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How Do Stress and Social Closeness Impact *Prosocial* Behavior?

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Abstract. Factors such as time pressure and psychosocial stress may increase or decrease prosocial behavior depending on a number of factors. One factor that consistently positively impacts prosocial behavior is relationship status: Prosocial behavior is more likely toward kin than toward strangers. The interactions among stress, kin relationships, and prosocial behavior were examined in two separate experiments. In Study 1, 79 university students were asked to decide how much money to donate to family members, friends, or strangers, either under time pressure or with no time constraints. Participants donated more to close kin and friends than to strangers, but time pressure did not increase prosocial behavior. In Study 2, 94 university students completed the Trier Social Stress Test for Groups (TSST-G) or a control task, followed by a similar donation task as used in Study 1. Participants donated more to close kin and friends than to strangers, but stress did not influence donation amounts. These results do not support the hypothesis that stress due to time pressure or psychosocial factors increases prosocial behavior.

Keywords: stress, prosociality, decision-making

Prosocial behaviors are intentional actions to help others, including comforting, sharing, and cooperating (Jensen, 2016). Such behaviors occur across animal species and have long-puzzled scientists and philosophers because they make little sense from an evolutionary perspective. Why should one yield their own resources for the benefit of another, especially to nonkin? The ultimate cause of prosocial behavior is thought to be to increase one's inclusive fitness—helping kin carries with it a benefit to one's own genes (Hamilton, 1964). Furthermore, even helping a stranger may benefit one's reputation via indirect reciprocity (see Rand & Nowak, 2013, for review). The proximate causes for prosocial behavior relate to an individual's motivation. A host of psychological factors, including time pressure and psychosocial stress, also impact prosocial behavior.

Time Pressure and Prosocial Behavior

The prevalence of prosocial behavior in humans is demonstrated by the early onset of such behaviors during development and the large amount of both time and money donated to charitable organizations around the world (see Zaki & Mitchell, 2013, for review). Recent work has suggested that prosociality represents the default state in humans (Marsh, 2019; Preston, 2013; Rand et al., 2014, 2012). When time constraints or cognitive load reduces one's cognitive resources, people fall back on default processing and behave in a more prosocial manner. In one example of default prosocial behavior, participants in a Public Goods Game are tasked with deciding how much money to share with a group (donated money is doubled and shared among all participants, while kept money is not doubled and stays with the original participant) either under strict time constraints (less than 7 s) or after waiting for 10 s to make their decision. Those in the time pressure condition contributed more money to the group fund compared to those in the no time-pressure group. Nishi, Shirado, Rand, and Christakis (2015) combined data from four independent studies including nearly 56,000 decisions, showing that cooperation is faster than defection in cooperative environments and the opposite is true in noncooperative environments. The Social Heuristics Hypothesis purports that humans' typical, intuitive response is prosocial, leading to cooperation (Rand et al., 2014). Individuals who are forced to make a decision quickly are more likely to rely on intuitive thinking, which favors prosocial responding (see Rand, Greene, & Nowak, 2012; Zaki & Mitchell, 2013, for review, though see Bouwmeester et al., 2017, for a challenge to this view).

In addition to the Social Heuristics Hypothesis, several other mechanisms are keys for prosocial behavior to take place: direct reciprocity, indirect reciprocity, spatial selection, multilevel selection, and kin selection (see Rand & Nowak, 2013, for review). Direct reciprocity only truly arises when two individuals meet multiple times and can expect to meet again in the future (Trivers, 1971). This pattern prioritizes cooperation in the present, with high expectations for reciprocity in the future when the two individuals meet again. Indirect reciprocity focuses on repeated prosocial actions that may be communicated to a third party (Nowak & Sigmund, 2005). Spatial selection focuses on an individual making a prosocial decision within a group to get ahead for themselves making it more likely to only deal with those who make prosocial decisions in the future (Rand & Nowak, 2013). Multilevel selection occurs if there is competition between both individuals within a group and within groups themselves (Boyd & Richerson, 1990; Traulsen & Nowak, 2006; Wilson, 1975).

