural and neural affective responses (Torre &

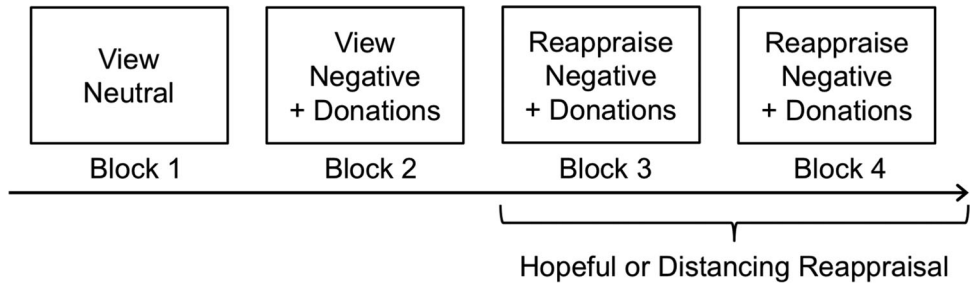

Figure 1. Block structure for the empathic emotion regulation task. In the first block, participants viewed a set of 10 neutral photos. In each of the subsequent three blocks, participants were presented with a set of 10 negative photos, with instructions to either view the photos or apply a hopeful or distancing reappraisal across all photos in the block. Each of the three negative photo blocks was immediately followed by a donation block in which the 10 photos were re-presented in the context of donation requests.

Lieberman, 2018), this method was selected as preferable to gathering affect ratings following the task such that affect would be measured upon first exposure to each photo and in the context of each appraisal block. In this way, affect ratings for each individual photo during appraisal or reappraisal could be used to predict donation behaviour in response to that specific photo in our trial-level analytical models.

Immediately after completing each negative photo block, participants completed a donation task (Figure 2B). During this task, participants again saw the 10 photos they had just viewed or reappraised. Images were re-presented in random order for 8 s each. Each image was followed by a randomly selected proposed donation amount that varied from $1 to $10 across the photos (each value appeared once per block). Participants could respond either yes or no (via the 1 or 0 keys) to either donate or not donate the proposed amount to a charity that could help the person in the photo. Participants had been instructed prior to beginning the task that at the end of the study one trial would be randomly selected and any money they had chosen to donate would be donated to the American Red Cross (which was carried out at the conclusion of these studies), so that they should respond to each donation trial independently (i.e. they had $10 to "spend" on each trial). This paradigm was adapted from recent investigations of donations to vulnerable victims (Genevsky et al., 2013).

The task was presented on an iMac desktop computer via Superlab version 4.0. All photos were presented in colour, at the centre of the screen, on a black background.

Electrodermal activity (EDA) was measured throughout the task as an index of sympathetic arousal to supplement self-reported affect. Due to task presentation software malfunction affecting timing, physiological data are not discussed further here but are included as Supplementary Material.

Questionnaires

Following the empathic emotion regulation task, participants completed self-report questionnaires, the Positive and Negative Affect Schedule (PANAS; Watson et al., 1988), which measures state mood, the Emotional Reactivity Scale (ERS; Nock et al., 2008), which assesses trait emotional reactivity, the Emotion Regulation Questionnaire (ERQ; Gross & John, 2003), which measures trait emotion regulation (and includes both trait reappraisal and suppression subscales), and the Interpersonal Reactivity Index (IRI; Davis, 1983), which measures trait empathy. They also provided basic demographic information and self-reported psychological status including any psychiatric diagnoses, psychological symptoms, and current medications or drug use. As a manipulation check and to gather information on reappraisal execution, participants were queried on the strategies they used in each part of the task, how difficult they found each emotion regulation strategy to be, and how successful they felt in utilising each strategy.

Analysis

Donation choices were the main outcome of interest. When more than one response was entered, only the first valid response (either 0 or 1) during donation choice events (the presentation of a dollar amount following a photo) was counted, with the average response rate across the three blocks being 96.47% (range: 56.67-100.00%). One participant provided no valid donation responses during the *view negative*

