Emotion

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Prosocial Behavior Promotes Positive Emotion During the COVID-19 Pandemic

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The COVID-19 pandemic has raised concerns about humans' physical and mental well-being. In response, there has been an urgent "call to action" for psychological interventions that enhance positive emotion and psychological resilience. Prosocial behavior has been shown to effectively promote well-being, but is this strategy effective during a pandemic when ongoing apprehension for personal safety could acutely heighten self-focused concern? In two online preregistered experiments (N = 1,623) conducted during the early stage of pandemic (April 2020), we examined this question by randomly assigning participants to engage in other- or self-beneficial action. For the first time, we manipulated whether prosocial behavior was related to the source of stress (coronavirus disease 2019 [COVID-19]): Participants purchased COVID-19-related (personal protective equipment, PPE) or COVID-19-unrelated items (food/writing supplies) for themselves or someone else. Consistent with preregistered hypotheses, prosocial (vs. non-pro-social or proself) behavior led to higher levels of self-reported positive affect, empathy, and social connectedness. Notably, we also found that psychological benefits were larger when generous acts were unrelated to COVID-19 (vs. related to COVID-19). When prosocial and proself spending involved identical COVID-19 PPEs items, prosocial behavior's benefits were detectable only on empathy and social connectedness, but not on posttask positive affect. These findings suggest that while there are boundary conditions to be considered, generous action offers one strategy to bolster well-being during the pandemic.

Keywords: COVID-19, prosocial behavior, positive emotion, mental well-being, pandemic

Supplemental materials: https://doi.org/10.1037/emo0001077.supp

The coronavirus disease 2019 (COVID-19) pandemic has posed a significant threat to humans' physical and mental health (Gruber et al., 2020; Pfefferbaum & North, 2020). People around the world have been inundated with COVID-19-related news and death-tolls. At the peak of COVID-19 isolation measures in April 2020, more than 3.9 billion people in 90 countries (Sandford, 2020) were affected by physical distancing or "stay at home" orders which helped to contain the virus but may have also precluded opportunities for meaningful social connections that could alleviate distress (Tull et al., 2020). The pressures of COVID-19 have been associated with sleep disturbance, substance abuse, anxiety, depression, and domestic violence (e.g., Altena et al., 2020; Humphreys et al., 2020; Holmes et al., 2020; Huang & Zhao, 2020). Thus, it is of paramount importance to "*develop novel interventions to protect mental well-being, including those based on positive mechanistically based components*" (Holmes et al., 2020). Here, we examine the efficacy of one potential strategy: helping others.

Humans are an exceptionally prosocial species (Burkart et al., 2014). People frequently give their time, money, skill, blood, and organs to help others (Aknin & Whillans, 2020). In the United States alone, people donated $427.71 billion to U.S. charities in 2018, according to Giving U.S.A. Annual Report on Philanthropy (Giving USA Foundation, 2019). Impressively, prosocial tendencies have been shown to persist—and sometimes flourish—in emergency situations (Zaki, 2020). For instance, data collected in Louisiana following Hurricane Katrina captured prosocial behavior from diverse groups, such as hotels, hospitals, and communities in response to the catastrophe (Rodriguez et al., 2006). Similarly, after the 8.0 magnitude earthquake

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in Wenchuan, Sichuan, Chinese people in the highest areas of destruction displayed more generosity than those in less affected areas (Rao et al., 2011). This phenomenon, termed as "catastrophe compassion," has been observed during COVID-19; people have donated money, blood, and personal protection equipment to help others. Frontline health workers have volunteered to join the "dirty team" to take care of those infected with COVID-19, and people have been providing emotional support to strangers on online message forums (e.g., Butler, 2020).

Selfless acts such as these can provide immeasurable assistance to recipients, but do helpers benefit from enacting prosocial behavior? A mounting body of evidence suggests that engaging in various forms of prosocial behavior can promote emotional well-being, which may stem from the positive experiences uniquely afforded by prosocial behavior, such as increased social connectedness and meaningfulness (Aknin et al., 2013; Aknin et al., 2020; Dunn et al., 2008; Dunn et al., 2014; Klein, 2017; Nelson et al., 2016; Poulin et al., 2013; Weinstein & Ryan, 2010; see Curry et al., 2018; Hui et al., 2020 for meta-analyses). Despite this evidence, it is possible that the COVID-19 pandemic could undermine the positive relationship between prosocial behavior and emotional well-being. Specifically, COVID-19's imminent threat, exceptional spread and ever-increasing death toll may lead to reduced empathy, compassion fatigue and collapse, as well as greater ego-centric thinking (Cameron & Payne, 2011; Todd et al., 2015; Todd & Simpson, 2016; Västfjäll et al., 2014). Indeed, past research on compassion collapse demonstrates that people exposed to greater numbers of disaster victims show lower levels of empathy toward others than those exposed to fewer victims (e.g., Cameron & Payne, 2011; Galak et al., 2011; Kogut & Ritov, 2005; Västfjäll et al., 2014). Moreover, higher levels of uncertainty increase ego-centric thinking (Todd et al., 2015; Todd & Simpson, 2016). These findings are important because past work also suggests that the emotional benefits of prosocial action may only be detectable among actors who have a high degree of care or concern for others (Hill & Howell, 2014; see also Wiwad & Aknin, 2017). Therefore, it is plausible that the threats imposed by COVID-19 may prioritize self-interests, which might then eliminate or even reverse the emotional reward of giving.

On the other hand, a large and growing body of research suggests that the emotional reward of prosocial behavior are robust and detectable in a range of contexts. For example, prosocial behavior has been shown to increase positive affect in rich and poor countries around the globe (Aknin et al., 2013), in small-scale, rural societies (Aknin et al., 2015), in young children (Aknin et al., 2012), and among exoffenders reporting elevated levels of antisocial tendencies (Hanniball et al., 2019). Building on this evidence, we hypothesized that prosocial behavior could enhance emotional well-being, even during an ongoing pandemic when social isolation and mental stress are prevalent (Tull et al., 2020). Specifically, prosocial behavior's proximal outcomes such as increased social connectedness, meaningfulness could satisfy one's social and psychological needs and promote positive affect and well-being (e.g., Aknin et al., 2013; Aknin et al., 2018; Crocker et al., 2017; Hui et al., 2020). Consistent with this possibility, a recent study suggests that people reported experiencing higher levels of emotional well-being on days in which they engaged in more prosocial action during the COVID-19 pandemic (Sin et al., 2021). Thus, it seems plausible that prosocial action may also have a causal impact on well-being, even during the COVID-19 pandemic —the largest collective trauma that most living humans have experienced (Fancourt et al., 2021; Rosenfeld et al., 2021).

In addition to positive affect, research shows that prosocial behavior reduces negative psychological responses, such as distress, anxiety- and depression-related symptoms and even intrusive memories from lab-analogue traumatic experience (e.g., Cialdini & Kenrick, 1976; Doré et al., 2017; Raposa et al., 2016; Varma & Hu, 2022; Wang et al., 2020). Here, we also examined whether prosocial behavior could alleviate subjective worry/fear and intrusive thoughts related to the pandemic. Excessive worry and intrusive thoughts are among the most common reactions to a traumatic event that could lead to anxiety and stress-related disorders (Bomyea & Lang, 2016; Hu et al., 2017; Zoellner et al., 2011). Given that the "altruism as hedonism" account suggests that helping can relieve one's own distress or sadness (Cialdini & Kenrick, 1976; Raposa et al., 2016), we hypothesized that prosocial behavior could reduce negative affect and therefore intrusive thoughts (Marks et al., 2018; Varma & Hu, 2022). However, past research shows that prosocial behavior is more strongly linked with positive emotions than negative emotions (Hui et al., 2020; Jebb et al., 2020; Kushlev et al., 2020). Furthermore, realistic imminent threats imposed by the ongoing pandemic may render negative psychological reactions particularly salient and resistant to change. Therefore, it is possible that prosocial behavior may only enhance positive affect and positive psychological outcomes.

To examine these questions, we conducted two well-powered, preregistered experiments online between April 16–30, 2020, when the number of COVID-19 cases and fear of the virus rose dramatically worldwide. This timing was approximately 1 month after the World Health Organization declared the COVID-19 outbreak a pandemic on March 11, 2020 and the United States administration declared COVID-19 a national emergency on March 13, 2020 (Keith & Gharib, 2020). Infection cases within the US—where our samples were drawn from—nearly doubled from 652,600 on April 15, 2020 to 1,100,000 on April 30, 2020 (John Hopkins Coronavirus Resource Center, n.d.), suggesting that the pandemic was likely a central thought and salient context for many people. In both studies, participants reported their current affect and other psychological states before and after being randomly assigned to either a prosocial or a control condition (Experiment 1: a non-pro-social control condition; Experiment 2: proself conditions), allowing us to probe whether generous action promoted greater emotional and psychological well-being in the context of COVID-19. In Experiment 2, we also manipulated whether the prosocial or proself action was related to the current stressor—the COVID-19 pandemic—or not. Taken together, these studies allowed us to examine whether prosocial behavior (a) enhances positive affect and positive psychological outcomes (e.g., meaningfulness, empathy); and (b) reduces negative affect and negative psychological reactions (fear/worry and intrusive thoughts related to COVID-19) during the COVID-19 pandemic. Moreover, Experiment 2 allowed us to examine whether the emotional reward of prosocial action were moderated by the alignment between one's action and the current stressor (e.g., buying pandemic supplies vs. general supplies).

