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The impact of affective congruence on charitable giving

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Abstract

Although charitable aid requests often include multiple salient affective features, their interactive effects on donation behavior and the neuropsychological mechanisms underlying their combined influence remain unclear. In four studies, including six behavioral experiments and one Functional Magnetic Resonance Imaging (fMRI) experiment, we examine how the affective congruence of request features influences giving decisions. Across studies, requests with affectively congruent features, regardless of valence, elicited greater donations. The impact of affective congruence was mediated by increased positive aroused affect experienced by donors. Convergently, at the neural level, congruent requests elicited greater activity in the Nucleus Accumbens (NAcc), a brain region associated with positive aroused affect. Increased NAcc activity subsequently predicted donation decisions, bridging responses to stimulus input and behavioral output. These findings suggest that both positive and negatively valenced charitable requests can effectively increase donations if their salient affective features are congruent through neuro-affective mechanisms that support positive aroused affect. These results contribute to a deeper understanding of how affective congruence in charitable appeals engage neural reward systems to drive prosocial behavior. By identifying the NAcc as a bridge from request stimulus to giving behavior, these data illustrate the intersection of emotion, decision-making, and prosociality at both behavioral and neural levels.

Keywords: affect; congruence; charitable giving; prosocial behavior; affect match

Charitable organizations rely on their ability to solicit funds to support people in need. These organizations thus face difficult decisions regarding the content of aid requests, in the context of limited organizational resources and donor attention. Prior research on prosocial behavior has generated a number of compelling but often competing predictions about which features of appeals most effectively elicit aid (Erlandsson et al. 2015, 2018). Specifically, recommendations regarding the relative efficacy of positively or negatively valenced emotional features remain unclear. While real-world aid requests often involve multiple salient features, experimental manipulations have primarily focused on single features of requests. Thus, although the interaction of request features may determine their combined impact on donor behavior, these interactive effects have been understudied. Here, we apply a multimethod approach including behavioral and neural experiments to test whether a common psychological mechanism supports the impact of affectively congruent request features on giving behavior. Specifically, we apply laboratory and online experiments to first establish the effect of congruence on giving. We then use neural measures to identify processes underlying responses to congruent appeals and their subsequent impact on charitable giving behavior.

Previous research has largely focused on the impact of individual features of requests for charitable aid, including, for example, affective images (Burt and Strongman 2000, Small and Verrochi 2009, Genevsky et al. 2013, Fisher and Ma 2014, Chung and Lee 2019) or message framing (Fisher et al. 2008, Chang and Lee 2009, Erlandsson et al. 2016; Requests that elicit greater emotional reactions have reliably been associated with increased prosocial responses (Kogut and Ritov 2005a, 2005b, Small and Verrochi 2009, Genevsky et al. 2013, Genevsky and Knutson 2015). Research on predictors of prosocial behavior has yielded inconsistent evidence, however, regarding the relative impact of positive versus negative valenced affective features. Specifically, while some studies have found that features that elicit negative affect (e.g. guilt or distress) promote charitable behavior (Cialdini et al. 1973, 1987, Carlson and Miller 1987, Burt and Strongman 2000, Small and Verrochi 2009, Baberini et al. 2015), others have found that features that elicit positive affect (e.g. joy or warmth) promote charitable behavior (Carlson et al. 1988, Andreoni 1990, Dunn et al. 2008, Aknin et al. 2012).

Evidence from neuroimaging studies has also suggested that positive affective responses can promote prosocial behavior. Specifically, increased activity in brain regions associated with reward anticipation and the experience of positive affect (Knutson and Greer 2008) predicts choice across a broad range of decision-making contexts, including charitable giving (Kuhnen and Knutson 2005, Moll et al. 2006, Harbaugh et al. 2007, Knutson et al. 2007, Hare et al. 2010, Genevsky et al. 2013, Kuss et al. 2013, Genevsky and Knutson 2015). In one example, the impact of the identifiability of recipients on charitable giving relied on increased neural activity

associated with positive affect, which in turn predicted increased choices to donate (Genevsky et al. 2013).

While these studies have identified single predictors of giving, donor responses likely depend on the interactive impact of multiple request features. In particular, the combined effects of multiple features may be influenced by the extent to which their affective valence matches (Levin et al. 1985, Levin et al. 1998). Counterintuitively, even negatively matched features might also facilitate desired behavior. Previous work suggests that matched stimuli, regardless of valence, are more easily processed and consequently experienced more positively than incongruent stimulus pairs (Winkielman and Cacioppo 2001, Winkielman et al. 2003). The match between message features and context has been demonstrated to positively influence persuasiveness (Lee and Aaker 2004), as well as charitable behavior (White and Peloza 2009). Similarly, congruence between message features and internal psychological states can encourage charitable behavior (Lockwood et al. 2002, Jeong et al. 2011, Mukherjee et al. 2014). Research on charitable giving has not, however, addressed whether affectively evocative features act independently or interactively to influence giving behavior, nor have they elucidated which psychological processes underlie the combined impact of multiple features.

Previous findings support the idea that stimulus features might have an interactive rather than additive effect. The notion that feature congruence could induce a positive subjective experience has connections to processing fluency (i.e. the relative ease of processing a message; Winkielman et al. 2003, Oppenheimer 2008) and its relational fit or "feeling right" (i.e. the subjective sense of importance or correctness; Cesario et al. 2004, Lee and Aaker 2004). For example, research has demonstrated that matched facial expressions in social categorization tasks can enhance perceived value, even superseding the explicit affective impact of the expressions themselves (Winkielman et al. 2015). Physiological measures demonstrate that viewers smile more in response to matched expressions than mixed expressions, even when those expressions are angry. Further, negative stimuli are evaluated more positively when paired with a typical physical manifestation of avoidance (i.e. pushing away) (Centerbar and Clore 2006).