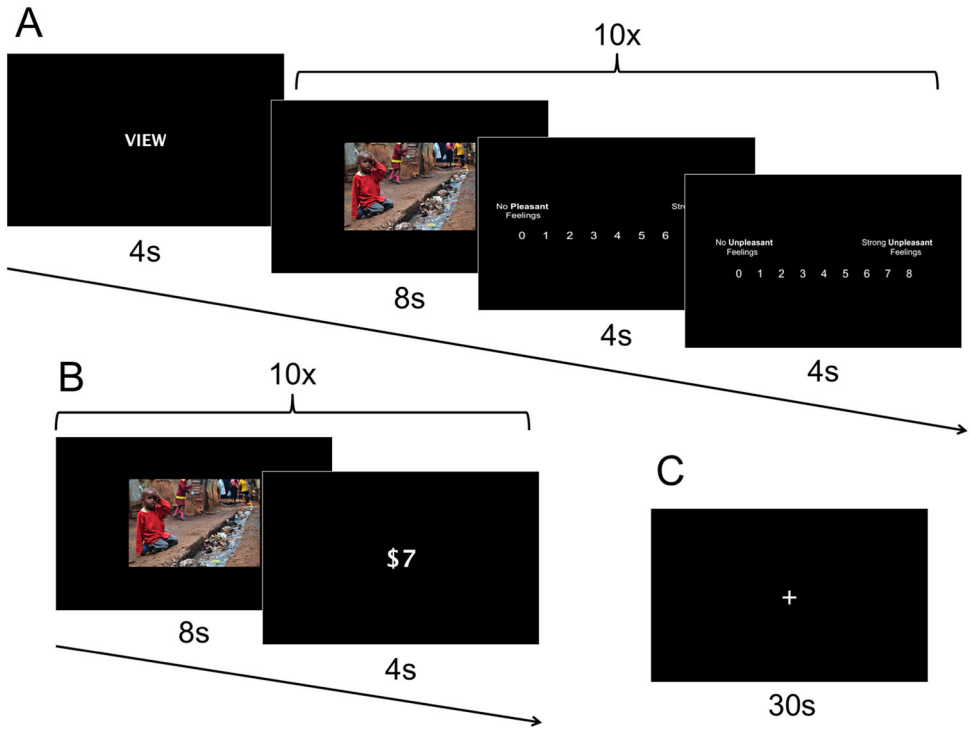

Figure 2. Trial structure for empathic emotion regulation task. (A) Structure of a photo block with instruction to view or reappraise then presentation of 10 photos and affect scales. (B) Structure of a donation block, which immediately followed each corresponding negative photo block. (C) A 30-second fixation separated each block. Photo: Eoghan Rice / Trócaire via Wikimedia Commons.

block, but was retained in analyses not dependent on donation responses in this block.

Responses were analyzed using the generalised estimating equations (GEE) method of logistic regression in SPSS 25. GEE is a semiparametric analysis method that uses generalised linear models while accounting for correlated repeated measurements, thus accounting for multiple responses within each condition for each participant. Response to each donation opportunity was the binomial response variable. Instruction type was a within-subjects predictor variable with three levels (*view negative, distance, hope*). Due to the wide age range of participants in Study 1 and previous findings of age effects on both giving and emotion regulation (Sze et al., 2012; Urry & Gross, 2010), models also included age as a covariate of no interest. An exchangeable working correlation matrix was specified, as correlations between repeated trials were expected to be equivalent. A model-based estimator was used for the covariance matrix because a subject variable was also specified, thus accounting for the repeated nature of within-subject measurements. Least significant difference correction was applied to post hoc comparisons of regression effects. Donation decisions were analyzed using this trial-level approach because it provides greater analytical precision than averages of behaviour across trials within conditions and also because the online affect ratings we collected for each photo could then be used to predict behaviour.

As with donation decisions, only the first valid response to each affect rating scale was counted, resulting in an average affect response rate of 94.60% (range: 77.50-100.00%). Mean affect ratings were calculated for each condition, separately for positive (pleasantness) and negative (unpleasantness) affect. Positive and negative affect ratings were also summed as a measure of emotional arousal (Kron et al., 2013). Affect ratings across conditions were compared via repeated measures ANOVAs and paired samples *t* tests. Affect ratings for each photo individually were also considered in predicting trial-level donation behaviour in logistic regressions.

Given potential nonlinear associations between affect and prosociality, quadratic associations were examined in addition to linear associations via

hierarchical linear regression models with the addition of a quadratic term calculated by squaring the predictor of interest. Across all analyses, parametric statistics are reported unless otherwise noted.

Results

Effectiveness of reappraisal instructions

We first examined the effectiveness of the reappraisal manipulations on affect ratings. A 2 (affect type: positive, negative) x 4 (instructions: *view neutral, view negative, hope, distance*) ANOVA revealed a main effect of instructions, $F(2.46,120.57) = 24.68$, $p < .001$, $\eta_p^2 = .335$, a main effect of affect type, $F(1,49) = 178.01$, $p < .001$, $\eta_p^2 = .784$, and an instructions x affect type interaction, $F(2.31,113.38) = 68.76$, $p < .001$, $\eta_p^2 = .584$ (Figure 3). (Greenhouse-Geisser correction was applied to the main effect of instructions and the instructions x affect type interaction due to violations of sphericity.) *View neutral* affect ratings were more positive and less negative than ratings for all negative blocks of photos, all $p < .001$, all effect sizes > .860, though the mean difference was smaller for positive affect ratings for *hope* versus *view neutral*, $t(49) = 2.02$, $p = .049$, $d = .286$.

Affect ratings across the three negative blocks were compared via Wilcoxon signed-rank tests, given violations of normality. Both *hope*, $W = 1006$, $p < .001$, $r = .578$, and *distance*, $W = 1014$, $p < .001$, $r = .591$, were rated as less negative than *view negative*, suggesting that both reappraisal instructions were successful. *Hope* and *distance* did not differ significantly in their negative affect rating $W = 647.5$, $p = .731$, $r = .016$, suggesting the two reappraisals had equivalent effects on negative affect. *Hope* yielded significantly more positive affect than both *view negative*, $W = 149$, $p < .001$, $r = .766$, and *distance*, $W = 158$, $p < .001$, $r = .752$ instructions, which did not differ from each other, $W = 421.5$, $p = .538$, $r = .339$ (Figure 3).

Across participants, the *distance* strategy was rated as more difficult than the *hope* strategy, $t(49) = 3.76$, $p < .001$, $d = .532$, and participants felt less success in using it, Wilcoxon $W = 87$, $p < .001$, $r = .864$. See Supplementary Results for arousal ratings across conditions.