Materials, data, analytic code, and preregistrations for both studies can be found at https://osf.io/e3kdr. This research was approved by the Human Research Ethics Committee of the University of Hong Kong. Participants provided informed consent prior to participation, and were

debriefed upon completing the study. Participants were paid $3 for their time.

Experiment 1

Method

Participants

An a priori power analysis indicated that we required 398 participants to detect a small effect size of Cohen's $d = 0.25$ with $\beta = 80\%$ and $\alpha = .05$ (one-tailed tests given our directional hypotheses). Our effect size estimate of $d = .25$ was informed by previous preregistered studies using a similar paradigm (Aknin et al., 2020; Hanniball et al., 2019; *d*s = .36, .15), and recent meta-analyses examining prosocial behavior's effect on well-being ($\delta = .28$ in Curry et al., 2018; $d = .26$ in Hui et al., 2020). We preregistered our intention to oversample and collected data from 499 participants on Prolific Academic between April 16–17, 2020 (215 female, age: $M = 26.78$ years old, $SD = 6.08$). The expected exclusion rate (20%–25%) was similar to other online research conducted during the COVID-19 (see Pennycook et al., 2020).

Materials and Procedure

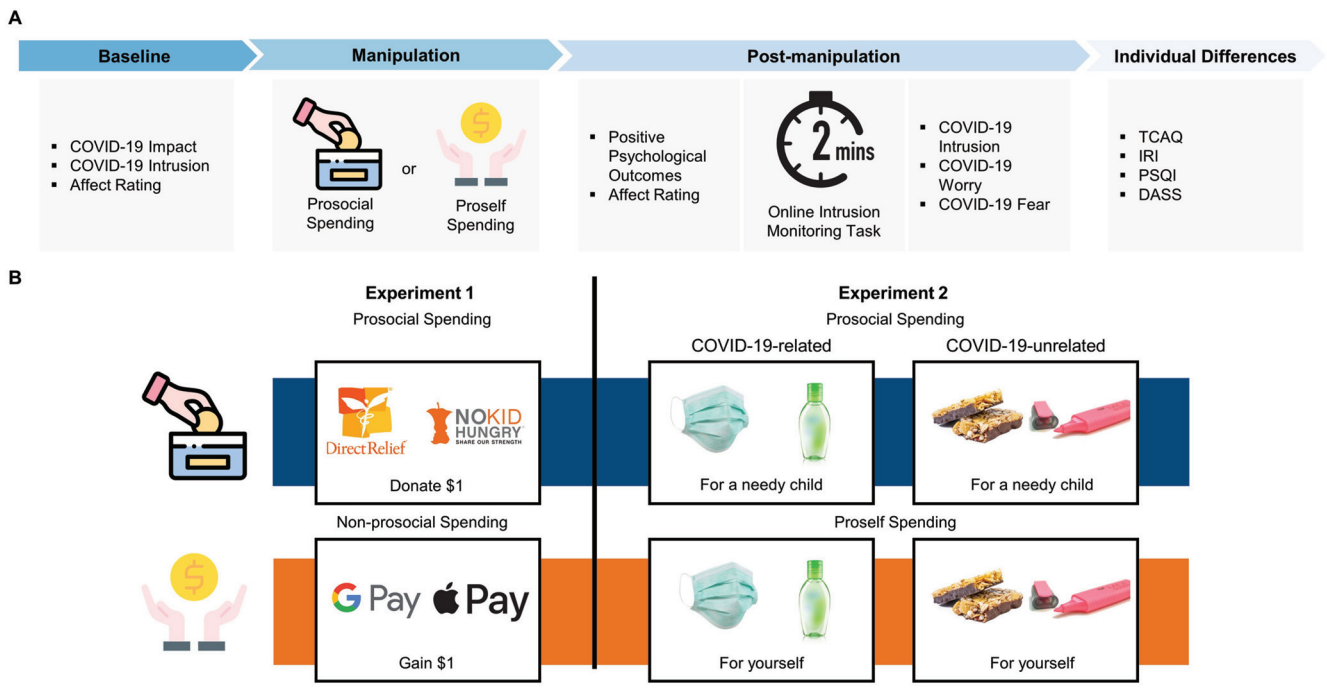
An overview of the experimental procedure is presented in Figure 1. Participants first completed a COVID-19 impact questionnaire which measured (a) their perceptions of COVID-19 infectiousness, death rates, and personal possibility of virus contraction; (b) their positive/negative affect in past 7 days; (c) how COVID-19 had impacted their physical and mental health, work and social life, and distress levels; and (d) their intrusive thoughts related to COVID-19 in the past week. Participants also rated their alertness level on the Stanford Sleepiness Scale (SSS).

Afterward, participants reported their current positive and negative affect (i.e., baseline affect) on a 7-point Likert scale (1 = *not at all* to 7 = *extremely*) for five positive items (inspired, relaxed, enthusiastic, happy, content) and five negative items (hopeless, fearful, anxious, depressed, sad). Cronbach's alphas for positive and negative affect measures were high at baseline and posttask assessments for both experiments (.85–.92).

Following baseline affect ratings, participants were told that they had received a 5 cent voucher that they could use in an upcoming task. Using an adapted version of the online goody bag paradigm from Hanniball et al. (2019), participants were randomly assigned to either a prosocial or a non-pro-social control condition. In the *prosocial condition*, participants read about two U.S. charities: *Direct Relief,* an organization that provides frontline health workers with medical resources (e.g., protective masks, exam gloves and isolation gowns) to protect them from COVID-19; and *No Kid Hungry,* an organization that provides free meals to children when schools are closed due to COVID-19. Participants could use their 5 cent electronic voucher to donate $1 to their preferred charity. Given that autonomy is important for experiencing the emotional reward of prosocial decisions (Weinstein & Ryan,

Figure 1

An Overview of the Experimental Procedures in Experiments 1 and 2



Note. (A) Experiments 1 and 2 task flows and (B) prosocial versus non-pro-social or proself manipulations in Experiments 1 and 2, respectively. In Experiment 2, COVID-relatedness was manipulated using both instructions and the purchased items: whether they were PPEs (masks and hand sanitizers, COVID-19-related) or general supplies that are not directly related to the COVID-19 (snacks and writing supplies, COVID-19-unrelated). COVID-19 = coronavirus disease 2019. See the online article for the color version of this figure.

2010), participants were given the choice to opt-out of donating and keep the cash value (5 cents) for themselves (credited to their Prolific account). As in previous research (e.g., Aknin et al., 2013; Hanniball et al., 2019), we excluded participants who opted out of making a donation in the prosocial condition.

In the *non-pro-social control condition*, participants could choose to transfer the equivalent $1 purchasing power of their 5 cent electronic voucher to their digital wallet for personal use with either *Google Pay*, *Apple Pay,* or they could choose to receive the $1 with their Prolific accounts. To equate the amount of information and choices presented in both conditions, participants in the non-pro-social control condition were given brief descriptions about the digital wallets. After making their financial decision, participants in both the prosocial and non-pro-social control conditions were asked to explain their selection by typing at least 150 characters into a blank text box; we added this novel step to the goody bag paradigm to increase the salience of one's recent prosocial or non-pro-social behavior.

Participants were then asked to complete a five-item questionnaire evaluating their recent actions (α = .88). Statements included: (a) I feel my act is meaningful; (b) My action will have a positive impact; (c) My action makes me feel empathetic for others' needs; (d) My action makes me feel I am social connected with others; and (e) I feel happy. Ratings were made on a 7-point Likert scale (1 = *not at all* to 7 = *extremely*). Participants then reported their posttask positive and negative affect using the same items and scale from the baseline affect measure.

Afterward, participants completed a two-minute COVID-19 thought intrusion monitoring task (adapted from Takarangi et al., 2014). Participants were instructed to click anywhere on the browser whenever they experienced a COVID-19-related intrusive thought. The total number of clicks provided an estimate of COVID-19 intrusive thoughts. To ensure participants did not leave their computer or navigate away from the survey, we asked participants to count the number of times that the letter "A" appeared on the screen among three other letters (L, M, Z) and respond after the intrusion monitoring task. This counting task also served as an attention check. With a correct response of 7, we preregistered our intention to exclude participants who reported <5 or >9 from subsequent analyses.

Following the intrusion monitoring task, participants reported how frequently they thought about COVID-19 during the previous 2 min on a four-item self-report questionnaire (α = .83), which was adapted from the Impact of Event Scale—Revised intrusion subscale (Weiss & Marmar, 1997). A sample item stated, "Thoughts related to COVID-19 suddenly or unexpectedly popped up in my mind," with participants answering on a 7-point Likert scale (1 = *not at all* to 7 = *extremely*). Participants next reported their worry (α = .94) and fear (α = .82) related to COVID-19 (adapted from Ahorsu et al., 2020; Freeman et al., 2020).

Finally, participants provided their demographic information and completed the Interpersonal Reactivity Index (IRI, Davis, 1980), Thought Control Ability Questionnaire (TCAQ, Luciano et al., 2005), Pittsburgh Sleep Quality Index (PSQI, Buysse et al., 1989), and Depression-Anxiety Stress Scale (DASS-21, Lovibond & Lovibond, 1995).