If the affective congruence of charitable request features has a positive impact on emotional experience, matched positive features should elicit a maximum level of positive arousal. Counterintuitively, however, matched negative features might also elicit positive affective experience relative to incongruent stimuli due to the match in valence. Congruent stimulus features that elicit a positive affective experience could then lead to approach-related behavior (Knutson and Greer 2008), such as charitable giving. While consistent with the behavioral predictions of a motivational congruence model (Sherman et al. 2006, Dreisbach and Fischer 2015), these predictions imply that affective congruence (both positive and negative) might elicit a common underlying psychological mediator—positive aroused affect.

Here, we explore the role of affective congruence in charitable giving in four studies, featuring seven experiments involving laboratory, online, and Functional Magnetic Resonance Imaging (fMRI) neuroimaging data collection. Study 1 consists of two experiments that demonstrate an effect of affective congruence of charitable request features on giving behavior. Study 2 provides process evidence that experienced positive affect can account for the influence of congruence on giving. In Study 3, an fMRI experiment offers neural evidence that congruent aid requests evoke positive affective responses, which in turn predict charitable giving. Finally, Study 4 includes three behavioral experiments establishing the replicability and robustness of these findings.

Study 1: the impact of affective congruence on charitable giving

In laboratory (1a) and online (1b) experiments, we explored the impact of valence-matched request features on donation behavior. We hypothesized that affectively congruent request features will lead to increased giving relative to requests with incongruent features.

Methods

Experiment 1a

Fifty-six participants were recruited from a paid community subject pool (mean age = 23.68, SD = 6.78, 33 female). Participants received a cash endowment ($10.00) to make donation decisions, one of which would be selected at random at the end of the session to count "for real." Participants read aid scenarios with either positive or negative messages, presented in a counter-balanced block design. On each trial, participants viewed a single individual in need and used a slider bar to indicate the portion of their endowment to donate. The study included a two (image valence: happy, sad expressions) × two (message valence: positive, negative) within-subjects factorial design. A total of 48 trials were presented to each participant. The dependent measure of interest was the dollar amount donated on each trial. At the end of the session, one trial was randomly selected and implemented. If the participant had chosen to donate on that trial, the amount was removed from their endowment and donated. Otherwise, they retained their full endowment of $10. Demographic descriptions of all study samples are provided in Supplementary Appendix A.

Experiment 1b

Two hundred participants were recruited via the Amazon Mechanical Turk platform (nine were excluded from analyses for failure to complete the experiment, leaving a total of 191 for analysis). The experimental procedure was identical to experiment 1a except that participants chose what portion of a hypothetical $20 endowment they would donate. A total of 30 trials were presented to each participant.

Image valence was manipulated through the facial expressions of the donation recipients in the aid requests. Facial affect was chosen because photographic images of individuals are salient visual elements evident in most real-world aid requests. Facial expressions have the added benefit of being naturalistic stimuli that are easily modified by organizations when crafting solicitations and thus offer a generalizable extension to real-world applications. Facial stimuli were selected from a set of naturalistic photographs of actual charitable loan requesters used in a prior study (Genevsky and Knutson 2015; for sample stimuli, see Supplementary Appendix B). In a pretest, an independent sample of participants provided ratings of facial affect for each photograph on a seven-point scale indexing the valence of the person's facial expression. Photographs in the positive condition received significantly higher valence ratings than those in the negative condition ($t = 44.69$, $P < .001$).

The affective valence of request messages was also manipulated to be either positive or negative. Trials in the positive message condition feature aid scenarios described as opportunities to proactively address a dangerous or unfortunate situation. These scenarios were designed to focus on the opportunity to positively impact individuals in need. Trials in the negative message condition featured aid scenarios that depicted threats posing an immediate danger to the health and well-being of those in need. These messages were designed to focus on alleviating the threat to those in danger. In a pretest, an independent sample of participants

confirmed that messages in the positive message conditions were associated with significantly higher valence ratings than those in the negative message condition ($t=7.74$, $P < .001$; stimuli: Supplementary Appendix C).

Results

In Experiment 1a, a hierarchical mixed-effects regression model explored the influence of affective features and their congruence on donation amount. Models regressed image valence, message valence, and their interaction on donation amount and included random effects of subject-level intercept and slope. While image valence was found to be significantly associated with higher donations ($t=2.50$, $P = .013$), message valence only showed a nonsignificant trend towards an association with higher donations ($t=1.83$, $P = .070$). Importantly, there was a significant interaction effect of affective congruence ($t=3.91$, $P < .001$), characterized by higher donations in trials that included requests with affectively matched features ($4.38) than without ($3.96; Fig. 1). Across the four valence pair conditions, mean donations were higher for the congruent pairs compared to the incongruent pairs (mean ± SEM: pos/pos: 4.39 ± 0.15; neg/neg: 4.38 ± 0.15; pos/neg: 4.03 ± 0.15; neg/pos: 3.89 ± 0.15; Supplementary Appendix D).

In Experiment 1b, the interactive effect of affective congruence replicated, with significantly higher donations in trials with affectively congruent request features ($t=3.822$, $P < .001$) (Fig. 1). There were also significant main effects of both image and message valence (image: $t=3.98$, $P < .001$; message: $t=2.50$, $P = .013$). Across the four conditions, mean donations were again highest for the congruent pairs compared to the incongruent pairs (pos/pos: 11.88 ± 0.23; neg/neg: 11.31 ± 0.24; pos/neg: 11.19 ± 0.23; neg/pos: 10.84 ± 0.24; Supplementary Appendix D).