Kin selection is closely related to inclusive fitness theory first proposed by Hamilton (1964). This theory states that altruistic or prosocial actions will be favored when $br > c$, with c being the cost and b being the benefit to the individual and the recipient, and r is the relatedness between the individual and the recipient. When two individuals are more related, inclusive fitness theory states that they will be more prosocial toward each other (Foster, Wenseleers, & Ratnieks, 2006). People are also more likely to help those that they *feel* closer to, i.e., friends, as opposed to mere acquaintances. Furthermore, as the cost of helping increases (requiring more time or money), the gap between helping kin more than nonkin widens (Stewart-Williams, 2007).

Stress and Prosocial Behavior

Acute stress exerts widespread effects on behavior. Recent work has focused on how individuals who are under acute stress may make more prosocial decisions such as deciding to trust or cooperate with others (von Dawans, Fischbacher, Kirschbaum, Fehr, & Heinrichs, 2012; see Buchanan & Preston, 2014, and Frisch, Häusser, & Mojzisch, 2015, for reviews). One potential mechanism for the effects of stress on prosociality has been highlighted by the tend-and-befriend hypothesis (Taylor et al., 2000). This hypothesis describes a secondary behavioral stress response that follows the initial fight or flight response. The tend-and-befriend hypothesis postulates a mechanism to mitigate the negative effects of the stressor through enhancing social bonds. Tending involves nurturant activities that protect the individual and offspring while reducing stress. The befriend component deals with the creation and subsequent maintenance of social networks to help deal with a stressor (Taylor et al., 2000). These affiliative actions, in particular befriending, could have evolved as a type of coping mechanism to help accelerate recovery from stress (Floyd et al., 2007). This secondary stress response allows greater flexibility in determining the best course of action when making a decision under stress (Taylor, 2006). Although this hypothesis initially focused on females, more recent work suggests that both sexes may show this tend-and-befriend pattern after the initial stress response (Geary & Flinn, 2002; Taylor, 2006).

One study, in particular, demonstrated that when faced with an acute stressor, individuals engaged in more social approach behavior (von Dawans et al., 2012). After completing a stressful task (the Trier Social Stress Test for Groups; TSST-G), or a control task, participants took part in social interaction games in which real monetary rewards were at stake. Stressed participants were more prone to trusting and sharing with their game partner than those in the control group (von Dawans et al., 2012). Importantly, these results were found in an all-male group of participants, suggesting that the tend-and-befriend pattern is not specific to stressed females (see also Geary & Flinn, 2002; Taylor, 2006). Follow-up work has demonstrated increased trustworthiness and sharing behavior in stressed women (von Dawans, Ditzen, Trueg, Fischbacher, & Heinrichs, 2019). Other studies have shown similar prosocial effects of stress (von Dawans, Ditzen, Trueg, Fischbacher, & Heinrichs, 2019) or cortisol administration (Margittai et al., 2018). These findings support the validity of the tend-and-befriend hypothesis as a secondary behavioral stress response (but see Nickels, Kubicki, & Maestripieri, 2017, who showed such a pattern only in women, but not in men, and Zhang, Ma, & Nater, 2019, who showed that only men reporting low empathic concern and high cortisol response to stress showed increased generosity in a Dictator Game).

Research in this area has been equivocal, however, as several studies have documented an "antisocial" pattern of behavior in response to stress (Bendahan et al., 2017; FeldmanHall, Raio, Kubota, Seiler, & Phelps, 2015; Potts, McCuddy, Jayan, & Porcelli, 2019). In a social version of the trust game in which participants could either "trust" a partner with a monetary investment or "defect" and not share any money with a partner, FeldmanHall et al. (2015) found that stress reduced trusting behavior. Similarly, other groups have reported reduced trust (Potts et al., 2019) and reduced donation behavior (Bendahan et al., 2017) immediately after a stressor.

The Current Investigation

Several studies have shown that stress and time pressure can function similarly in affecting decision-making performance (Edland & Svenson, 1993; Svenson & Benson, 1993). These similarities between time pressure and stress made using them interchangeably across studies a logical choice to address the similarities and differences between how these two factors influence prosocial behavior. We examined the potential effects of time pressure (Study 1) and psychosocial stress (Study 2) on prosocial behavior using a newly developed economic game. In the game, participants were asked to donate hypothetical money ranging from $0 to $100 to different target individuals in need of medical care for the treatment of diabetes. Because we were interested in the effect of kin and friendship on donation amounts, targets included participants' family members (mothers, cousins) as well as nonfamily members (friends, strangers). In Study 1, we used Time Pressure as a between-subjects factor: One group was required to make their decision within 7 s, another group was required to wait for 10 s before making their decision, and a third group was given no information about timing. We predicted that donations would be greater to kin than nonkin targets and that time pressure would increase donation amounts to more distant relatives (cousins) and nonkin targets (strangers), but not to close relatives (mothers) because donation amounts should be at maximum for mothers due to kin selection factors. In Study 2, we tested the effects of stress, rather than time pressure, on donation behavior. Participants in a stress group completed the TSST-G (von Dawans, Kirschbaum, & Heinrichs, 2011) or a nonstressful task before completing the economic donation game. We predicted that those in the stress group would donate more money to more distant targets compared to those in the nonstress group, but that donations to closer targets would be unaffected by stress.