Analysis Plan: Preregistered Analyses

We preregistered our intention to compare conditions on posttask measures using parametric independent sample one-tailed *t*-tests or their nonparametric equivalent (one-tailed Mann–Whitney *U* tests) if data violated normality assumption in the Shapiro-Wilk normality test. When we measured both baseline and posttask scores, we preregistered our intention to use analyses of covariance (ANCOVAs) to compare between-group differences on posttask outcomes, with baseline scores as covariates. We preregistered our plans to exclude participants based on Prolific's bot/duplicate detection algorithm, attention check failures, and so forth (n = 75). While it was an oversight that we did not preregister our plans to exclude participants based on their opt-out decisions, we excluded participants in the prosocial condition who did not engage in a prosocial act (i.e., "prosocial opt-outs"; n = 35) to be consistent with past research (Aknin et al., 2013, 2020; Hanniball et al., 2019). Individual differences between prosocial opt-in and opt-out participants are presented in Table S1. We included all participants in the non-pro-social condition, regardless of their choice, because everyone received $1. The final sample included 182 participants in the prosocial condition and 207 participants in the non-pro-social control condition.

Positive Psychological Outcomes

We examined each individual outcome rating and the overall average rating based on the five positive psychological outcome items.

Positive and Negative Affect

We calculated a mean positive and negative affect score for each participant at both baseline and posttask time points.

Intrusive Thoughts

We calculated (a) the total number of COVID-19 related intrusive thoughts during the 2-min monitoring task and (b) the standardized average score of self-reported intrusion frequencies during the monitoring task.

Subjective Worry/Fear About COVID-19

We computed an average rating of subjective worry and fear, separately, for each participant.

Individual Difference Variables

Each construct was computed following its conventional scoring criterion. We examined whether these individual differences measures moderate the aforementioned results (see online supplemental materials and Tables S6).

Results

Statistical analyses were performed using *R* 4.0 and *JASP* .12.2. Sample sizes, descriptive statistics, and 95% CIs for each outcome measure are presented in Table 1. Cohen's *ds* are calculated based on means and the standard deviations (*SD*) of the prosocial versus non-pro-social control conditions. We report Bayes factors (BF_{10}) to present the likelihood that observed data favor the alternative hypothesis over null hypothesis (H_1 vs. H_0). Based on conventional criterion (Dienes, 2014), $BF_{10} > 3$ suggests conclusive evidence favoring the alternative hypothesis; $BF_{10} < .3$ suggests conclusive evidence favoring the null hypothesis; and BF_{10} between .3 and 3 suggests inconclusive evidence favoring either hypothesis. The following measures violated normality assumptions: average scores and individual ratings from positive psychological outcomes ($ps < .001$), total

Table 1
Experiment 1 Means, SD, 95% CIs, and Cohen's d Effect Size Estimates for Preregistered Outcome Comparisons, Based on N = 389

Outcome measurements	Prosocial (n = 182)	Non-prosocial (n = 207)	d	P_{corr}
Positive outcomes (5-item avg.)	4.80 (1.23) [4.64, 5.01]	3.31 (1.32) [3.14, 3.50]	1.16	<.001
Happiness	4.62 (1.47) [4.41, 4.85]	4.52 (1.54) [4.29, 4.71]	0.06	1.000
Meaningfulness	4.77 (1.56) [4.54, 5.01]	3.48 (1.95) [3.22, 3.75]	0.73	<.001
Positive impact	5.16 (1.38) [4.97, 5.37]	3.69 (1.83) [3.41, 3.94]	0.90	<.001
Empathy	5.07 (1.26) [4.89, 5.27]	2.48 (1.61) [2.27, 2.72]	1.78	<.001
Social connectedness	4.37 (1.59) [4.15, 4.63]	2.39 (1.54) [2.16, 2.59]	1.26	<.001
Positive affect (adjusted mean)	4.01 (0.83) [3.89, 4.13]	3.77 (0.83) [3.66, 3.88]	0.29	.060
Negative affect (adjusted mean)	2.38 (0.77) [2.27, 2.49]	2.00 (0.77) [1.90, 2.11]	0.49	<.001
COVID-19 intrusion frequency	2.47 (3.08) [2.06, 2.95]	2.23 (2.83) [1.88, 2.63]	0.08	1.000
Self-reported COVID-19 intrusions	2.43 (1.21) [2.26, 2.62]	2.29 (1.22) [2.13, 2.45]	0.12	1.000
COVID-19 worry	1.68 (0.94) [1.53, 1.82]	1.56 (1.07) [1.42, 1.71]	0.12	1.000
COVID-19 fear	0.87 (0.72) [0.77, 0.99]	0.81 (0.74) [0.72, 0.91]	0.09	1.000

Note. Cohen's *d*s were calculated using means and *SD*s from the two conditions ($d > 0$: prosocial > non-pro-social). Intrusion frequency refers to number of COVID-19 thought intrusions captured during the 2-min intrusion monitoring task; self-reported intrusions refer to post-task self-reported intrusions. Bonferroni corrected p-values were reported. CI = confidence interval; COVID-19 = coronavirus disease 2019.

number of intrusions ($p < .001$), subjective fear ($p < .001$), and worry ($p = .005$). Given that we did not find the prosocial versus non-pro-social effects in intrusive thoughts nor subjective worry/fear, these results are reported in online supplemental materials.

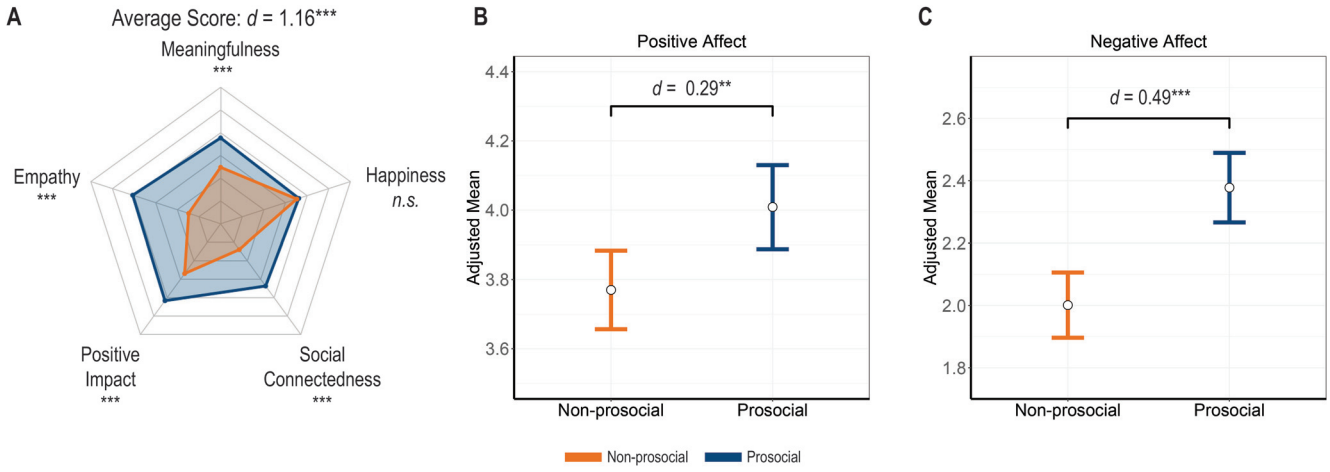
Preregistered Analyses

Positive Psychological Outcomes. Consistent with our preregistered hypotheses, participants in prosocial condition reported higher levels of overall positive psychological functioning (M = 4.80, SD = 1.23) than participants in the non-pro-social control condition (M = 3.31, SD = 1.32), W = 7832; $p < .001$, d = 1.16, $BF_{10} = 2.30 \times 10^{23}$. Similarly, when looking at the individual items, participants in the prosocial condition also reported higher levels of meaningfulness (d = 0.73), positive impact (d = 0.90), empathy (d = 1.78), and social connectedness (d = 1.26; ps < .001, $BF_{10} > 3.00 \times 10^9$, Figure 2A) than participants in the non-pro-social control condition. However, prosocial behavior did not increase happiness on the single-item measure, p = .343, d = 0.06, with BF_{10} = 0.20 showing that the data were 5 times (i.e., 1/0.20) more likely under the null than the alternative model (Table 1).

Positive Affect. Consistent with our preregistered hypothesis, an ANCOVA controlling for baseline positive affect revealed that participants in the prosocial condition reported significantly higher levels of positive affect (M = 4.01, SD = 0.83) after the task than participants in the non-pro-social control condition (M = 3.77, SD = 0.83), $F(1, 386) = 7.97$, p = .005, d = 0.29, with BF_{10} factor showing that the data were 4.77 more likely under the alternative as opposed to the null model (Table 1, Figure 2C).

Negative Affect. Counter to our preregistered hypothesis, an ANCOVA controlling for baseline negative affect revealed that participants in the prosocial condition reported significantly *higher* levels of negative affect (M = 2.38, SD = 0.77) than participants in

Figure 2
Results of Experiment 1



Note. (A) Participants in the prosocial condition reported higher levels of empathy, positive impact, social connectedness, and meaningfulness but not happiness than participants in the non-pro-social condition. (B) Posttask positive affect adjusting baseline positive affect. (C) Posttask negative affect adjusting baseline negative affect. ** $p < .01$. *** $p < .001$. *n.s.* = $p > .05$. See the online article for the color version of this figure.

the non-pro-social control condition after the task ($M = 2.00$, $SD = 0.77$), $F(1, 386) = 23.37$, $p < .001$, $d = 0.49$, with the BF_{10} factor showing that the data were 6,999 more likely under the alternative as opposed to the null model (Table 1, Figure 2D).

Exploratory Analyses Controlling Individual Differences (N = 389)

Participants in the prosocial condition reported significantly higher scores on our measure of baseline alertness (SSS), depression, anxiety (DASS-21), and thought control (TCAQ) than participants in the non-pro-social control condition (see Table S4). Given that these differences could influence posttask affect, we conducted linear regression analyses in which we predicted posttask positive and negative affect using (a) conditions, (b) baseline affect, and (c) all individual difference variables. Results confirmed that conditions remained a significant predictor for posttask positive and negative affect (*p*s $< .02$, see Table S5) while controlling for baseline affect and individual differences.