Donation decisions

We next analyzed donation decisions across conditions using logistic regression in which each decision to donate was a binary response variable. Omnibus comparison across the three blocks revealed a trend toward a main effect of condition, $\chi^2(2) = 5.59$, $p = .061$, with paired contrasts finding higher donation rates during *hope* (M = .73, SE = .04) than *distance* (M = .68, SE = .04), $p = .021$, with *view negative*

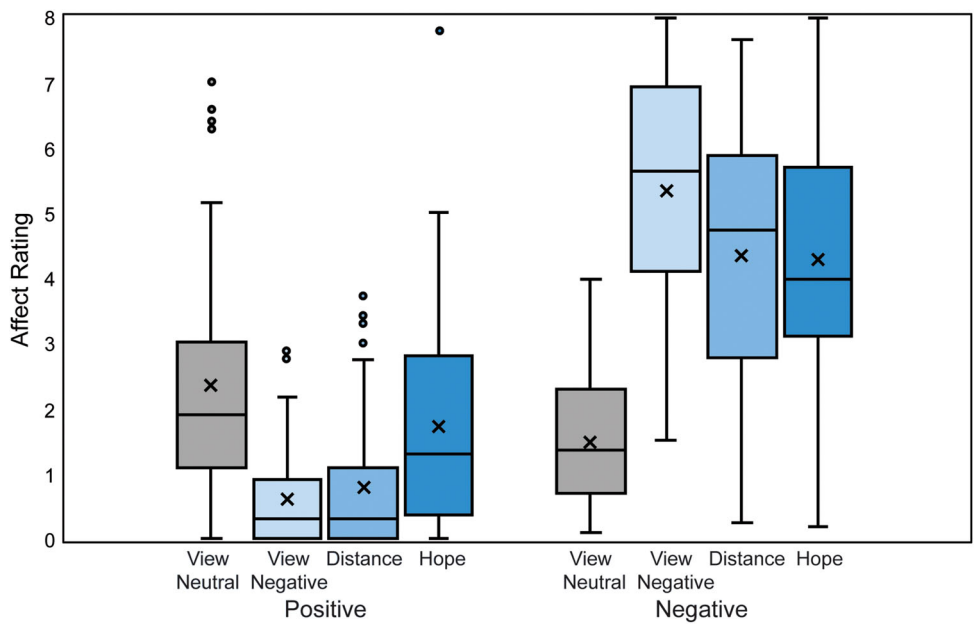

Figure 3. Affect intensity ratings across conditions in Study 1. Boxplots display range and quartiles. Means marked by an x. Dots represent outliers.

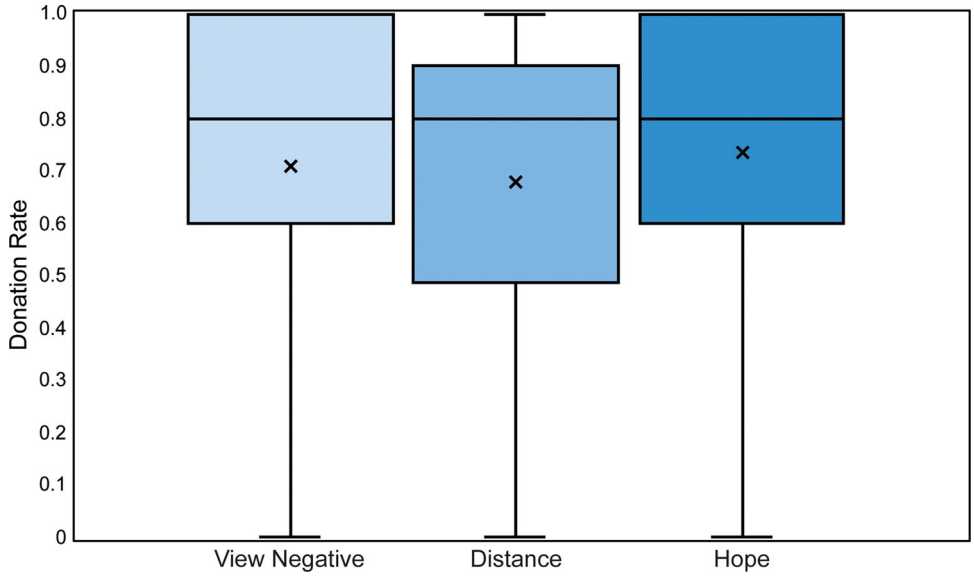

Figure 4. Donation rates by condition in Study 1. Boxplots display range and quartiles. Means marked by an x.

(M = .72, SE = .04) characterised by intermediate donation rates not significantly different from the two reappraisal instructions, both $p > .12$ (Figure 4). Including age as a covariate did not change the results.

Given an *a priori* expected moderating effect of trait reappraisal on donation behaviour, we next examined how trait reappraisal tendency, instructions, and their interaction predict donation responses and found a significant interaction between trait reappraisal and instructions, $\chi^2(2) = 8.50$, $p = .014$, which remained when controlling for age, $\chi^2(2) = 8.42$, $p = .015$, and was specific to reappraisal tendency. Trait reappraisal tendency was a relatively more positive predictor of donation decisions during *hope* than *distance*, $\chi^2(1) = 6.02$, $p = .014$, and *view negative*, $\chi^2(1) = 7.07$, $p = .008$, conditions, while *distance* and *view negative* did not differ significantly in the association between trait reappraisal and donation decisions, $\chi^2(1) = 0.07$, $p = .796$. This effect was specific to reappraisal tendency; no similar interaction was observed for trait suppression tendency, $\chi^2(2) = 1.00$, $p = .606$.