In summary, in Experiments 1a and 1b, we utilized an incentive-compatible donation paradigm in laboratory and online experiments to establish the impact of the affective congruence of request features on giving behavior. In both experiments, we observed a significant positive effect of affectively matched features on donation amounts.

Study 2: Experienced affect in the congruence effect

In Study 2, we sought to dissociate two potential psychological mechanisms underlying the impact of affective congruence on giving. First, if the congruence effect is explained by a generalized increase in affective response (regardless of valence), donors should give more based on higher experienced positive affect to the positive attribute pairs, but conversely, based on higher experienced negative affect to the negative attribute pairs. Alternatively, if congruence instead elicits positive affect regardless of stimulus valence, increased experienced positive affect should drive donations in both positive and negative paired conditions.

Methods

Two hundred participants were recruited via the Amazon Mechanical Turk platform (11 excluded for failure to complete the experiment, leaving 189 for analysis). As in Study 1, participants read positive and negative aid scenarios presented in counter-balanced blocks. On each trial, participants viewed a single individual in need and used a slider bar to indicate the portion of a hypothetical $20 endowment they would choose to donate. The study included a two (affective facial expression: positive, negative) × two (request framing: positive, negative) within-subjects factorial design. A total of 30 trials were presented to each participant.

Subsequently, participants rated their own affective response to each of the donation requests immediately following the donation task using two seven-point scales—one indexing valence (positive–negative) and the other indexing arousal (highly arousing–not arousing). The valence and arousal ratings were transformed into positive-arousal and negative-arousal scores to be used as measures of self-reported affect. Positive and negative aroused affect are dissociable constructs and theoretically more closely associated with approach and avoidance motivational states than valence alone (Knutson et al. 2014). They have also been used in prior research to effectively predict prosocial choices (Genevsky et al. 2013, Genevsky and Knutson 2015). Within-subject mean-deviated valence and arousal scores were projected onto positive and negative arousal axes rotated 45° (i.e. positive arousal=(arousal/√2) + (valence/√2); negative arousal=(arousal/√2) – (valence/√2); (for further details, see Watson et al. 1999, Kuhnen and Knutson 2005, Knutson et al. 2014).

Results

As in Study 1, we first explored the behavioral effect of congruence on donations. A hierarchical mixed-effects regression model regressed image and message valence on donation amount and included random effects of subject intercept and slope. The interaction effect of affective congruence replicated ($t=3.79$, $P < .001$; Fig. 2A), indicating significantly higher donations in response to requests
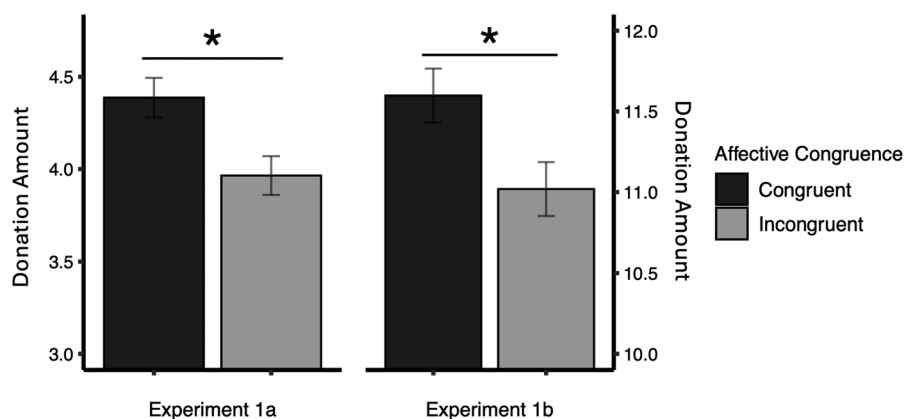