Discussion

Consistent with our preregistered hypotheses, spending 5 cents to make a $1 donation led to higher levels of positive affect and positive psychological outcomes (except for the one-item measure of happiness) than personally receiving $1. However, counter to our preregistered hypotheses, engaging in a prosocial versus non-pro-social choice did not influence negative psychological outcomes such as intrusive thoughts, subjective worry or fear related to COVID-19. Moreover, while negative affect reduced from baseline to posttask assessments across the entire sample, participants in the prosocial condition reported significantly *higher* levels of negative affect than participants in the non-pro-social control condition. Smaller decreases in negative affect observed among participants in the prosocial condition could have occurred because participants in the prosocial condition were repeatedly reminded about COVID-19, while participants in the non-pro-social condition had their attention temporarily diverted away from COVID-19 during the task. Indeed, reference to the pandemic in the prosocial task may have reminded participants of the suffering the pandemic had caused (e.g., frontline health workers who lack protection gear), contributing to higher negative affect. While this explanation is post hoc and speculative, it aligns with existing evidence documenting a robust association between COVID-19 information exposure and lower well-being and greater distress (e.g., Bu et al., 2020; Gao et al., 2020; Huckins et al., 2020).

One critical limitation is that participants in the prosocial and non-pro-social conditions received "opt-out" choices with different features, which may have also resulted in different perception of autonomy across conditions. Specifically, participants in the prosocial condition decided *whether* to donate $1 to one of two charities or to opt-out, meaning that they would receive 5 cents. Meanwhile, participants in the non-pro-social condition decided *how* they would receive $1 depending on their choices of platforms (Google, Apple, or Prolific). Accordingly, participants in the prosocial condition may have experienced higher levels of autonomy than participants in the non-pro-social condition, which may have influenced results. We addressed this limitation in Experiment 2 wherein participants were offered the choice to opt-in versus opt-out from engaging in a prosocial versus proself act with equivalent outcomes (see Experiment 2 Methods section for details).

Despite the aforesaid limitation, the results of Experiment 1 raise several intriguing questions. First, does prosocial behavior need to be directly related to the source of stress/anxiety (e.g., COVID-19) to have emotional benefits? Second, does reading COVID-19-related information alone increase negative affect in the context of an ongoing global pandemic? To address these questions, we directly manipulated whether purchasing items were related to COVID-19 in a 2 (prosocial vs. proself) $\times$ 2 (COVID-19-related vs. COVID-19-unrelated) between-subjects design (Figure 1B). In the COVID-19-related conditions, participants could purchase either a face mask or hand sanitizer, and they read how these PPEs could be important for health during the COVID-19 pandemic. In the COVID-19-unrelated conditions, participants could purchase either healthy snacks or writing supplies, and they read how snacks/writing supplies could be important for nutrition/academic performance without COVID-19-related information. We also manipulated whether these items were available for purchase for oneself (in the proself condition) or for a needy child (in the prosocial condition). This 2 $\times$ 2 design allowed us to not only examine our preregistered hypothesis examining whether prosocial behavior enhances positive affect during the pandemic, but it also allowed us to examine the main effects of COVID-19-relatedness on participants' emotional responses, as well as their interactions. To our knowledge, this is the first investigation of how prosocial behavior's relatedness to the source of stress (COVID-19 in the present context) may influence its emotional benefits.

Experiment 2

Method

Participants

An a priori power analysis ($\beta = 80\%$, $\alpha = 5\%$) revealed that we required 1,200 participants to detect a relatively small effect size (Cohen's $d = 0.23$) in a 2 (prosocial vs. proself) $\times$ 2 (COVID-19-related vs. COVID-19-unrelated) between-subjects design. Anticipating an exclusion rate of approximately 20%–25% (based on Experiment 1, see also Pennycook et al., 2020), we collected data from 1,421 participants who submitted responses on Prolific Academic (664 female, age: $M = 26.34$ years old, $SD = 6.32$). Participants were randomly assigned to one of the four conditions in our between-subjects design. Data collection began on April 24,2020 and ended on April 30, 2020 when we reached our target sample size.

Materials and Procedure

The procedure was the same as Experiment 1, except (a) we added a self-report measure of perceived competence to the positive psychological outcomes ($\alpha = .91$); (b) we changed prosocial and proself tasks into a 2 $\times$ 2 design (see Figure 1); and (c) we removed the 150-character writing task.

Prosocial Versus Proself Tasks in COVID-19-Related Versus COVID-19-Unrelated Conditions

After completing the baseline survey, participants read that they had received an additional payment of 5 cents in the form of an electronic voucher with a purchasing power of $1. Participants in the *prosocial conditions* could use the $1 to purchase an item for a needy child from a low-income American family through real, online donation campaigns posted on DonorsChoose.org. Meanwhile, participants in the *proself* conditions could use the $1 to purchase equivalent items for themselves. In the COVID-19-related conditions, participants could purchase PPE, such as a reusable face mask or hand sanitizer—two essential hygiene items during the pandemic. In the COVID-19-unrelated condition, participants could purchase healthy snacks or writing supplies—items that were not directly related to COVID-19.

Participants then read information about the importance of the items available. Specifically, in the *prosocial/COVID-19-related* condition, participants were told how PPEs and sanitizer are important in protecting the needy child's health during the pandemic. In the *prosocial/COVID-19-unrelated* condition, participants read how snacks/writing supplies were important for the needy child's nutrition/academic performance, and they did not read any COVID-19-related information. In the *proself* conditions, participants were presented with similar information but beneficiary of each purchase was themselves (see OSF for materials).

Similar to Hanniball et al. (2019), participants could opt-out from making a purchasing choice in all four conditions and keep the cash value (5 cents) for themselves (credited to their Prolific account). The opportunity to opt-out of making a purchase was provided to encourage a sense of volition, which past research shown to be critical for experiencing the emotional reward of prosocial behavior (Weinstein & Ryan, 2010). The higher monetary value gained by making a $1 purchase over claiming 5 cents was intentionally used here to encourage participants to engage in similar purchasing behavior across conditions (see Hanniball et al., 2019 for similar study design). To further discourage opt-outs, participants were informed that the 5 cents would be credited to their Prolific account at a later date in ~3 months.

Participants were informed that the goods they purchased would be delivered to them after the study. At the end of the study, however, to avoid collecting personal data (e.g., mailing address) required for delivery, opt-in participants in the proself conditions were later informed that they would receive the value ($1) credited to their Prolific account (for verbatim instruction, see https://osf.io/bx5ge/).

Preregistered Analyses

Analyses were same as in Experiment 1, except that *t*-tests/Mann–Whitney *U* tests/ANCOVAs were run on prosocial versus proself comparisons within COVID-19-related and COVID-19-unrelated conditions, separately.

We preregistered our plan to explore whether COVID-relatedness moderated the emotional benefits of prosocial behavior with a series of 2 (COVID-19-related vs. COVID-19-unrelated) × 2 (prosocial vs. proself) ANOVAs on positive psychological outcomes, intrusive thoughts frequency from intrusion monitoring task, and on subjective worry/fear. For positive/negative affect, and self-report COVID-19 intrusive thoughts, we conducted mixed 2 (time, baseline vs. Posttask, within-subjects) × 2 (COVID-19-related vs. COVID-19-unrelated, between-subjects) × 2 (prosocial vs. proself, between-subjects) ANOVAs.

We preregistered our intention to analyze the data excluding prosocial opt-out participants. We also preregistered our intentions to present results twice: (a) with proself opt-outs included, and (b) with proself opt-outs excluded. Participants who opted out in the proself condition still made a self-gain (i.e., receiving 5 cents), justifying their inclusion (see also Aknin et al., 2020; Hanniball et al., 2019). On the other hand, excluding proself opt-out participants makes the prosocial versus proself condition more comparable because all remaining participants complied with instructions (i.e., chose to opt-in) and selected an item with an identical cash value (i.e., $1). Detailed exclusions, sample sizes and statistical power are presented in Table 2.

Opt-out rates were not significantly different between COVID-19-related and COVID-19-unrelated prosocial conditions, $\chi^2(1) = 2.01$, $p = .157$. However, we did find meaningful differences between opt-out and opt-in participants. In the prosocial conditions, opt-out participants reported lower scores of empathetic concerns than opt-in participants in both COVID-19-related and -unrelated conditions ($ps < .01$). Across prosocial and proself conditions, opt-out participants reported that they were less impacted by the COVID-19, which may explain why they chose to disengage from the prosocial or proself behavior (see Tables S2–3 for details). Note that these individual differences did not moderate emotional benefits of prosocial behavior (see online supplementary materials).

Results

Means, standard deviations, 95% CIs, and Cohen's *d*s are presented in Tables 3 and 4 for the COVID-19-related and COVID-19-unrelated conditions, respectively. The following measures violated normality assumptions: averaged and individual ratings from positive psychological outcomes ($ps < .001$), intrusions ($p < .001$), subjective fear ($p < .001$), and worry ($p < .004$). Given that we did not find any effects on intrusive thoughts nor subjective worry/fear, these results are reported in online supplemental materials.