Next, we considered associations between self-reported affect and donation behaviour. We found a main effect of negative affect, $\chi^2(1) = 71.20$, $p < .001$, such that negative affect was positively associated with donating. We also found a non-significant trend toward an interaction with condition, $\chi^2(2) = 4.85$, $p = .089$. Negative affect was a relatively less positive predictor of donating during *hope* than *distance*, $\chi^2(1) = 4.85$, $p = .028$, though neither *hope*, $\chi^2(1) = 1.25$, $p = .263$, nor *distance*, $\chi^2(1) = 1.20$, $p = .274$, differed from *view negative* in the association between negative affect and donating. In a second model examining positive affect, we found a main effect of positive affect, $\chi^2(1) = 3.97$, $p = .046$, such that positive affect was negatively associated with donating. We also found a significant positive affect x instructions interaction, $\chi^2(2) = 10.33$, $p = .006$. Positive affect was a relatively more negative predictor of donating during *distance* than *hope*, $\chi^2(1) = 10.01$, $p = .002$, though neither *hope*, $\chi^2(1) = 0.47$, $p = .493$, nor *distance*, $\chi^2(1) = 3.55$, $p = .060$, differed from *view negative* in the association between positive affect and donating. A full factorial model including positive affect, negative affect, instructions, and their interactions found no three-way interaction among these variables, $\chi^2(2) = 0.04$, $p = .980$. No quadratic associations between positive or negative affect and donation rates were observed.

Summary

We found that instructed reappraisal affected both self-reported affect and donation outcomes. Both reappraisal strategies decreased self-reported negative affect, but the *hope* strategy also increased positive affect. Despite equivalent decreases in negative affect, the two reappraisal instructions diverged in donation rates, with higher rates during *hope* than

distance. Seemingly paradoxically, however, negative affect was a positive predictor of donating and positive affect was a negative predictor of donating, though both associations were weaker during *hope* than *distance*. Thus, these two reappraisal approaches diverged both in terms of their effects on donation behaviour and in how they shaped affect-donation associations.

At the individual level, trait reappraisal moderated the effects of instructions in predicting donation rates, yielding particularly positive associations with donating during *hope* reappraisals, suggesting that those with the greatest tendency to reappraise in daily life are most successful in using this reappraisal strategy to increase prosocial behaviour. Given this moderating effect of trait reappraisal, we surmised that if highly altruistic individuals are more proficient in regulating empathic distress, this group may show an even larger effect of an approach-oriented appraisal on donation behaviour. We tested this possibility in Study 2.

Study 2

Methods

Participants

Fifty-eight healthy adults between 21 and 60 years old ($M = 40.74$, $SD = 9.21$) took part in the study for payment (Table 1). Given that this task was completed concurrently with a neuroimaging study (Brethel-Haurwitz et al., 2018; O'Connell et al., 2019), sample sizes were determined using simulations of sample size required for at least 80% power for voxelwise analyses in fMRIPower (SPM Toolkit), specialised software used to determine power estimates for functional MRI (fMRI) data, and pilot data from our previous study of altruistic donors (Marsh et al., 2014). This sample included 30 altruistic kidney donors and 28 controls largely matched on major demographic variables.

Table 1. Study 2 Participant Characteristics.

	Altruists ($n = 30$)	Controls ($n = 28$)	p
Gender (% Male)	11/19 (36.7%)	12/16 (42.9%)	.630
Race (% White)	27/3 (90.0%)	25/3 (89.3%)	.929
Household Income ≥ $60,000	22 (73.3%)	25 (92.6%)	.056
Education ≥ Four-Year Degree	20 (66.7%)	26 (92.9%)	.014
Age *M* (*SD*)	42.70 (10.03)	38.64 (7.89)	.127
IQ *M* (*SD*)	107.45 (12.63)	111.96 (11.39)	.162

Note. Significance value for the age comparison between groups is a Mann-Whitney test due to violation of normality. One control did not report their household income. One altruist declined the KBIT-2 IQ assessment.

Altruistic kidney donors were recruited using mailings and electronic advertisements through local and national transplant organisations. The sample of altruists was limited by the extreme rarity of this behaviour (1,819 such donations in the United States through 2016 according to the Organ Procurement and Transplantation Network (OPTN, 2017)). Because altruists were recruited from across North America, most altruists resided more than a two-hour drive from the university and were provided with airfare and up to two nights' lodging. All altruists had donated a kidney to a stranger unknown to them personally at the time of donation. Twenty-three altruists were non-directed donors for whom the recipient was anonymous at the time of donation. The remaining seven directed their donations to a specific individual whose need for a kidney they had learned about through, for example, a flier or Internet posting. All donations were verified through independent sources, including transplant centre records or media reports. Using data obtained from the Organ Procurement and Transplantation Network (2017), which is administered by the United Network of Organ Sharing under contract with the U.S. Department of Health and Human Services, we confirmed that the altruists recruited for this study were representative of the national population of altruistic donors in terms of sex and race (exact ages are not available for the national sample). Healthy comparison volunteers were recruited from the local community using fliers, online advertisements, and electronic participant databases including ResearchMatch.

Given overlap with the neuroimaging study mentioned above, exclusion criteria for all participants included current use of psychotropic medication, history of head injury or neurological illness, IQ < 80 (as assessed using the Kaufman Brief Intelligence Test - Second Edition (KBIT-2; Kaufman & Kaufman, 2004)), and pregnancy or other contraindications to safe MRI scanning, including metal fragments or implants. Thorough screening of psychopathology was also conducted, in order to ensure group matching on potentially relevant psychological variables. Participants were excluded if they scored above clinical cutoffs for Global Severity, Positive Symptom Distress, or Positive Symptom Total on the Symptom Checklist - 90 (SCL-90; Derogatis & Unger, 2010), due to scores on the Somatization, Obsessive-Compulsive, Depression, Anxiety, Paranoid Ideation, or

Psychoticism subscales. If totals reflected elevated scores on the Interpersonal Sensitivity or Hostility subscales, participants were not excluded. Controls were excluded if they reported having ever volunteered to donate an organ to any individual (not including consenting to become a deceased organ donor), or if they expressed interest in potentially doing so. Specifically, all controls were asked during initial screening if they would be interested in receiving additional information from the Washington Regional Transplant Center about becoming a living organ donor, and 27 potential controls that answered yes to this question were excluded solely for this reason.