Study 1

Method

Participants

Participants were 90 university students (mean age = 19.1, range: 18–24) who received course credit for participation; participants were randomly assigned to the Time Pressure or No Time Pressure. Eleven participants were excluded for failing to complete the survey in its entirety, specifically, failing to answer donation items in the "Pressure" condition in the allotted time or simply not answering any of the questions. This resulted in a sample size of 79 for data analysis ($n = 31$ in Time Pressure group and $n = 48$ in No Time Pressure). Of these 79 participants, 56 identified as female and 23 as male.

After a review of prior research, we estimated a small effect size ($r = .20$) of time pressure for this mixed 2 (Time Pressure or No Time Pressure) × 3 Target (Mother, Friend, Stranger) design, with Time Pressure as a between-subjects factor and Target as a within-subjects factor. An *a priori* power analysis in G*Power version 3 (Faul, Erdfelder, Lang, & Buchner, 2007) using an effect size estimate of $r = .20$, at $\alpha = .05$ and $\beta = .80$, suggested that 75 participants would be necessary to test our hypothesis, which we exceeded in the current investigation.

Procedure

Both studies were approved by Saint Louis University's Institutional Review Board. Participants were randomly assigned to complete one of two conditions of a donation game implemented in Qualtrics Survey Software (Provo, UT, USA): Time Pressure (decisions must be made in under 7 s) or No Time Pressure (allowed to take as much or as little time as they want). Participants were asked to imagine how much money, up to US $100, they would donate to a target individual who needs medical care for diabetes. Targets included their mother, a friend, and a stranger, presented individually to each participant in a random order (a within-subjects factor). In the time pressure condition, if a participant did not respond in the allotted seven seconds, the survey automatically advanced to the next page; these participants' data were excluded from that Target donation condition.

Data Availability

All data from studies 1 and 2 and other relevant materials are publicly available at https://osf.io/3u6sq/.

Results

Our main hypothesis was tested with a 2 (Time Pressure or No Time Pressure) × 3 Target (Mother, Friend, Stranger) repeated measures ANOVA (analysis of variance). Greenhouse–Geisser-corrected degrees of freedom are reported for all repeated measures analyses to control for the violation of the sphericity assumption (Greenhouse & Geisser, 1959). As expected, participants donated more money to individuals with whom they shared a closer relationship, with the pattern mother > friend > stranger (see Figure 1; main effect of Target closeness: $F(1.74,125.6) = 111.45$, $p < .001$, partial $\eta^2 = .61$). We did not find a significant main effect of Time Pressure ($F(1,72) = 1.32$, $p = .27$, partial $\eta^2 = .02$) nor an interaction between Time Pressure and Closeness: $F(1.74,125.6) < .8$, $p = .4$, partial $\eta^2 = .01$, demonstrating that time pressure did not significantly affect donation amounts across donation targets.

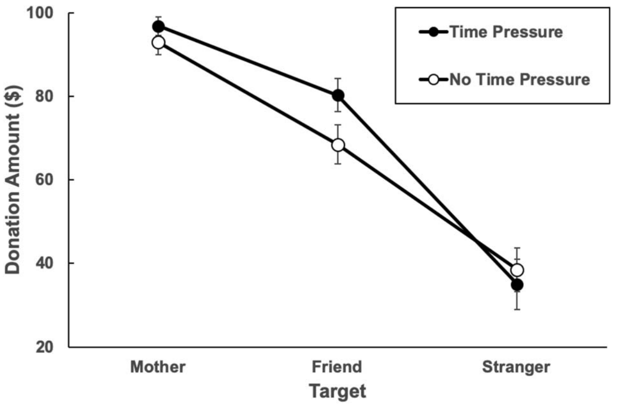

Figure 1. Donation amounts to targets between the time pressure and no time pressure groups from Study 1. Entries show mean ± standard error of the mean (*SEM*).