Preregistered Confirmatory Analyses: Including Proself Opt-Out Participants N = 1,234

Positive Psychological Outcomes. Consistent with our preregistered hypotheses, participants in the prosocial (vs. proself) condition reported higher positive psychological outcomes in both the COVID-19-related (prosocial, $M = 4.78$, $SD = 1.23$; proself, $M = 3.95$, $SD = 1.43$) and COVID-19-unrelated conditions (prosocial, $M = 4.92$, $SD = 1.31$; proself, $M = 3.35$, $SD = 1.28$, $ds > 0.60$, $ps < .001$, $BF_{10} > 1 \times 10^{11}$), with BF_{10} strongly favoring the alternative hypothesis. Specifically, in the COVID-19-related conditions, prosocial behavior led to greater feelings of happiness, meaningfulness, positive impact, empathy, social connectedness (*d*s: 0.32–0.87, $ps < .001$ $BFs_{10} > 300$), but not competence ($p = .377$, $d = 0.04$, $BF_{10} = 0.14$, Figure 3A, Table 3). In the COVID-19-unrelated condition, prosocial (vs. proself) spending led to elevated reports on all positive outcomes, *d*s = 0.38–1.91, $ps < .001$, with BF_{10} factor showing that the data were 9000 times more

Table 2
Sample Size and Exclusion Information for Experiment 2

Experimental conditions	Entire sample	excluded[a]	Prosocial			Proself			Statistical power[c]
			Entire prosocial sample	Prosocial opt-outs (excluded[b])	Prosocial opt-ins	Entire proself sample	Proself opt-outs	Proself opt-ins	
Experiment 2	1,421	105	652	82	570	664	277	387	
COVID-19-related	706	47	330	48	282	329	127	202	0.81, *0.70*
COVID-19-unrelated	715	58	322	34	288	335	150	185	0.82, *0.68*

Note. COVID-19 = coronavirus disease 2019. [a] Preregistered exclusion criteria, including bot/duplicate detection and attention check failure. [b] We preregistered our intention to exclude participants who chose to opt-out in the prosocial conditions because they did not perform a prosocial act (consistent with Aknin et al., 2013, 2020; Hanniball et al, 2019). The prosocial opt-out rate observed in Experiment 2 was 6.2% (82 out of 1,316), which was comparable to data collected using a similar online prosocial spending paradigm before the COVID-19 pandemic (8.4% prosocial opt-out rate, see Hanniball et al., 2019,Table 1). [c] Statistical power indicates the achieved power in detecting preregistered effect sizes (Cohen's $d = .23$ in Experiment 2, false positive rate = 5%) when sample includes prosocial opt-in participants and entire proself sample (left), and when sample includes prosocial opt-in participants and proself opt-in participants (*right* in italics).

likely under the alternative as opposed to the null model (see Figure 3C, Table 4).

Positive Affect. Consistent with our preregistered hypotheses, ANCOVAs controlling for baseline positive affect revealed that participants in the prosocial condition reported higher posttask positive affect than participants in the proself condition, in both the COVID-19-related condition (prosocial, $M = 3.92$, $SD = 0.84$; proself, $M = 3.63$, $SD = 0.84$, $F(1, 608) = 18.63$, $p < .001$, $d = 0.35$, $BF_{10} = 713.88$, Figure 4A, Table 3) and COVID-19-unrelated condition (prosocial, $M = 4.13$, $SD = .90$; proself, $M = 3.71$, $SD = 0.90$, $F(1, 620) = 34.29$, $p < .001$, $d = 0.47$, $BF_{10} = 1.05 \times 10^6$, Figure 4A, Table 4). Both BF_{10} factors strongly support the alternative as opposed to the null model.

Negative Affect. Counter to our preregistered hypotheses, ANCOVAs controlling for baseline negative affect revealed that postspending negative affect did not significantly differ between prosocial and proself acts in the COVID-19-related conditions, $F(1, 608) = 0.71$, $p = .401$, $\eta_p^2 = .001$, $d = 0.07$, $BF_{10} = 0.12$; nor the COVID-19-unrelated conditions, $F(1, 620) = 0.91$, $p = .341$, $\eta_p^2 = .001$, $d = 0.08$, $BF_{10} = 0.12$ (see Figure 4B, Tables 3, 4). with BF_{10} showing that the data were about 8.3 times (i.e., 1/0.12) more likely under the null than the alternative model.

Preregistered Exploratory Analyses: Including Proself Opt-Out Participants, N = 1,234

Positive Psychological Outcomes. An ANOVA on average positive psychological outcomes revealed a significant condition by COVID-19-relatedness interaction: $F(1, 1230) = 23.90$, $p < .001$, $\eta_p^2 = .019$, with BF_{10} showing the data were 9,736 times more likely under the alternative as opposed to the null model (see Figure 3C). Post hoc Bonferroni-corrected comparisons showed that the prosocial versus proself psychological benefits in the COVID-19-unrelated condition, $t(1,230) = 14.81$, $p < .001$, $d = 1.21$, were nearly twice as large as those in the COVID-19-related condition, $t(1,230) = 7.79$, $p < .001$, $d = 0.62$.

Positive Affect. A mixed ANOVA revealed that the three-way time by COVID-19-relatedness by condition interaction was not significant, $F(1, 1230) = 0.87$, $p = .351$, $\eta_p^2 < .001$, with $BF_{10} = 0.38$ providing inconclusive evidence supporting the alternative model, that is, the data were 2.63 times (1/0.38) more likely under the null than the alternative model. Thus, COVID-19-relatedness did not moderate prosocial behavior's enhancements of positive affect (Figure 4A). However, we found a significant COVID-19-relatedness by time interaction, $F(1, 1230) = 9.67$, $p = .002$, $\eta_p^2 =$

Table 3
Experiment 2, COVID-19-Related Conditions. Means, SDs, 95% CIs, and Cohen's d Estimates for Preregistered Outcome Comparisons

Outcome measurements	Prosocial ($n = 282$)	Including proself opt-out			Excluding proself opt-out		
		Proself ($n = 329$)	d	P_{corr}	Proself ($n = 202$)	d	P_{corr}
Positive outcomes	4.78 (1.23) [4.64, 4.92]	3.95 (1.43) [3.80, 4.11]	0.62	<.001	4.58 (1.16) [4.43, 4.73]	0.17	.223
Happiness	4.50 (1.52) [4.31, 4.67]	4.01 (1.56) [3.83, 4.18]	0.32	<.001	4.35 (1.45) [4.16, 4.53]	0.10	.905
Meaningfulness	5.06 (1.47) [4.89, 5.22]	4.17 (1.87) [3.98, 4.36]	0.52	<.001	4.93 (1.41) [4.73, 5.10]	0.09	1.000
Positive impact	5.32 (1.36) [5.16, 5.48]	4.29 (1.88) [4.09, 4.48]	0.62	<.001	5.23 (1.27) [5.05, 5.40]	0.07	1.000
Empathy	5.18 (1.32) [5.02, 5.34]	3.74 (1.92) [3.52, 3.95]	0.87	<.001	4.42 (1.69) [4.19, 4.62]	0.52	<.001
Social connectedness	4.10 (1.66) [3.91, 4.27]	3.02 (1.74) [2.84, 3.22]	0.64	<.001	3.59 (1.67) [3.37, 3.82]	0.30	.005
Competence	4.52 (1.52) [4.33, 4.70]	4.46 (1.59) [4.29, 4.64]	0.04	1.000	4.96 (1.35) [4.75, 5.13]	−0.30	.019
Positive affect (adjusted mean)	3.92 (0.84) [3.82, 4.02]	3.63 (0.84) [3.54, 3.72]	0.35	<.001	3.77 (0.87) [3.65, 3.89]	0.12	1.000
Negative affect (adjusted mean)	2.23 (0.69) [2.15, 2.31]	2.19 (0.69) [2.11, 2.26]	0.07	1.000	2.19 (0.68) [2.09, 2.28]	0.08	1.000
COVID-19 intrusion frequency	2.41 (2.73) [2.11, 2.76]	2.64 (3.13) [2.30, 2.99]	−0.08	1.000	2.71 (3.09) [2.31, 3.18]	−0.10	1.000
Self-reported COVID-19 intrusions	2.30 (1.11) [2.17, 2.44]	2.35 (1.17) [2.23, 2.49]	−0.04	1.000	2.40 (1.18) [2.24, 2.57]	−0.08	1.000
COVID-19 worry	1.53 (0.97) [1.41, 1.64]	1.63 (0.94) [1.53, 1.74]	−0.10	1.000	1.70 (0.95) [1.57, 1.84]	−0.17	.789
COVID-19 fear	0.79 (0.72) [0.70, 0.87]	0.80 (0.72) [0.72, 0.88]	−0.02	1.000	0.86 (0.77) [0.76, 0.98]	−0.11	1.000

Note. Cohen's d was calculated using means and SDs from the two conditions ($d > 0$: prosocial > proself). Intrusion frequency refers to counts of intrusions during the 2-min intrusion monitoring task; self-reported intrusions refer to posttask self-reported intrusions. Bonferroni corrected p-values were reported. CI = confidence interval; COVID-19 = coronavirus disease 2019.