All study procedures were approved by the Institutional Review Board at Georgetown University, and all participants provided written informed consent before testing.

Procedures

The empathic emotion regulation task and questionnaires in Study 2 were identical to Study 1. The primary procedural differences from Study 1 were the recruitment of altruistic kidney donors and matched controls in Study 2, and the administration of the task and questionnaires in the context of a larger battery of behavioural tasks and questionnaires following fMRI scanning in Study 2. All participants in this study completed the same battery of behavioural tasks and questionnaires prior to the empathic emotion regulation task, which included the KBIT-2 IQ assessment and several tasks assessing perceptions of emotional facial expressions and emotion-eliciting statements and reactions to familiar vs. unfamiliar faces. Twenty-nine altruists and 26 controls in this study also completed a neuroimaging component prior to the procedures of this study that is reported elsewhere (Brethel-Haurwitz et al., 2018; O'Connell et al., 2019), which included an empathy for pain paradigm and emotional face processing.

As in Study 1, Electrodermal activity (EDA) was measured throughout the task as an index of sympathetic arousal to supplement self-reported affect. Due to task presentation software malfunction affecting timing, physiological data are not discussed further here but are included as Supplementary Material.

Analysis

The goals for analyses for Study 2 were to examine group differences in the effects of instructions, self-reported affect, and trait reappraisal on donation behaviour. The analysis approach followed that of Study 1, with the addition of tests for group differences. Only the first valid response (0 or 1) during donation choice events was counted, with an average donation response rate across the three blocks of 97.93% (range: 83.33-100.00%). As with donation decisions, only the first valid response to each affect rating scale was counted, resulting in an average affect response rate of 94.14% (range: 80.00-100.00%). Given a group difference in education level, a trend toward a group difference in household income, and an age range similar to Study 1, models were also tested with these demographic variables as covariates of no interest.

Results

Effectiveness of reappraisal instructions

As we found in Study 1, main effects of instructions, $F(1.98,110.61) = 35.03$, $p < .001$, $\eta_p^2 = .385$, affect type, $F(1,56) = 150.39$, $p < .001$, $\eta_p^2 = .729$, and an instructions x affect type interaction, $F(2.11,118.06) = 235.65$, $p < .001$, $\eta_p^2 = .808$, were observed. *View neutral* affect ratings were significantly more positive and less negative than all negative blocks, all $p < .001$, all effect sizes > 0.94. There was no evidence of a 2 (affect type) x 4 (instructions) x 2 (group) interaction in affect ratings, $F(2.11,118.06) = 0.23$, $p = .810$, $\eta_p^2 = .004$. Greenhouse-Geisser correction was applied to the main effect of instructions and all interactions with instructions due to violations of sphericity.

Next, affect ratings in the three negative blocks were examined. Wilcoxon signed-rank tests were used when normality was violated. Both *hope*, $W = 1296$, $p < .001$, $r = .515$, and *distance*, $t(57) = 5.41$, $p < .001$, $d = .710$, were rated less negative than *view negative*, suggesting that cognitive reappraisal was again successful in both conditions. *Hope* and *distance* did not differ significantly in their negative affect rating, $t(57) = 0.67$, $p = .506$, $d = .088$, suggesting that with regard to negative affect the two reappraisals were equivalent. As in Study 1, across participants, the *distance* strategy was rated as more difficult, Wilcoxon $W = 879$, $p < .001$, $r = .064$, and less successful, $t(56) = 6.56$, $p < .001$, $d = .870$, than the *hope* strategy. Altruists and controls were similar in their perceptions of success and difficulty in applying the reappraisal strategies, although altruists rated the *distance* strategy as more difficult than controls, Mann–Whitney $U = 268.5$, $p = .028$, $r = .337$. In both *distance*, $W = 279.5$, $p = .012$, $r = .673$, and *hope* conditions, $W = 82.5$, $p < .001$, $r = .904$, affect was rated as significantly

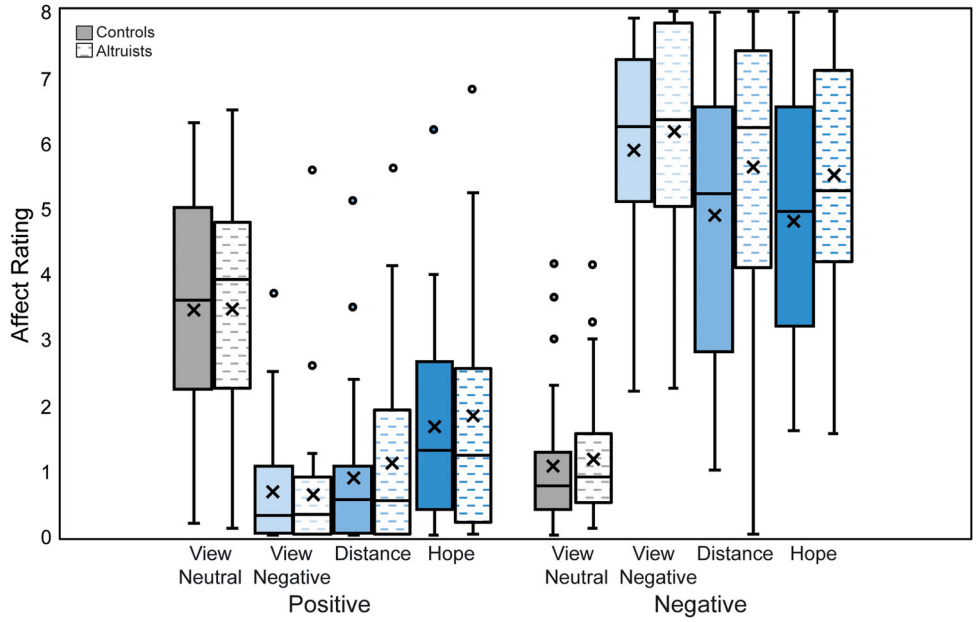

Figure 5. Affect ratings across conditions for altruists and controls. Boxplots display range and quartiles. Means marked by an x. Dots represent outliers.