Note that we tested for gender differences in donation behavior using a Gender × Time Pressure × Target repeated measures ANOVA. We found no evidence for gender differences in donation behavior, nor any interactions with gender and any other factors in the analysis.

Discussion

Study 1 showed that individuals tend to donate more money to those in need to whom they feel closer compared to those to whom they feel more distant. We did not, however, find support for the positive effects of time pressure on prosocial behavior. These results are counter to previous findings on time pressure and prosocial behavior. In Study 2, we aimed to determine whether psychosocial stress impacts prosocial behavior across donation targets who differ in closeness.

Study 2

Method

Participants

Ninety-four university students were recruited (mean age = 19.5, range: 18–26). Exclusion criteria included taking any psychiatric, neurological, or corticosteroid-based medications. Of these 94 participants, 51 identified as female and 43 as male. Females taking any type of steroidal contraceptives were excluded, and the remaining females were tested only during the luteal phase of the menstrual cycle (days 14–25) due to the effects of menstrual cycle phase on cortisol reactivity to stress (see Kirschbaum, Kudielka, Gaab, Schommer, & Hellhammer, 1999; Kudielka & Kirschbaum, 2005).

Sample size determination was based on von Dawans et al. (2012) and FeldmanHall et al. (2015), who each showed an equivalent (Cohen's $d = .6$) main effect of stress on prosocial behavior (importantly, von Dawans et al. (2012) showed that stress *increased* prosocial behavior, and FeldmanHall et al. (2015) showed that stress *decreased* prosocial behavior), and we conducted a power analysis using the following parameters: effect size of $d = .6$, $\alpha = .05$ and $\beta = .80$, which demonstrated that 90 participants would be necessary to test our hypothesis. The final sample size for Study 2 is $N = 94$ for behavioral data (randomly assigned to the in the Stress group; $n = 41$, or the No-Stress group; $n = 53$); however, physiological data from four participants in the Stress group are missing due to experimenter error.

Procedure

Study 2 followed a similar pattern as Study 1, with the exception of Stress replacing Time Pressure as the primary independent variable and "cousin" replacing "friend" as the intermediate donation target. This change was motivated by our interest in addressing the kin selection hypothesis by including two different kin relatives that varied in the closeness of the relationship (mother vs. cousin). The study design was a 2 (Stress or No Stress) × 3 (Target: Mother, Cousin, and Stranger) design with Stress as a between-subjects factor and Target as a within-subjects factor. Participants first completed the TSST-G (von Dawans et al., 2011; Kirschbaum, Pirke, & Hellhammer, 1993) or a placebo version of the TSST adapted for use with groups (see the detailed description below; Het, Rohleder, Schoofs, Kirschbaum, & Wolf, 2009). The TSST-G follows the same procedure as the original TSST but allows for more participants to be run at the same time. The TSST is a commonly used and well-validated method of inducing stress in the laboratory. Our laboratory has successfully implemented the TSST in the study of the physiology of stress and social cognition (Buchanan, Bagley, Stansfield, & Preston, 2012).

The TSST-G consisted of a 10-min anticipation period, followed by a test period of 12 min in total, including 3 min during which each participant delivered a speech and performed mental arithmetic in front of an "audience" of two experimenters while also being videorecorded. At the beginning of the anticipation period, participants were presented with a scenario which formed the basis of their speech. The participants were asked to imagine a hypothetical situation in which they are interviewing for a job; the participant was asked to construct an argument as to why the participant deserves the job over the other interviewees. The 3-min speech, without the use of notes, occurred while standing. After the speech, the participant performed a 2-min mental arithmetic task: serial subtraction of the number 16 from a four-digit number beginning in the 4,000 range as quickly and as accurately as possible. The exact starting number varied between participants to avoid practice and learning effects. Mistakes on the arithmetic task were corrected by the experimenter, and the participant was asked to return to the original number and continue. We note that our implementation of the TSST-G represents an alteration of the time frame of the original TSST-G, in which the job interview portion lasts for 12 min and the arithmetic portion lasts for 8 min.