Table 4
Experiment 2, COVID-19-Unrelated Conditions. Means, SDs, 95% CIs, and Cohen's d Estimates for Preregistered Outcome Comparisons

Outcome measurements	Prosocial (n = 288)	Including proself opt-out			Excluding proself opt-out		
		Proself (n = 335)	d	P_{corr}	Proself (n = 185)	d	P_{corr}
Positive outcomes	4.92 (1.31) [4.74, 5.05]	3.35 (1.28) [3.22, 3.49]	1.21	<.001	3.60 (1.28) [3.41, 3.80]	1.01	<.001
Happiness	4.89 (1.57) [4.70, 5.06]	4.12 (1.57) [3.94, 4.28]	0.49	<.001	4.39 (1.51) [4.17, 4.61]	0.32	.004
Meaningfulness	5.03 (1.54) [4.85, 5.20]	3.36 (1.75) [3.17, 3.53]	1.01	<.001	3.72 (1.74) [3.46, 3.97]	0.81	<.001
Positive impact	5.35 (1.32) [5.19, 5.49]	3.82 (1.72) [3.64, 4.01]	0.99	<.001	4.21 (1.67) [3.94, 4.44]	0.78	<.001
Empathy	5.28 (1.49) [5.08, 5.43]	2.41 (1.51) [2.26, 2.58]	1.91	<.001	2.57 (1.51) [2.32, 2.78]	1.81	<.001
Social connectedness	4.33 (1.73) [4.11, 4.52]	2.38 (1.59) [2.21, 2.55]	1.18	<.001	2.61 (1.63) [2.37, 2.85]	1.02	<.001
Competence	4.62 (1.60) [4.41, 4.78]	4.00 (1.65) [3.82, 4.17]	0.38	<.001	4.14 (1.60) [3.90, 4.36]	0.30	<.010
Positive affect (adjusted mean)	4.13 (0.90) [4.03, 4.23]	3.71 (0.90) [3.61, 3.81]	0.47	<.001	3.83 (0.92) [3.70, 3.97]	0.30	.013
Negative affect (adjusted mean)	2.03 (0.78) [1.94, 2.21]	2.09 (0.78) [2.01, 2.18]	0.08	1.000	2.12 (0.76) [2.01, 2.33]	0.11	1.000
COVID-19 intrusion frequency	2.47 (2.69) [2.21, 2.78]	2.12 (2.53) [1.87, 2.42]	0.13	1.000	2.20 (2.45) [1.85, 2.56]	0.10	1.000
Self-reported COVID-19 intrusions	2.40 (1.16) [2.27, 2.53]	2.26 (1.11) [2.15, 2.38]	0.12	1.000	2.30 (1.08) [2.14, 2.46]	0.09	1.000
COVID-19 worry	1.68 (0.91) [1.56, 1.79]	1.61 (0.97) [1.50, 1.71]	0.07	1.000	1.72 (0.94) [1.59, 1.85]	−0.05	1.000
COVID-19 fear	0.87 (0.71) [0.78, 0.95]	0.87 (0.74) [0.79, 0.96]	−0.005	1.000	0.94 (0.74) [0.83, 1.05]	−0.09	1.000

Note. Cohen's d was calculated using means and SDs from the two conditions ($d > 0$: prosocial > proself). Intrusion frequency refers to counts of intrusions during the 2-min intrusion monitoring task; self-reported intrusions refer to post-task self-reported intrusions. Bonferroni corrected p-values were reported. CI = confidence interval; COVID-19 = coronavirus disease 2019.

.008. To break down this interaction, we calculated positive affect change scores (Time 2–Time 1 positive affect, with higher scores indicating elevated positive affect from baseline to posttask). We found that participants in the COVID-19-unrelated conditions reported higher positive affect enhancements than participants in the COVID-19-related conditions, W = 173236, p = .006, d = 0.17, with BF_{10} showing that the data were 5.26 times more likely under the alternative as opposed to the null model.

Negative Affect. The same three-way interaction on negative affect was not significant $F(1, 1230) = 0.87$, p = .350, $\eta_p^2 < .001$, with the BF_{10} = 0.14 providing conclusive evidence favoring the null model. Again, we found a significant COVID-19-relatedness by time interaction, $F(1, 1230) = 14.68$, $p < .001$, $\eta_p^2 = .012$, with BF_{10} showing that the data were 65.77 times more likely under the alternative as opposed to the null model. To break down this interaction, we calculated negative affect change scores (Time 2–Time 1 negative affect, with negative scores indicating reduced negative affect from baseline to posttask). We found that COVID-19-unrelated participants showed larger negative affect reduction than COVID-19-related participants, W = 210498, p = .001, d = 0.21, with BF_{10} showing that the data were 69.59 times more likely under the alternative as opposed to the null model (Figure 4B).

Preregistered Confirmatory Analyses: Excluding Proself Opt-Out Participants, N = 957

Positive Psychological Outcomes. Consistent with our preregistered predictions, in the COVID-19-related conditions, participants in the prosocial (vs. proself) condition reported higher average positive psychological outcomes, with BF_{10} providing inconclusive evidence favoring the null model (prosocial, M = 4.78, SD = 1.23; proself, M = 4.58, SD = 1.16, W = 25274, p = .017, d = 0.17, BF_{10} = 0.98). Participants in the prosocial (vs. proself) condition also reported higher scores on empathy and social connectedness (ds > 0.30, ps < .001), but not on happiness, meaningfulness, positive impact nor competence (ds = –0.30–.0.10, ps > .070, $BFs_{10} < 0.35$, see Figure 3B, Table 3).

In the COVID-19-unrelated conditions, participants in the prosocial (vs. proself) condition reported significantly higher average positive psychological outcomes, with BF_{10} providing conclusive evidence favoring the alternative hypothesis (prosocial, M = 4.13, SD = 1.31; proself, M = 3.60, SD = 1.28, W = 12268, $p < .001$, d = 1.01, $BF_{10} = 2.34 \times 10^{21}$), as well as higher scores on all six individual items (ps < .001, ds > 0.30, $BF_{10} > 30$, Figure 3D, Table 4).

Positive Affect. In contrast to our preregistered predictions, the ANCOVA controlling for baseline positive affect did not detect a significant difference in posttask positive affect between prosocial and proself spending in the COVID-19-related conditions (prosocial, M = 3.92, SD = 0.84; proself, M = 3.77, SD = 0.87), $F(1, 481) = 1.97$, p = .161, d = 0.13, BF_{10} = 0.25, indicating that the data were 4.00 times (i.e., 1/0.25) more likely under the null model as opposed to the alternative model (see Table 3).

In the COVID-19-unrelated conditions, the same ANCOVA showed that prosocial participants reported higher posttask positive affect compared with proself participants (prosocial, M = 4.13, SD = 0.90; proself, M = 3.83, SD = 0.92), $F(1, 470) = 10.92$, p = .001, d = 0.30, with BF_{10} showing that the data were 18.87 times more likely under the alternative as opposed to the null model (Figure 4A, Table 4).

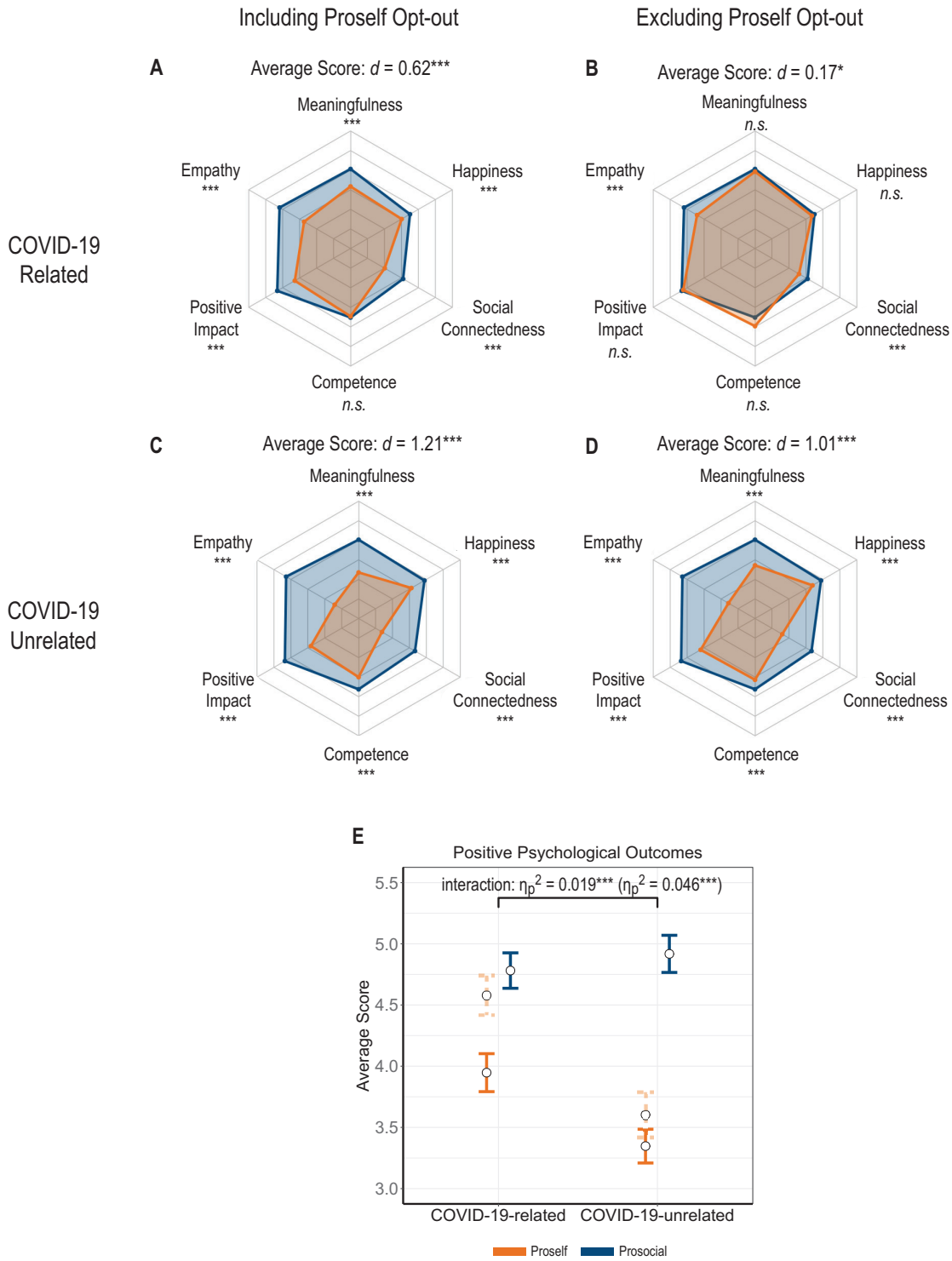
Negative Affect. In contrast to our preregistered predictions, the ANCOVA on posttask negative affect showed there were no significant differences between proself and prosocial spending in the COVID-19-related conditions, $F(1, 481) = 0.82$, p = .366, d = 0.08, BF_{10} = 0.15, nor in the COVID-19-unrelated conditions: $F(1, 470) = 1.31$, p = .253, d = 0.11, BF_{10} = .20, see Figure 4B. BFs_{10} indicate that the data were 6.67 (i.e., 1/0.15) and 5 (i.e., 1/.20) times more likely under the null as opposed to the alternative model.