Figure 1. Affective congruence increases donations. In the laboratory experiment (Experiment 1a) and replication (Experiment 1b), there was a significant effect of affective congruence in aid requests on donation amount. In both cases, requests with affectively congruent features received significantly higher donations. Error bars represent standard errors of the mean.
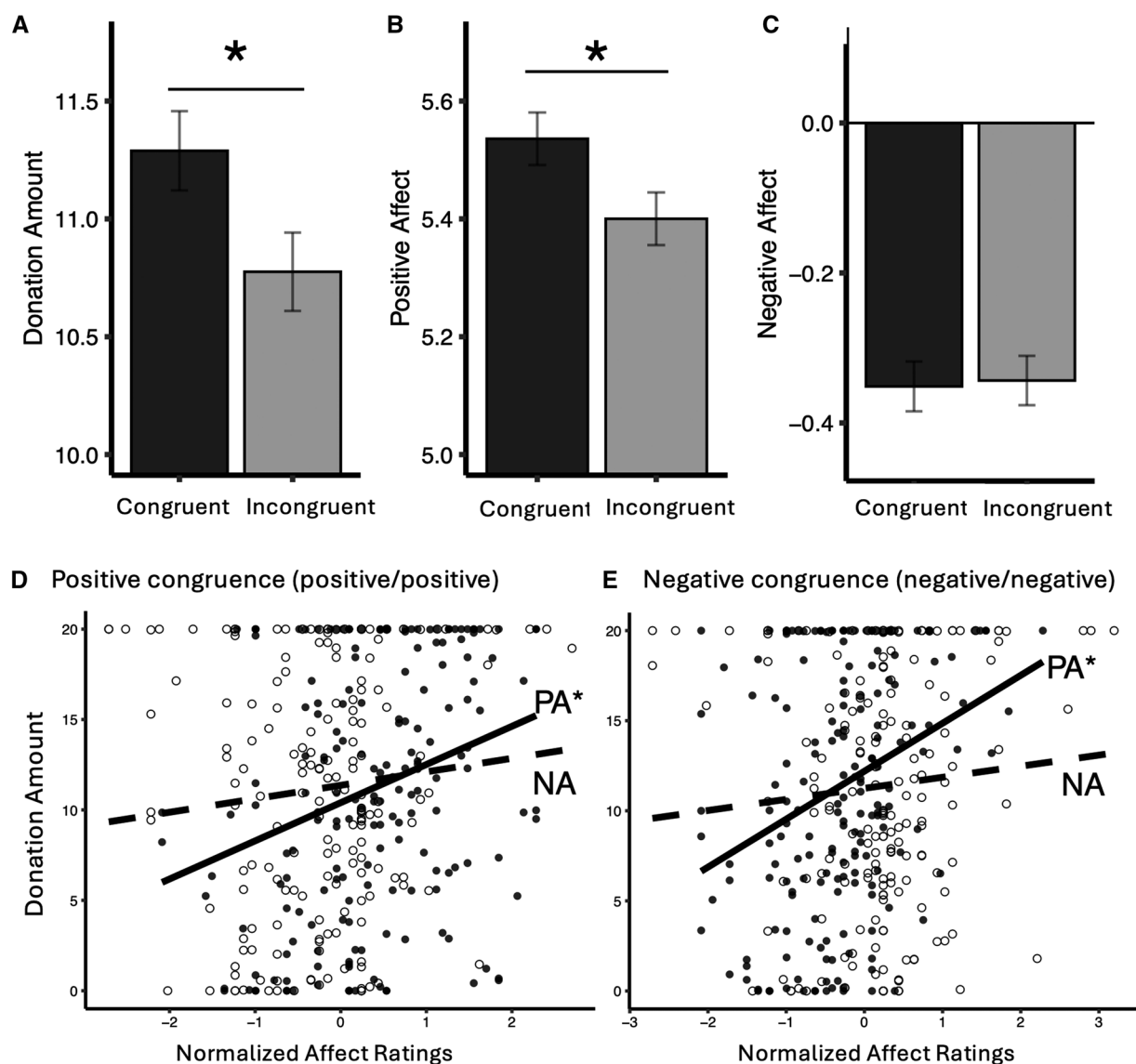
Figure 2. Associations between congruence, self-reported affect, and giving behavior. Congruence in affect feature of donation requests leads to significantly higher donations (2A) and positive affect ratings (2B). Negative affect ratings do not significantly differ (2C). Self-reported positive affect (PA), but not negative affect (NA), is significantly associated with donations for both positive/positive (2D) and negative/negative (2E) congruent conditions. Error bars are SEM.

with affectively matched features ($11.29 vs. $10.95). Further analyses of the main effects of image and message valence indicate that positively valenced images were independently associated with higher donations ($t=3.08$, $P=.002$). Positively valenced messages were not, however, significantly associated with higher donations ($t=0.33$, $P=.739$). As in Studies 1a and 1b, across the four conditions, mean donations were higher in the congruent pairs compared to the incongruent pairs (pos/pos: 11.20 ± 0.24; neg/neg: 11.38 ± 0.24; pos/neg: 11.08 ± 0.23; neg/pos: 10.46 ± 0.24; Supplementary Appendix D).

Next, we explored the impact of congruence on experienced affect. Hierarchical mixed-effects regression models assessed the association between image and message valence and positive and negative affect ratings and included subject-level random intercept and slope. Results revealed a significant interaction effect of affective congruence on self-reported positive affect ($t=3.22$, $P=.001$) with higher positive affect reported for congruent trials (Fig. 2B). Conversely, there was no significant impact of congruence condition on negative affect ratings ($t=-0.27$, $P=.790$; Fig. 2C). To further

explore whether the impact of affective congruence on self-reported affect differed by affect type, we assessed the interaction between congruence condition (congruent vs. incongruent) and affect rating type (positive vs. negative). A hierarchical mixed-effects model predicting affect ratings with fixed effects of congruence and affect type (and random effects of subject intercept), revealed a significant interaction effect ($t=5.40$, $P < .001$). This finding further supported previous work suggesting that affective congruence most directly influences positive affective experience.

We then assessed the association of the affect ratings with donations. Hierarchical linear regression models predicted donations with positive and negative affect ratings and included random effects of subject intercept and slope. Only positive affect ratings were significantly associated with donations ($t=4.76$, $P < .001$). Negative affect ratings showed no significant association ($t=1.38$, $P = .171$). Thus, self-reported positive affect was uniquely associated with eventual donation decisions.

We next tested the hypothesis regarding the process underlying the effect of congruence on donations. If experienced positive affect

elicited by congruent request features can account for the effect, we would expect a significant association between self-reported positive affect in both positive/positive and negative/negative pairs. Alternatively, if a general increase in affective response to congruent features can account for the effect, we would expect negative affect ratings to be associated with donations in the negative/negative trials. To compare these accounts, we repeated our analysis independently for the positive/positive and negative/negative trials. Indeed, in both trial types, positive affect was significantly associated with donations (pos/pos: $t = 3.84$, $P < .001$; neg/neg: 4.36, $P < .001$) (Fig. 2D), but negative affect was not (pos/pos: $t = 1.29$, $P = .199$; neg/neg: $t = 1.06$, $P = .290$) (Fig. 2E). This pattern of findings suggests that the psychological processes responsible for the impact of affective congruence on giving behavior across valence conditions involves an increase in positive affect in response to requests with affectively matched features.