The TSST-G Control condition was modeled after the TSST-placebo task (Berger, Heinrichs, von Dawans, Way, & Chen, 2016; Het et al., 2009) and required participants to complete the TSST-G, but without any of the stressful components of social evaluation and uncontrollability (see Dickerson & Kemeny, 2004). Participants in the control condition were asked to read aloud a simple text in a low voice, then follow-up with a simple counting task. Participants were explicitly told that they will not be judged on their reading performance. Next, they were instructed to enumerate a series of numbers in increments of 2, 5, 10, or 20 for 8 min. They were watched during this phase by two individuals who did not wear lab coats and who did not interrupt at any point. Furthermore, no video recorder was present throughout the task.

Participants also completed the Subjective Ratings of Stress Scale (SRSS). The SRSS is a four-item scale designed to measure an individual's subjective reports of stress after completing a task (Gaab, Rohleder, Nater, & Ehlert, 2005). The following four statements were rated on a scale of 1, indicating strong disagreement, to 6, indicating strong agreement:

1. This task was stressful for me.
2. I found the task to be a challenge.
3. I knew what I had to do to perform well on the task.
4. I was able to do something to influence the outcome of the task.

Physiological stress responses were assessed by measuring cortisol and salivary alpha amylase (sAA) from saliva. Saliva was collected at four time points using Salivette collection devices (Sarstedt, Nümbrecht, Germany):

1. 2 min before the end of the preparation phase,
2. at the end of the public speaking,
3. at the end of the mental arithmetic, and
4. 10 min after the conclusion of the TSST-G procedure.

After the TSST, participants completed a similar donation task described in Study 1.

After each session, saliva samples were stored in a freezer at −20°C until assayed. Cortisol samples were measured with an immunoassay kit with chemiluminescence detection (CLIA; IBL Hamburg, Germany), and sAA was measured by the quantitative enzyme kinetic method (see Granger, Kivlighan, El-Sheikh, Gordis, Stroud, 2007; Nater & Rohleder, 2009). Intra- and inter-assay coefficients of variation were less than 10%. The lower sensitivity for cortisol is 0.5 nmol/L, and for sAA, 1.5 U/ml.

Results

Two Group (Stress, No Stress) × 4 (Time: Pre-TSST, TSST 1 [post speech], TSST 2 [post mental arithmetic] and 20 min post-TSST) repeated measures ANOVAs were conducted on cortisol and sAA to confirm the effectiveness of the TSST-G to induce an acute stress response. For cortisol, there were significant main effects of both Time (F(1.54, 135.9) = 30.3, p < .001, partial η^2 = .26) and Group (F(1, 88) = 23.3, p < .001, partial η^2 = .21), as well as a significant interaction between Time and Group (F(1.54, 135.9) = 24.7, p < .001, partial η^2 = .22; see Figure 2). These results demonstrate that our stress manipulation was effective at impacting cortisol response. For sAA, the stress group showed significantly greater sAA levels in response to the task compared to the no-stress group. There was a significant main effect of Time (F(2.44, 215.0) = 5.6, p = .002, partial η^2 = .06), and a significant main effect of Group (F(1, 88) = 4.19, p = .04, partial η^2 = .05). There was also a significant interaction between Time and Group (F(2.44, 215.0) = 3.28, p = .03, partial η^2 = .04; see Figure 3), demonstrating different patterns of sAA activity between groups across the TSST. These results conform with previous work showing the typical dynamics of sAA to stress manipulations.

Subjective reports of stress were higher in the stress group (M = 4.2, SD = 1.2) than the no-stress group (M = 2.91, SD = 1.47; t(1, 92) = 4.5, p < .001, Cohen's d = .93).

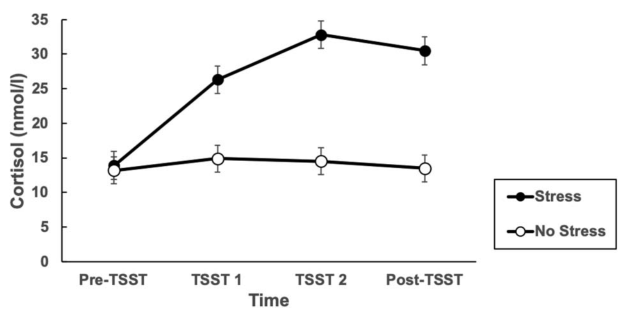

Figure 2. Mean cortisol levels (± standard error of the mean, *SEM*) across TSST time points between the Stress and No Stress groups from Study 2.