Preregistered Exploratory Analyses: Excluding Proself Opt-Out Participants, N = 957

Positive Psychological Outcomes. The ANOVA on average positive psychological outcomes revealed a significant condition by COVID-19-relatedness interaction, $F(1, 953) = 45.50$, $p < .001$, $\eta_p^2 = .046$, with BF_{10} providing conclusive evidence favoring

Figure 3

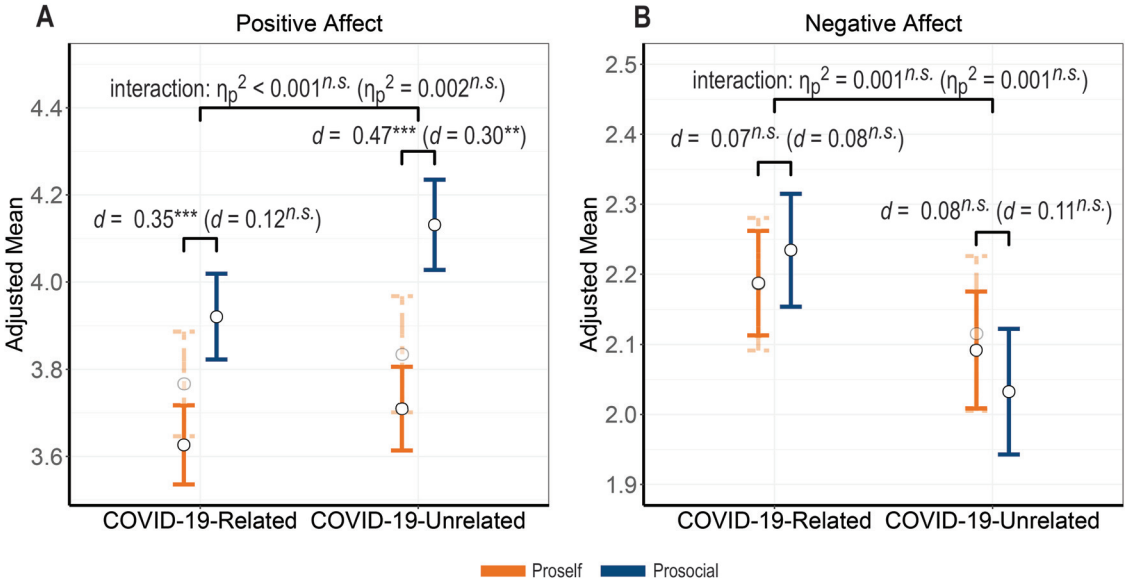
Positive Psychological Outcome Ratings From the COVID-19-Related and COVID-19-Unrelated Conditions in Experiment 2



Note. Results were calculated including proself opt-out participants (Panels A and C) and excluding proself opt-outs (Panels B and D). Panel E depicts the COVID-19-relatedness by prosocial versus proself interaction. While prosocial (vs. proself) behavior led to higher positive psychological outcomes in both conditions, the benefits were significantly larger in the COVID-19-unrelated conditions. Error bars indicate 95% CIs. Dashed lines present the results excluding proself opt-out participants. * $p < .05$. *** $p < .001$. See the online article for the color version of this figure.

Figure 4

Results of Experiment 2 on Posttask Positive and Negative Affect, Adjusting Baseline Affect Measures



Note. (A) Posttask positive affect and B: post-task negative affect reported by participants in the prosocial and proself conditions in COVID-19-related, and COVID-19-unrelated condition. COVID-19 = coronavirus disease 2019. Error bars indicate 95% confidential intervals. Dashed lines and Cohen's ds in parentheses indicate results excluding proself opt-out participants. ** $p <$ .01. *** $p <$.001. *n.s.* = $p >$ .05. See the online article for the color version of this figure.

the alternative hypothesis: $BF_{10} = 2.49 \times 10^8$. Bonferroni-corrected comparisons showed that the prosocial (vs. proself) behavior significantly enhanced positive psychological outcomes in the COVID-19-unrelated condition, $t(953) = 11.15$, $p < .001$, $d = 1.01$, $BF_{10} = 1.17 \times 10^{21}$, while the prosocial versus proself condition difference was not significant in the COVID-19-related condition, $t(953) = 1.75$, $p = .479$, $d = 0.17$, $BF_{10} = 0.51$.

Moreover, among proself participants, purchasing PPEs (i.e., COVID-19-related) increased positive psychological outcomes more than purchasing food/writing supplies (i.e., COVID-19-unrelated): $t(953) = 7.67$, $p < .001$, $d = 0.80$, with BF_{10} showing that the data were 1.62×10^{11} times more likely under the alternative as opposed to the null model, see Figure 3E.

Positive Affect. The time by COVID-19-relatedness by condition three-way interaction on positive affect was not significant, $F(1, 953) = 1.45$, $p = .228$, $\eta_p^2 = .002$, with $BF_{10} = 0.22$, suggesting the data were 4.55 times (i.e., 1/.22) more likely under the null as opposed to the alternative model. In line with the main findings, we found a significant COVID-19-relatedness by time interaction, $F(1, 953) = 4.79$, $p = .029$, $\eta_p^2 = .005$, $BF_{10} = 1.65$. Again, participants in the COVID-19-unrelated conditions reported higher positive affect increases (from baseline to posttask) than participants in the COVID-19-related conditions, $W = 104525$, $p = .020$, $d = 0.16$, $BF_{10} = 1.72$, indicating that the data were 1.72 times more likely under the alternative model as opposed to the null model.

Negative Affect. The time by COVID-19-relatedness by condition three-way interaction on negative affect was not significant, $F(1, 953) = 1.23$, $p = .268$, $\eta_p^2 = .001$, $BF_{10} = 0.21$, suggesting the data were 4.76 (i.e., 1/0.21) times more likely under the null as opposed to the alternative model. Again, we found a significant COVID-19-relatedness by time interaction, $F(1, 953) = 9.17$, $p = .003$, $\eta_p^2 = .01$: participants in the COVID-19-unrelated conditions showed larger negative affect reduction than participants in the COVID-19-related conditions, $W = 125871$, $p = .007$, $d = 0.21$, with BF_{10} showing that the data were 14.87 times more likely under the alternative as opposed to the null model.

Impact of Excluding Proself Opt-Out Participants in Experiment 2

While participants in the proself condition who decided to make a purchase received PPEs and food/writing supplies worth $1, participants in the proself condition who opted-out received a smaller and delayed reward of 5 cents. Thus, excluding proself opt-out participants who were presumably less pleased with their choice increased average ratings on the positive psychological outcome measure and posttask positive affect, thereby minimizing differences between the prosocial versus proself conditions (Figure 3E, Figure 4A, Tables 3–4). The reduced emotional benefit of prosocial (vs. proself) behavior was most evident in the COVID-19-related condition where the effect size dropped from 0.62 to 0.17 on positive psychological outcomes, and from 0.35 to 0.12 on posttask positive affect. (see Table 3) Meanwhile, in the COVID-19-unrelated condition, prosocial behavior's emotional benefits remained significant regardless of inclusion or exclusion of proself opt-out participants. Inspecting Figure 4A also suggests that among prosocial participants, donating PPEs were associated with lower positive affect enhancement ($M = 0.43$, $SD = 0.85$) than donating food/writing supplies ($M = 0.64$, $SD = 1.01$, $W = 36462$,

$p = .035$, $d = 0.23$), which further contributed to the smaller effect sizes of prosocial behavior's benefits observed in the COVID-19-related conditions.

To summarize, we found relatively robust support for the emotional benefits of prosocial behavior during COVID-19. The well-being benefits were most pronounced and reliable in the COVID-19-unrelated conditions, where prosocial behavior consistently increased positive affect and positive psychological outcomes (except for competence), regardless of whether analyses included participants who chose to opt-out of spending on themselves or not. Meanwhile, results were less reliable in the COVID-19-related conditions: When including only opt-in participants from prosocial and proself conditions, prosocial (vs. proself) behavior led to greater overall positive psychological outcomes including empathy and social connectedness, but not happiness, positive impact, meaningfulness, posttask positive affect. Heterogenous effects should be interpreted with caution because several constructs (e.g., competence, meaningfulness) were captured using single-item measures. It is possible that results may differ if longer and more reliable measurement instruments are used in future research.