Finally, having established a consistent effect of congruence on both donations and positive affect ratings, we investigated whether the effect of congruence on donations was mediated by positive affect. First, regressing the mediator (positive affect ratings) on the independent variable (congruence) yielded a significant effect ($t = 7.59$, $P < .001$), indicating that congruence was associated with an increase in positive affect ratings. Next, we regressed the dependent variable (donation amount) on both the independent variable (congruence) and the mediator (positive affect). The effect of positive affect on donations was significant ($t = 5.03$, $P < .001$), suggesting that an increase in positive affect predicted an increase in donations. The direct effect of congruence on donations, controlling for positive affect, was no longer significant ($t = 0.65$, $P = .517$). To test for mediation, we calculated the indirect effect of congruence on donations through positive affect. The Average Causal Mediation Effect (ACME) was significant (ACME = 0.129, 95% CI = [0.076, 0.190], $P < .001$), suggesting that positive affect significantly mediated the relationship between affective congruence and donations.

In Study 2, we explored associations between congruence, self-reported affect, and donations. Affective congruence elicited positive affect in donors, which subsequently increased donations. Importantly, positive affect (and not negative affect) mediated the effect of congruence on donations. This finding indicates a specific psychological process responsible for how affective congruence can influence charitable giving. Specifically, the facilitating effect of congruence on donations results from elevated positive affect in donors, leading in turn to more generous donations. Crucially, the primacy of positive affect was observed in both positively and negatively congruent scenarios, suggesting that congruence operates uniquely through aroused positive affect rather than by generalized increases in affective responsiveness.

Study 3: fMRI experiment

To directly test the assertion that congruence influences donations through positive affect, we conducted an fMRI experiment to identify the neuro-affective circuits activated by affective congruence, and whose activity subsequently predicted donations. Based on the findings of Studies 1 and 2, we predicted that neural activity in the Nucleus Accumbens (NAcc), a brain region whose activity has been associated with positive affect and reward (Knutson and Greer 2008, Bartra et al. 2013), would increase in response to stimulus congruence and subsequently predict enhanced donation behavior (Genevsky et al. 2013). This would suggest that the affective congruence of request features influences the basic emotional processing of charitable requests, triggering changes in the neuro-affective correlates of decision-making and ultimately promoting charitable giving.

Methods

Twenty-eight healthy right-handed participants were recruited for the neuroimaging study. Participants were screened for psychotropic drug use and substance use, for a history of neurological disorders, and for typical magnetic resonance exclusions (e.g. metal in the body). Two participants were excluded from analysis, one for excessive head movement in the scanner and one due to malfunctioning hardware, leaving a total of twenty-six subjects for analysis. Participants completed informed consent prior to the task, were debriefed following the task, and all procedures were approved by the university ethics board.

While in the fMRI scanner, participants completed forty-eight trials of a charitable giving decision-making task modified from the design used in Study 1. On each trial, participants were presented with a request for donation that included an image of the potential recipient and a text description of their need. As in the previous studies, the valence of the image and text features were independently manipulated. At the beginning of each block, participants were presented with one of two donation text scenarios which varied by valence and related to helping reduce food insecurity. The positive and negative valenced request texts were presented in randomly counterbalanced blocks. Image valence (positive, negative) was randomized within each block. Participants were endowed with $10 to use during the experiment and were informed that one trial would be selected to count "for real" at the end of the study. Thus, their responses would not carry over between trials, and they should treat each trial independently.

Each trial proceeded with presentation of a fixation cross to draw attention to the center of the screen (2, 4, or 6 s), followed by the facial image of the potential recipient (2 s), the facial image and the request text presented together (4 s), a donation decision prompt (4 s), and the decision feedback (1 s). Five donation amount options ($0, $2, $6, $8, $10) were presented to participants on each trial in a randomized right-to-left or left-to-right order. Upon making a selection, participants received visual confirmation of their selection. Region Of Interest (ROI) analyses were conducted by specifying neural regions associated in previously published papers and meta-analyses with affect (NAcc, Anterior Insula (AIns), amygdala; Knutson and Greer 2008) and value integration (Medial PreFrontal Cortex or MPFC; Knutson et al. 2007, Plassmann et al. 2007, Samanez-Larkin and Knutson 2015). For full imaging analyses details, see Supplementary Appendix E.

Results

We first explored participants' behavioral responses to assess the impact of affective congruence on donation decisions in the fMRI scanner. Hierarchical linear regression models predicted donation amount by image valence and message valence and included random effects of subject intercept and slope. Results revealed an absence of main effects of stimulus feature valence, but a significant interaction effect of affective congruence, with higher donations in trials with valence-matched features ($t = 2.48$, $P = .016$). This finding replicates the effect of congruence observed in the previous behavioral studies in a novel neural sample. Across the valence pair conditions, mean donations were again higher for congruent pairs compared to the incongruent pairs, further replicating the previous behavioral results (pos/pos: 3.17 ± 0.10; neg/neg: 3.08 ± 0.10; pos/neg: 2.83 ± 0.11; neg/pos: 2.94 ± 0.10; Supplementary Appendix D).