more positive than in *view negative*. However, affect in *hope* trials was rated as more positive than in *distance* trials, $W = 168.5$, $p < .001$, $r = .803$. Thus, across the Study 2 sample, effects of condition on affect were replicated from Study 1, with an additional finding of increased positive affect during *distance*, though no group differences emerged. See Figure 5 for affect ratings by group across conditions. See Supplementary Results for arousal ratings across conditions.

Donation decisions

Donation responses were analyzed using logistic regression in which the decision to donate on each trial was the binary response variable. First, a model was tested with instructions, group, and their interaction predicting donation behaviour. A main effect of group was observed, $\chi^2(1) = 4.53$, $p = .033$, with altruists (M = .83, SE = .05) donating more than controls (M = .66, SE = .06) overall, but there was no main effect of instructions, $\chi^2(2) = 1.22$, $p = .543$, nor a group x instructions interaction, $\chi^2(2) = 4.04$, $p = .133$ (Figure 6). This pattern of results largely persisted while controlling for demographic covariates, though the main effect of group was no longer significant, $\chi^2(1) = 2.17$, $p = .141$.

Trait reappraisal and its interactions with group and instructions were considered next, given *a priori* expectations that this may be a relevant moderator of reappraisal instructions and findings from Study 1. There was a main effect of trait reappraisal on donation rates, $\chi^2(1) = 8.24$, $p = .004$, in which higher trait reappraisal was associated with higher donation rates overall. However, there was no interaction with instructions, $\chi^2(2) = 2.24$, $p = .327$, group, $\chi^2(1) = 0.18$, $p = .669$, nor with instructions x group, $\chi^2(2) = 0.56$, $p = .756$. This pattern of results persisted with demographic covariates.

Associations between self-reported affect and donation behaviour were examined next, partially replicating patterns from Study 1 and revealing group differences. Examining negative affect and its interactions with group and instructions predicting donation behaviour, there was a main effect of negative affect, $\chi^2(1) = 80.03$, $p < .001$, as was found in Study 1, such that negative affect was positively associated with donating. We also observed a trend-level interaction with group, $\chi^2(1) = 6.70$, $p = .010$, such that negative affect was a relatively less positive predictor of donating in altruists than controls, $\chi^2(1) = 3.74$, $p = .053$, but no other interactions. In a separate model with positive affect and its interactions with group and instructions predicting donation behaviour, there was a main effect of positive affect, $\chi^2(1) = 6.44$, $p = .011$, as was also found in Study 1, such that positive affect was negatively associated with donating.

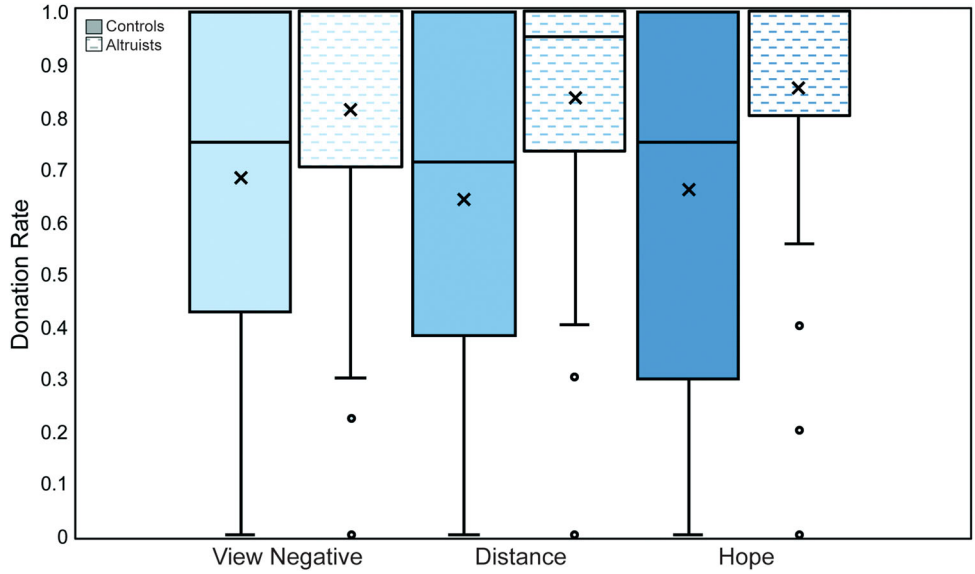

Figure 6. Donation rates by group and condition in Study 2. Boxplots display range and quartiles. Means marked by an x. Dots represent outliers.

We also observed a trend toward an interaction between positive affect and group, $\chi^2(1) = 2.88$, $p = .090$, such that positive affect was a relatively less negative predictor of donating in altruists than controls, $\chi^2(1) = 3.97$, $p = .046$, but no other interactions. Finally, in a full factorial model with positive affect, negative affect, group, instructions, and their interactions predicting donation behaviour, in order to test for a potential four-way interaction, no interaction was observed, $\chi^2(2) = 1.35$, $p = .509$. All of the above results were similar with demographic covariates, though positive affect as a relatively less negative predictor of donating in altruists was reduced to a trend level, $\chi2(1) = 3.56$, $p = .059$. No quadratic associations between positive or negative affect and donation rates were observed.