General Discussion

Supporting the public's mental health and emotional well-being is of paramount importance during a global pandemic when many people are under chronic stress, heightened anxiety and depression (Holmes et al., 2020). With many common sources of well-being and stress reduction being minimized or discouraged to slow the spread of the virus (e.g., in-person communication), people require alternative methods to find happiness, connection, and meaning. In two experiments, we found that online forms of prosocial behavior led to greater positive psychological outcomes (empathy, social connectedness), and greater positive affect than non-pro-social behavior in Experiment 1 and, than proself behavior in Experiment 2. These findings provide novel evidence that small acts of kindness may benefit helpers by bolstering their well-being and psychological resources when facing adversity and a global pandemic.

To our knowledge, this is the first work to probe whether the emotional benefits of prosocial behavior vary as a function of alignment with a source of concern or stressor. In Experiment 2, we showed that when proself opt-out participants were included, prosocial behavior led to greater positive affect and positive psychological outcomes than proself behavior in both COVID-19-related (except for competence) and COVID-19-unrelated conditions. However, when proself opt-out participants were excluded, prosocial behavior's emotional benefits (i.e., greater positive affect and positive psychological outcomes) emerged *only* in the COVID-19-unrelated condition. When prosocial acts involved PPEs as in the COVID-19-related conditions, the benefits of prosocial (vs. proself) action were detectable only on empathy and social connectedness.

The attenuated benefits of COVID-19-related prosocial behavior could be due to the high perceived value and the scarcity of PPEs during the pandemic. While items available for purchase in the COVID-19-related and -unrelated conditions were worth the same value of $1, donating PPEs were associated with lower levels of positive affect than donating food/writing supplies. Indeed, PPEs could be *perceived* as more beneficial for personal use than the snacks or writing supplies given that they protect individuals from being infected. Moreover, PPEs were in extremely short supply when these experiments were conducted in April 2020 (Khazan, 2020), and this scarcity may have further contributed to the heightened perceived value of PPEs over other available items. Therefore, donating valuable yet scarce PPEs could involve greater self-cost, amplify participants' concerns of their own physical safety and thus anxiety. Together, this may induce egocentric thinking and selfish motives in the COVID-19-related prosocial condition, which could have dampened prosocial behavior's emotional benefit (Todd et al., 2015; Todd & Simpson, 2016). Indeed, previous research suggests that prosocial actions motivated by selfish interests undermined the benefits of generous behavior (Hill & Howell, 2014; Wiwad & Aknin, 2017; see also Crocker et al., 2017; Konrath et al., 2012; Qu et al., 2020 on discussions of prosocial motives). Thus, this may help explain why the emotional benefits of prosocial behavior were attenuated in the COVID-19-related conditions.

Results from Experiment 2 also suggested that reading about COVID-19 may have exacted an emotional toll: compared with the COVID-19-unrelated conditions, participants in the COVID-19-related conditions reported lowered positive affect gains and smaller negative affect decreases, regardless of who they were spending on. These findings are consistent with previous research showing that media/news consumption of COVID-19 related information had a negative impact on mental well-being (Bu et al., 2020; Gao et al., 2020; Huckins et al., 2020). These findings are consistent with results from Experiment 1, wherein participants in the prosocial condition read additional COVID-19 information during the donation task and reported smaller negative affect decreases than participants in the non-pro-social control condition. Collectively, these results suggested that while people may already be inundated with COVID-19 information during the pandemic, repeated reminders of the ongoing pandemic may exact an additional toll. In contrast, diverting people's attention away from the pandemic to other information, even temporarily, may confer emotional benefits. Our results also suggest that prosocial acts, particularly when enacted for a cause that is not directly related to the pandemic, could be a fruitful avenue for improving well-being during a pandemic.

It is important to emphasize that prosocial action did not lead to larger reductions in negative affect than proself behavior, nor did prosocial action alleviated negative psychological outcomes, such as intrusive thoughts, as well as fear and worry related to COVID-19. This finding is consistent with past research and theorizing demonstrating that positive affect and negative affect are independent components of subjective well-being (Diener & Emmons, 1984; Diener, 2000) and exist on orthogonal dimensions (Watson & Tellegen, 1985). Therefore, an enhancement of positive affect does not necessitate or imply reductions in negative affect. Supporting this possibility, past research shows that prosocial behavior is more strongly linked with positive emotions than negative emotions (e.g., Curry et al., 2018; Hui et al., 2020; Jebb et al., 2020; Kushlev et al., 2020). Indeed, past work on prosocial spending typically finds that spending money on others consistently leads to benefits in positive emotions, while declines in negative emotions are less consistent, even mixed (e.g., Aknin et al., 2012; Aknin et al., 2018). It is possible that the current global context may also be a source of stability for negative emotions: Fear and worry may be

more resistant to change because of the chronic stress and imminent threat posed by the pandemic.

One precaution in generalizing the present findings is that we found meaningful differences between opt-out and opt-in participants in Experiment 2. Specifically, in both COVID-19-related and -unrelated prosocial conditions, participants who chose to opt-out of engaging in a prosocial act reported lower empathetic concern scores than participants who opted-in and engaged in a prosocial act. Moreover, across both prosocial and proself conditions, opt-out participants reported less impact of the COVID-19 (see Tables S2–3). While these individual differences could help explain why some participants engaged or disengaged from the prosocial or proself behavior, it remains an intriguing question whether prosocial behavior's emotional benefits may only be evident among people with higher empathic tendencies (see Hill & Howell, 2014; Wiwad & Aknin, 2017). Our supplementary analyses (see online supplemental materials) suggested that as long as people voluntarily engage in prosocial acts, prosocial behavior's emotional benefits were not modulated by individual differences of empathetic concerns and by perception of COVID-19 impact. However, given the exploratory nature of the analyses, future evidence is required to draw conclusions.

One possible limitation of the present work is that we only recruited participants from the United States, which may raise questions regarding the generalizability of these findings. The U.S. had some of the highest rates of COVID-19 infection and COVID-19 related deaths since March 26, 2020, especially at the time of data collection (John Hopkins Coronavirus Resource Center, n.d.). As a result, the heightened fear and anxiety surrounding the COVID-19 pandemic provides a theoretically rich backdrop for studying the potential benefits of prosocial behavior. While the present work suggests that prosocial behavior leads to emotional benefits even during the heightened stress of the pandemic, future work should test whether these results generalize to other regions and contexts. We suspect that similar results may emerge elsewhere because the well-being benefits of prosociality have been detected in a variety of different populations and cultural contexts around the world (Aknin et al., 2013). Furthermore, the present studies were preregistered with high statistical power and predetermined analytical plans, which is likely to increase their replicability.

Another limitation of this work concerns the nature of our prosociality manipulations. Admittedly, the prosocial behaviors enacted in Experiments 1 and 2 were relatively low cost in that participants only spent 5 cents to donate $1 worth of goods. On a practical level, this relatively small donation was required so that we could afford to recruit sufficiently large and well-powered samples. Moreover, this detail is consistent with past research wherein large numbers of online participants were provided with the opportunity to make $1 donations or purchase a small item for themselves (Hanniball et al., 2019). Theoretically, the low-cost donations provide a conservative test of our hypothesis (Prentice & Miller, 1992). Future research could test whether these effects generalize to high-cost prosocial behavior enacted during the pandemic. Importantly, however, generous action should not come at the expense of personal safety: risky or excessive generosity can have negative consequences, such as making people feel exhausted and leading to deteriorated mental health (e.g., Cameron & Payne, 2011; Falk & Graeber, 2020; Tei et al., 2014).

Along similar lines, our manipulation of COVID-19 relevance may have not been as clear cut as intended. Indeed, we hypothesized that PPEs were more related to the COVID-19 pandemic than snacks or writing supplies given that the PPEs can protect individuals from being infected by the virus. However, as we note in the introduction, COVID-19 has altered numerous aspects of daily life, such that providing snacks and writing supplies to needy children who were unable to attend school due to closures are not irrelevant forms of helping during the strain of a pandemic. Indeed, various disparities in food and educational access were amplified during the COVID-19 pandemic, meaning that these forms of aid may have been psychologically related to COVID-19. Future research, ideally looking at large and real-world demonstrations of generosity, and prosocial behavior's perceived relatedness with COVID-19, will further elucidate this relationship.

Despite these limitations, our results add to recent research underscoring the importance of prosociality during the COVID-19 pandemic (Brooks et al., 2020; Van Bavel et al., 2020). Our experimental findings converge with recent evidence from a diary study conducted during the COVID-19 pandemic wherein daily helping behavior was associated with higher levels of positive affect (Sin et al., 2021). Recent work has shown that people with higher prosocial motives were more willing to comply with preventive behavior (e.g., physical distancing, Jordan et al., 2021). Enhanced empathy and social connectedness, induced by prosocial behavior, could also motivate people to engage in protective behavior for those vulnerable people (Pfattheicher et al., 2020). Thus, emphasizing prosocial information during this pandemic could have broader social implications in combatting COVID-19 beyond promoting positive affect at an individual level.

Prosocial behavior has been suggested as an effective intervention to protect mental well-being during the unprecedented global pandemic (Holmes et al., 2020). Our research provides the first causal evidence for this argument by demonstrating that generous action leads to higher levels of positive affect during the COVID-19 pandemic than self-directed action. One practical way to implement the present findings is to encourage greater prosocial behavior at a systemic level. For instance, government funding could be used to support social service programs (e.g., job training, food banks etc.) that enable people to help others and improve the well-being of individuals in our society (Aknin & Whillans, 2020). At a societal level, promoting prosocial behavior not only brings emotional benefits to individuals, but could also increase social connectedness and cohesiveness. Future studies may provide deeper insight into how humans may experience positive emotion during a global pandemic via social solidarity—and possibly emerge kinder and happier than they were before.

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