To explore the impact of affective congruence on basic emotional processing of charitable requests, we contrasted brain activity when participants were presented with congruent (positive/positive or negative/negative) and incongruent (positive/negative or negative/positive) request features. Independent hierarchical mixed-effects
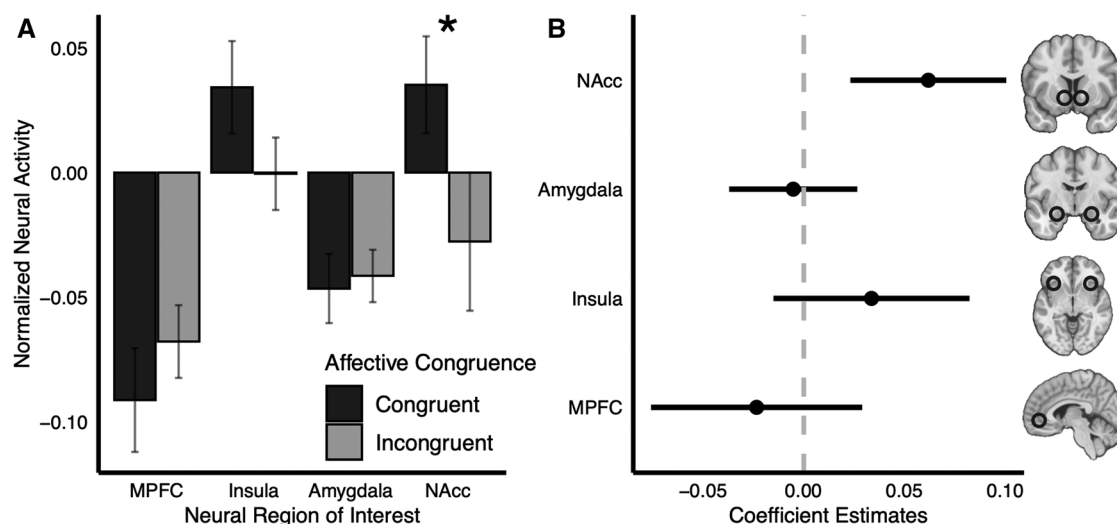
Figure 3. Contrasts of neural activity across regions of interest in congruent vs. incongruent requests. Across neural regions of interest, including the NAcc, Medial Prefrontal Cortex (MPFC), AIns, and Amygdala, only NAcc activity was significantly impacted by congruent vs. incongruent request messages. Panel A illustrates differences in mean activity between congruent and incongruent trials (bars indicate estimates with standard errors). Panel B indicates the magnitude of the impact of congruence on neural activity (point estimates with 95% CI).

regression models predicting neural activity by image and message valence were run for *a priori* defined regions of interest selected based on their associations with affective processes, value integration, and decision-making.

As predicted based on the behavioral findings, analysis revealed significantly greater activity in the NAcc for congruent versus incongruent trials ($t = 2.36$, $P = .022$) (Fig. 3). This finding offered evidence that at a neural level, donation requests with affectively matched features evoked positive neuro-affective responses. Subsequent analyses contrasting neural activity in other neural regions involved in affect and decision-making revealed no significant effects of congruence (MPFC: $t = -1.72$, $P = .091$; AIns: $t = 1.599$, $P = .116$; amygdala: $t = -0.12$, $P = .904$). These findings suggested that the effect of affective congruence operated through mechanisms tied to positive emotional responses rather than through broader neural systems associated with salience, value integration, or general affective processing (Fig. 3). Comparing across models predicting donations using image valence, message valence, and neural activity, we found that models including NAcc activity accounted for the more variance in donation behavior than those including only stimulus features or other neural ROIs (stimulus valence alone: $R^2 = .016$; NAcc alone: $R^2 = .061$; stimulus features + NAcc: $R^2 = .073$; see Supplementary Appendix F for full regression tables).

We next explored whether the impact of affective congruence on neural activity varied over time. We conducted an analysis using a first-half/second-half moderator, motivated by the possibility that participants may habituate to congruent or incongruent stimuli over the course of the task, potentially reducing the neural response to congruence in the latter half of the experiment. Such temporal effects could reveal whether the neural mechanisms underlying affective congruence are stable or dynamic over the course of decision-making. The results showed no significant moderation of congruence effects by task half ($t = 1.60$, $P = .112$), indicating that the influence of affectively congruent request features on NAcc activity remained consistent throughout the experiment. This finding suggests that the neural processes linked to affective congruence do not substantially diminish with repeated exposure to congruent or incongruent stimuli.

Having identified a neural correlate of stimulus congruence, we next explored the relationship between neural activity and

participants' choices to give. A hierarchical regression model predicted donation amount from brain activity during the choice phase of the task independently for each brain region of interest and included subject level random intercepts. Results revealed a significant association between NAcc activity and donation amounts, such that greater neural activity predicted higher donations in response to aid requests ($t = 2.50$, $P = .014$; Fig. 4). Subsequent analyses of other predefined regions of interest revealed no significant effects in the MPFC ($t = 1.24$, $P = .218$), AIns ($t = -0.36$, $P = .719$), or Amygdala ($t = -1.53$, $P = .130$). Thus, the NAcc was the only region in which activity was associated with congruence and predicted eventual decisions to give, uniquely linking positive affective responses to donation decisions.

We again tested if the relationship between neural activity and donation behavior was moderated by the first versus the second half of the task. Consistent with the previous findings, no significant moderation by task half was observed ($t = -0.61$, $P = .544$), indicating that the association between NAcc activity and donation amounts remained stable throughout the experiment. These results further suggest that both the neural response to affective congruence and its influence on prosocial behavior are robust, persisting across the entirety of the decision-making task without temporal variability.