Trait measures and state mood

As summarised in Supplementary Table 2, altruists and controls generally did not differ significantly in affective trait measures, or in state positive and negative affect as measured by the PANAS, though altruists did report greater empathic concern.

Summary

In Study 2, reappraisal instructions yielded the same effects on negative and positive affect as observed in Study 1. Moreover, we replicated the individual-level relationships between affect and donation behaviour that we observed in Study 1, with negative affect predicting higher donation rates and positive affect predicting lower donation rates. *Distance* was again rated as a more difficult strategy, especially for altruists. While altruists were more prosocial overall (without the inclusion of demographic covariates), neither group's donation behaviour was significantly affected by reappraisal instructions in Study 2. However, the associations between affect and donating varied by group. Specifically, both the positive association between negative affect and donations and the negative association between positive affect and donations were relatively weaker in altruists than controls, mirroring differences between *distance* and *hope* reappraisals observed in the larger community sample in Study 1. Thus, while reappraisal instructions did not yield group differences in donation behaviours between real-life altruists and a comparison sample in this relatively low-cost task, differential associations between affect and donation rates and also strategy difficulty highlight potential differences in how extraordinary altruists apply regulatory strategies to empathic emotion relative to typical adults.

Discussion

The present set of studies described the results of a novel empathic emotion regulation task that

established that participants can successfully engage regulation strategies to shape empathic—not only intrapersonal—distress. Specifically, we compared an approach-oriented hopeful reappraisal of empathic emotion with an avoidance-oriented and hopeless distancing reappraisal of empathic emotion as opposing ends of an appraisal continuum and found that these reappraisals shaped negative and positive affect in consistent ways. Both hopeful and distancing reappraisals reliably reduced negative empathic affect, but only hopeful reappraisals reliably increased positive affect. In both studies, increasing negative affect across individuals was associated with greater actual donations to charity, whereas increasing positive affect across individuals was associated with reduced donations. We also found in our community sample (Study 1) that experimental changes in affect yielded changes in donations to charity. Here, participants donated the most after employing a hopeful appraisal and donated the least after employing an avoidant distancing appraisal, revealing that emotion regulatory strategies can have opposite effects on prosocial outcomes. In Study 2, we found that a rare population of extraordinary altruists were more prosocial overall (though this effect was no longer significant with the inclusion of demographic covariates), although in this study the task manipulation did not yield differences in prosociality across conditions. But altruists' differential associations between affect and donations relative to controls mirrored those of the hopeful reappraisal relative to the avoidant distancing reappraisal in Study 1—with negative affect a relatively weaker positive predictor of donations and positive affect a relatively weaker negative predictor of donations. This suggests that hopeful reappraisals that promote prosociality through effects on negative and positive affect may be a default strategy for such altruists. Together, these findings support a role for emotion regulatory appraisals in shaping empathic emotion and prosociality, while also demonstrating linear (not quadratic) effects of both negative and positive affect on donation behaviour.

These findings also suggest an interesting distinction between between-subject and within-subject influences of affect on prosociality. Across Studies 1 and 2, we found that subjects with stronger negative responses and weaker positive responses to the empathy-eliciting stimuli responded the most prosocially across contexts. This suggests that variation between subjects in negative affective responses to others' suffering across several contexts and samples is a useful—and linear—predictor of prosociality, consistent with heightened affective resonance with distress in extraordinary altruists observed in our prior work (Brethel-Haurwitz et al., 2017; Brethel-Haurwitz et al., 2018; Marsh et al., 2014; O'Connell et al., 2019), and also with theories emphasising the role for concern in promoting prosociality (e.g. Batson, 1991; Nichols, 2001). By contrast, we found that *within*-subjects, the manipulation that reduced negative affect and increased positive affect most promoted prosociality (in Study 1). This finding is also consistent with findings that compassion training increases positive affect in response to distress in others and also promotes prosocial behaviour (Goetz et al., 2010; Singer & Klimecki, 2014). Such findings are also consistent with a role for positive emotions in low cost helping and cooperation (Genevsky et al., 2013; Hauser et al., 2014; Rand et al., 2015). To our knowledge, however, ours is the first study to identify these opposing effects of negative and positive affect between- versus within-subjects in a single study. These findings may help to clarify apparent contradictions in the literature regarding the role of negative and positive affect in prosociality. These findings may also help to clarify why the effectiveness of our manipulations varied across studies—because the effects of negative and positive affect interact to promote prosociality.

The observed pattern of increased positive affect as a result of a hopeful appraisal across samples suggests connections to recent research exploring compassion as an emotion regulatory process supporting empathy and prosociality. Across several studies, Klimecki and colleagues (Klimecki et al., 2014; Klimecki et al., 2013) found that whereas baseline responses to distress in others tended to be characterised by negative affect and neural activation in regions associated with empathy for pain, such as the anterior insula and anterior medial cingulate, compassion training increased positive affect and neural activation in regions associated with affiliation and positive emotional experiences, such as the medial orbitofrontal cortex and ventral striatum, while leaving negative affect intact. Further, empathy training focussed on resonating with others' suffering primarily increased negative affect and associated neural activation, suggesting an antagonism between empathy (here, closer in meaning to personal distress than empathic concern) and compassion as separable neural systems (Klimecki et al., 2014). Lending more support for distinct neural mechanisms of empathic

concern and distress, Ashar and colleagues (Ashar et al., 2017) found that empathic care and distress have distinct neural representations, both of which predict charitable donations, and that while empathic distress is characterised by negative affect, empathic care is a mixed valence state made up of positive and negative affect. Thus, as in our findings, eliciting mixed valance states may better promote prosociality rather than a focus on regulated negative affect.