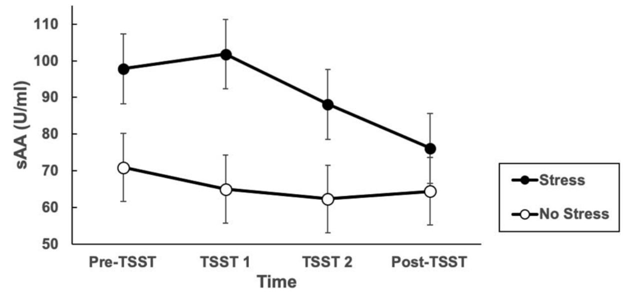

Figure 3. Mean sAA levels (± standard error of the mean, *SEM*) across TSST time points between the Stress and No Stress groups from Study 2. sAA = salivary alpha amylase.

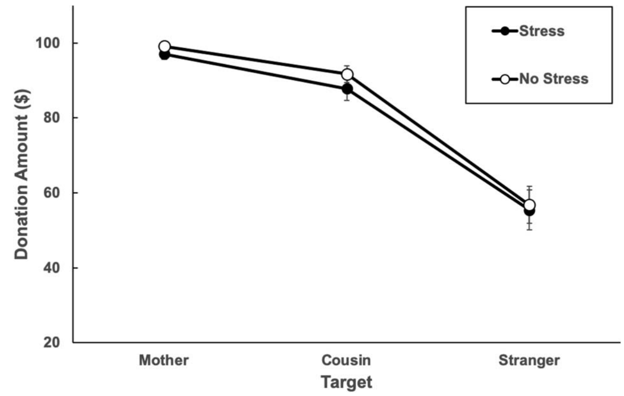

Figure 4. Donation amounts to targets between the Stress and No Stress groups from Study 2. Entries show mean ± standard error of the mean (*SEM*).

Table 1 shows full SRSS data, which demonstrates the psychological impact of the TSST-G. These demonstrate that the TSST-G elicited strong physiological and subjective stress responses.

The effects of stress on prosocial behavior were tested using a 2 (Stress, No Stress) × 3 Target (Mother, Cousin, and Stranger) repeated measures ANOVA. Closer relations received greater donations than did more distant relations with the pattern Mother > Cousin > Stranger (main effect of Target, $F(1.34,123.44) = 116.6$, $p < .001$, partial $\eta^2 = .56$; see Figure 4). Counter to our hypothesis, we did not find a significant interaction between stress and target, $F(1.34,123.44) < 1$, $p > .8$, partial $\eta^2 = .001$, as the Stress and No Stress groups showed a similar pattern of prosocial behavior toward all three targets. Nor did we find a significant main effect of stress on prosocial behavior (no main effect of Group: $F(1, 92) < 1$, $p > .4$, partial $\eta^2 = .005$). Note that we tested for gender differences in donation behavior using a Gender × Stress × Target repeated measures ANOVA. We found no evidence for gender differences in donation behavior, nor any interactions with gender and any other factors in the analysis.

Table 1. Means and *SDs* of the Subjective Ratings of Stress Scale items between groups

Item	Group	Mean	*SD*
This task was stressful for me	Stress	4.17[a]	1.20
	No Stress	2.91	1.47
I found the task to be a challenge	Stress	4.54[a]	1.16
	No Stress	2.53	1.44
I knew what I had to do to perform well on the task	Stress	4.10	1.32
	No Stress	4.81[b]	1.43
I was able to do something to influence the outcome of the task	Stress	4.22	1.08
	No Stress	4.32	1.17

Note. SD = standard deviation.
[a]Indicates significant group difference with the pattern Stress > No Stress.
[b]Indicates significant group difference with the pattern Stress < No Stress.

Discussion

Counter to our hypothesis, participants in the Stress group did not donate more money to any of the targets compared to those in the No-Stress group. Our manipulation checks show that there was a clear difference in psychological and physiological stress responses between the stress and no-stress groups. These responses, however, were not associated with donation behavior. Relational closeness, by contrast, was associated with donation amount, as observed in Study 1.

General Discussion

These studies were designed to examine the relationship between time pressure and stress on prosocial decision-making. Contrary to our predictions, neither time pressure nor stress impacted behavior on our task of prosocial decision-making. Relational proximity to the targets, defined as either kinship or friendship, was a much stronger predictor of prosocial behavior than either time pressure or stress. Ensuring the success of kin is vital to the concept of inclusive fitness, which suggests that any group-living species will have developed mechanisms to allow for the detection of costs and benefits of interacting with a conspecific and securing the success of offspring (Burnstein, Crandall, & Kitayama, 1994; Foster et al., 2006).