In this neuroimaging experiment, we expanded on the previous behavioral studies to explore the impact of affective congruence on the basic neural processing of charitable donation requests and its influence on subsequent giving decisions. Our findings revealed that affectively matched request features elicited greater activity in the NAcc, a region associated with positive affective experiences and reward processing. Notably, this heightened NAcc activity also predicted donation decisions, suggesting a pathway linking affectively congruent stimuli to charitable behavior via enhanced positive emotional responses.

Importantly, these findings were specific to the NAcc, as no significant effects of affective congruence were observed in other regions of interest traditionally implicated in affect and decision-making. This further underscores the unique role of positive affective mechanisms in mediating the influence of affective congruence on donation behavior, rather than a more generalized neural response related to salience or value integration.
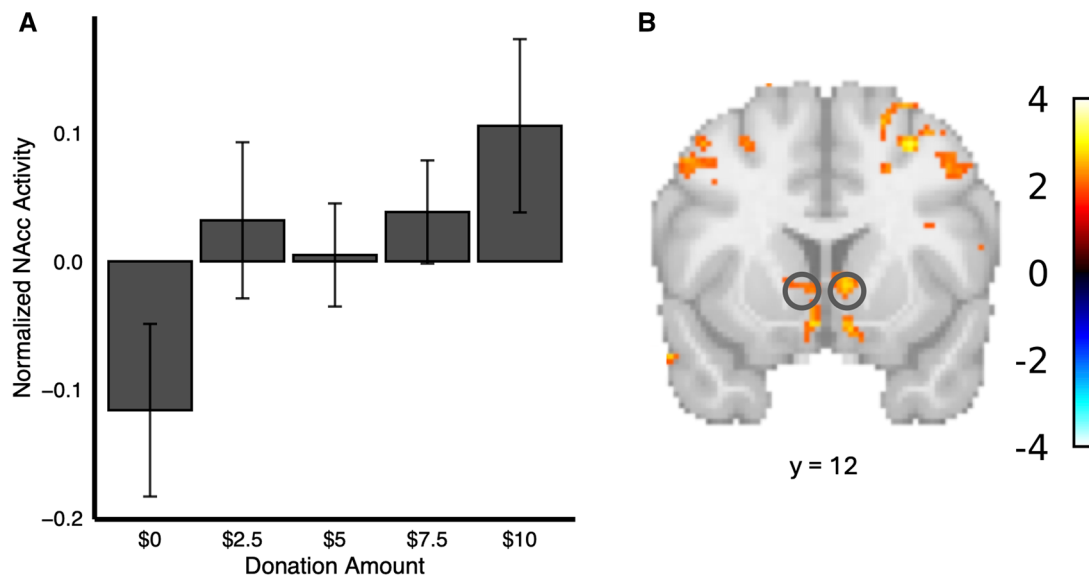
Figure 4. Neural activity associated with donation decisions. (A) Nucleus accumbens activity varied linearly with donation amounts. Increases in donations were associated with greater activity in the NAcc. Error bars represent standard errors of the mean. (B) Map indicating NAcc ROI and activation related to increasing donation amounts. Color scale represents *t*-values.
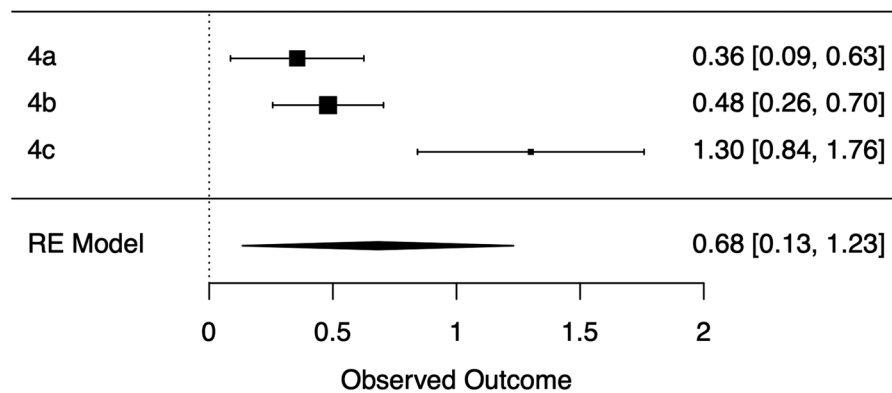

Figure 5. Individual and meta-analysis of Study 4 experiments. Effect size estimates and 95% CI for the congruence effect in Experiments 4a–4c are displayed in the right column and illustrated by the dark squares and horizontal bars. Point sizes indicate weighting in the pooled random effects model. The pooled estimated effect size and 95% CI are indicated by the dark diamond. The pooled analysis suggests a reliable and significant effect of congruence on donations across experiments.

Study 4. Replication and robustness experiments

As is often the case in empirical studies, particular aspects of the study design, stimuli, and dependent measures might have influenced the generalizability of our findings. In Experiments 4a, 4b, and 4c, we systematically tested the robustness of the findings across different novel empirical contexts. The three experiments and subsequent a meta-analysis reveal that the effect of affective congruence on giving was robust to empirical design choices including a binary choice giving paradigm, a broader range of giving contexts, and between-subjects designs (Fig. 5). Detailed descriptions of the studies and meta-analysis are available in the Supplemental Material (Supplementary Appendix G).

General discussion

This research combined behavioral and neural experiments to explore how affective congruence in charitable giving request features influences decisions to donate. Across behavioral studies and in both willingness-to-donate and forced-choice paradigms,

affective congruence increased giving. Results of Study 1 demonstrated that affective congruence increased donations in an incentive-compatible donation task as well as in a larger online sample. Results of Study 2 indicated that positive affect could account for how affective congruence increases donations. Importantly, the role of positive (but not negative) affect was apparent in both positive/positive and negative/negative congruent conditions. In Study 3, fMRI neuroimaging measures revealed that affective congruence in request features increased activity in the NAcc, a brain region associated with positive affect and anticipation of reward. Activity in this region predicted participants' subsequent decisions to donate, providing process evidence that the impact of affective congruence on donation behavior was generated by increased positive affective responses. Finally, the results of Study 4 demonstrated the replicability and robustness of this pattern of findings in three additional experiments.