The findings of Klimecki and colleagues (Klimecki et al., 2013; Klimecki et al., 2014) inspired them to label compassion a "new coping strategy" in the face of potential personal distress in response to a needy other. Engen and Singer (2015) followed up on this interpretation and directly compared a compassionate orientation to traditional cognitive reappraisal, in a study of empathic responses to distress by experts in compassionate meditation. Defining compassion as maintaining a positive emotional state in response to suffering and reappraisal as imagining a more positive ending to the distressing situation, they found that instructed compassion primarily increases positive affect while instructed reappraisal primarily decreases negative affect, with expected diverging modulations of neural activation. Though they did not measure behavioural outcomes of these two appraisals, the authors hypothesised that while compassion would have the expected positive effects on prosociality, reappraisal as they defined it could lead to apathy. The current study provides validation for these predictions, in that combined increased positive and decreased negative affect led to higher donations than decreased negative affect alone.

The current studies are consistent with a growing body of work characterising empathy as a motivated phenomenon (Cameron, 2018; Zaki, 2014; Zaki, 2016), and empirically demonstrate that cognitive reappraisals can promote helping behaviour rather than necessarily causing prosocial apathy. Cameron and colleagues have shown that regulated empathy can lead to a "collapse of compassion" (Cameron & Payne, 2011) and also that people are motivated to avoid empathy via the emotion regulatory strategy of situation selection given its cognitive costs (Cameron et al., 2019). In contrast, the current study clarified associations between empathy, emotion regulation, and helping by balancing this cost–benefit ratio. Empathising and helping were cognitively effortful and monetarily costly in our paradigm, but participants also experienced the benefit of helping a needy and distressed victim and choosing to help was a common response. While the avoidant distancing reappraisal employed here did lead to a more apathetic response toward the victims in the photos, consistent with hopelessness or empathic burnout, the hopeful reappraisal promoted rather than discouraged donation behaviour consistent with heightened compassion for the victims. These diverging effects highlight that the motivational orientation of empathic emotion regulation is important, and that such reappraisals affect prosociality through modulation of both positive and negative affect.

Several methodological limitations should be considered. The donation task was designed to be consistent with prior studies testing the effects of negative and positive affect on donation behaviour in response to vulnerable victims (Genevsky et al., 2013) and also consistent with the experience of donating to a charity in the real world. But Study 2 results may have been affected by the task load from the larger study battery, particularly because reappraisal is an effortful strategy (Sheppes et al., 2009). The relatively low cost of prosociality in these studies is another potential limitation. Stronger contrasts between altruistic kidney donors and non-donors may have been revealed if the stakes of helping had been higher, given the costly behaviour that differentiates the two groups. The generalizability of effects of empathic emotion regulation across donation contexts could be further explored by directly linking stimuli with specific giving opportunities (e.g. Genevsky & Knutson, 2015). Additionally, while participants described strategies consistent with cognitive reappraisal (and specifically consistent with the given instructions for each condition) when queried after the task, it is possible that other emotion regulatory strategies may have been deployed instead of or in addition to reappraisal. For example, participants may have engaged in distraction via attentional deployment in the avoidant distancing condition in particular, perhaps due to the increased difficulty of deploying this approach. There are also myriad ways to reappraise a given situation in order to modulate an emotional response (e.g. adopting a detached perspective like in prior intrapersonal emotion regulation studies to decrease negative affect or perhaps imagining the person in distress is a friend or family member to increase negative affect), and only two were examined here as a first attempt to examine potentially motivationally oppositional approaches. Future work should examine the effects of other reappraisals on empathic emotion. Further, while this initial

investigation of empathic emotion regulation was run in a laboratory setting to ensure task comprehension and also to allow for personal possession of the monetary endowment during task procedures, replication and extension of the findings reported here using larger samples, perhaps through adaptations for online data collection, will be an important next step. The paradigm we used here was designed to mirror those used in prior intrapersonal emotion regulation studies in order to examine how intrapersonal emotion regulation principles can be applied to empathic emotion regulation. However, the fact that this task did not reveal major differences between highly altruistic and typical populations suggests that alternative approaches may be better suited to examine the role of emotion regulation in the real world. Given our findings that trait reappraisal predicted donation behaviour, examining the extent to which individuals engage in empathic emotion regulation in daily life when confronted with distressed others will provide important information on the role of reappraisal in empathy and prosociality.

In sum, cognitive reappraisal can promote low-cost prosociality, though the motivational context of such reappraisal will determine whether empathic concern and helping become more or less likely. More hopeful appraisals may promote prosocial behaviour, whereas avoidant appraisals may lead to apathy and inaction. The current study adds to accumulating evidence that even short-term training in modulating responses to others' suffering can increase non-reciprocal prosocial behaviour toward strangers (Leiberg et al., 2011) and that targeting both negative and positive aspects of the empathic response may be most effective in supporting affiliation with distressed others and consequent helping (Engen & Singer, 2015). Further research into both the independent and interacting effects of negative and positive empathic affect on prosociality may further clarify these patterns. Together, the findings reported here suggest that regulated empathic affect has a role to play in prosociality, but that cognitive reappraisal as it is traditionally defined may not be an important variable in explaining prosocial decision-making among extraordinary altruists.

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Data availability statement

Data are available through the Open Science Framework: https://osf.io/bju2x/.

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