Contrary to previous findings (Rand et al., 2012), we found no influence of time pressure on prosocial donation behavior in our first study. The primary studies demonstrating the positive impact of time pressure has focused specifically on pure cooperation, in which there is little opportunity for future consequences for the noncooperator (see Rand, 2016, for meta-analytic review of pure cooperation). By contrast, time pressure exerts no effect when cooperation is strategic, such as when a cooperator can expect a benefit from cooperating from future interactions with a target. Our index of prosocial behavior is focused on making a decision regarding a monetary donation to family, friends, or strangers in need. Such a monetary decision is quite different from measures of either pure or strategic cooperation. The current findings demonstrate that our task may operate more like a "strategic" task such that donators would most likely interact with the recipients after donation opportunity. Such constraints may shift the decision from an intuitive response to more of a deliberation, negating any effect that time pressure may have on the behavior.

Similarly, our results demonstrate no effect of psychosocial stress on prosocial behavior. Manipulation checks such as self-reported stress and increases in cortisol and sAA demonstrate that our stress manipulation was effective. However, the experience of stress exerted no effect on our measure of prosocial decision-making in the current study. A number of previous studies have demonstrated the impact of stress on financial (Schwabe & Wolf, 2009; Starcke, Polzer, Wolf, & Brand, 2011) and social decision-making (van Dawans et al., 2012). The current findings do not support the tend-and-befriend hypothesis (Taylor et al., 2000), which suggests that stress may lead to increased prosocial behavior. The index of prosocial behavior employed in the current investigation focuses on an indirect behavior: the expenditure of hypothetical money to alleviate the suffering of another person. Although this task demonstrated effects of social proximity, in that more money was donated to socially closer targets, neither stress nor time pressure altered behavior. We (Buchanan & Preston, 2014) have proposed that the positive impact of stress on behavior may be limited to situations in which a known, vulnerable target is in direct need of help and when it is obvious how that help may be delivered. The current task, by contrast, may have been too artificial and the prosocial behavior too abstract to be influenced by stress or time pressure. Some work has suggested differences in both behavior and brain activity (Xu et al., 2018) in response to real versus hypothetical monetary gains and losses (see Fantino, Gaitan, Kennelly, & Stolarz-Fantino, 2007, for review). We are not aware of differences in behavior relative to real versus hypothetical monetary donations. Future work should address such limitations to better understand the state influences on prosocial behaviors.

Another limitation of these studies is the use of three donation targets. This choice allowed for experimental brevity but, by only including three categories of social proximity, it does not allow for the results to indicate the construct of "family" or "nonfamily" and how that construct plays into the decision-making process. While the effect of social proximity on donation behavior was documented, the current experimental setup does not help distinguish between closeness more generally and kin specifically. The use of only undergraduate students as participants does not allow for the assessment of decision-making differences across younger and older adults as well as in other socioeconomic groups. It could be that older adults or those in a different socioeconomic group may show different patterns of social and financial decision-making that may well be affected by stress or time pressure.

The results from these experiments lead to a number of questions for future research. For instance, the use of a repeated interaction decision-making tasks could provide more avenues for examining the potential effects of stress and time pressure across different prosocial and cooperative situations. By comparing the differences between repeated and one-shot games, where repeated involves multiple donation trials and decisions between individuals over a course of time and one-shot involves one donation trial and decision between individuals that occurs in an instant. Most time-pressure effects have been seen using one-shot games. These findings, coupled with the pattern of results in the current study, suggest that it would be interesting to directly compare the prosocial decision-making in those who interact with other participants in a one-shot situation versus those who make repeated decisions with others in repeated games. Research on the connection between empathy and altruism has suggested that eliciting empathy in an observer toward a specific target that the observer interacts with leads to greater altruistic behavior toward that specific target (see Batson, 2010, for review). Such a manipulation may be possible in the TSST for Groups in which participants who share in the stressful experience may be more likely to show prosocial behavior toward each other. Research on this relationship may be more ecologically valid than our current design and should be addressed in the future. Future work should also examine how time pressure and stress affect actual prosocial behavior rather than the artificial situations that have more typically been assessed in this line of work.

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