These results help to resolve previously apparently divergent findings on affect and charitable giving. Specifically, while some prior studies suggest that negative affect can drive prosocial behavior (Small and Verrochi 2009), other findings indicate that positive affect plays a central role in giving (Andreoni 1990, Harbaugh et al. 2007).

In this research, both positive and negative stimulus features could promote charitable behavior if their affective valence was congruent. These results may help to clarify previously conflicting findings and suggest an integrative framework to reconcile these divergent perspectives.

This work also theoretically implicates a specific neuropsychological mechanism underlying the impact of affective congruence on giving behavior. Self-report measures and an fMRI experiment convergently demonstrated that increased positive aroused affect facilitates the influence of affective congruence on potential donation. Individuals reported significantly higher positive affect for congruent versus incongruent requests, and their positive affect ratings mediated the effect of congruence on donations. Importantly, the same mediating effect of positive affect was found for both positive and negative congruent features. These findings, therefore, rule out the possibility that congruence acts through a generalized increase in affective salience or arousal. Rather, affective congruence appears to influence donation behavior more specifically through increased positive affect. While future research might investigate how both valences of affective congruence can elicit positive affect (e.g. via perceptual fluency or semantic coherence; Winkielman et al. 2015), this finding highlights the importance of distinguishing between affective labels categorically assigned to stimuli and individuals' affective responses to the same stimuli. Temporal analyses provided further evidence that affective congruence can exert a stable influence over time on positive affective responses during charitable decision-making.

Neural evidence converged with self-report measures in implicating a positive affective impact of congruence on giving. Only in the NAcc, a region associated with positive aroused affect (Knutson and Greer 2008), was increased activity associated with affective congruence. Increased NAcc activity also predicted subsequent decisions to donate, bridging stimulus response to behavioral choice. Consistent with previous work indicating that affectively matched stimuli (regardless of valence) can positively influence the experienced affect of individuals (Reber et al. 1999, Centerbar and Clore 2006, Putrevu 2014, Winkielman et al. 2015), this neuroimaging evidence indicates that congruent request features elicit greater activity in brain circuits associated with core affective processing. More specifically, both positive and negative congruence can enhance giving through a common positive affective mechanism in the context of donation. Together, these results highlight the unique contribution of the NAcc to the positive affective mechanisms that motivate charitable behavior and reinforce the impact of affective congruence in shaping prosocial decision-making.

While affectively congruent stimuli of both valences appeared to elicit positive affect which promoted donation, these findings raise the question of why negative features of the stimuli did not as powerfully or consistently elicit negative affect (either in terms of self-report or neural activity). The donation tasks utilized in this research may implicitly impose an additional form of congruence related to the positive valence of helping behavior. Indeed, mounting research investigating self-report and neural predictors of giving on a trial-to-trial basis has consistently implicated positive but not negative affect in promoting donations (Moll et al. 2006, Harbaugh et al. 2007, Genevsky et al. 2013, Park et al. 2017). Thus, pairing congruent affective stimuli with a prosocial goal of donation may have endowed stimuli with a positive motivational force in the current task. Future research might explore whether congruence-elicited positive aroused affect has the same motivational force in tasks involving more antisocial choices (e.g. those promoting retribution or defense).

Beyond theoretical implications, these findings further suggest valuable practical guidelines for organizations to craft more effective donation requests. In particular, ensuring congruence of affective request features may enhance the overall effectiveness of aid requests. In common practice, many requests for aid combine conflicting elements—for example, solicitations for humanitarian aid that feature starving children paired with messages focused on the positive benefits of helping, or smiling children paired with messages about dire circumstances they face. This work demonstrates that affective match in requests for donations can increase positive affect in donors, which can promote subsequent decisions to give. Extrapolated to large-scale aid campaigns, relatively small modifications to request features (with negligible additional cost) might substantially increase donations. These results contribute to a deeper understanding of how affective congruence in charitable appeals can engage neural reward systems to drive prosocial behavior. By identifying the NAcc as a bridge from request stimulus to giving behavior, the present study provides insights about convergent processes at the intersection of emotion, decision-making, and prosociality at both behavioral and neural levels.

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Author contributions

Alexander Genevsky (Conceptualization [lead], Data curation [lead], Formal analysis [lead], Investigation [lead], Methodology [equal], Project administration [lead], Supervision [equal], Visualization [lead], Writing—original draft [equal], Writing—review & editing [equal]), Carolyn Yoon (Conceptualization [equal], Funding acquisition [equal], Investigation [equal], Supervision [equal], Writing—review & editing [equal]), Ting-Yi Lin (Data curation [Supporting], Formal analysis [Supporting], Methodology [Supporting], Visualization [Supporting]), Steven D. Shaw (Data curation [Supporting], Methodology [Supporting]), and Brian Knutson (Conceptualization [equal], Funding acquisition [equal], Investigation [equal], Methodology [equal], Resources [lead], Supervision [equal], Writing—original draft [equal], Writing—review & editing [equal])

Supplementary data

Supplementary data is available at SCAN online.

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Data availability

The data described in this article are available in the OSF, at https://osf.io/4vp9t/? view_only=8b7f29b3dce04a36a1c58537ef78f48e

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